

NASA Technical Memorandum 4220

NASA Geodynamics Program: Annual Report and Bibliography

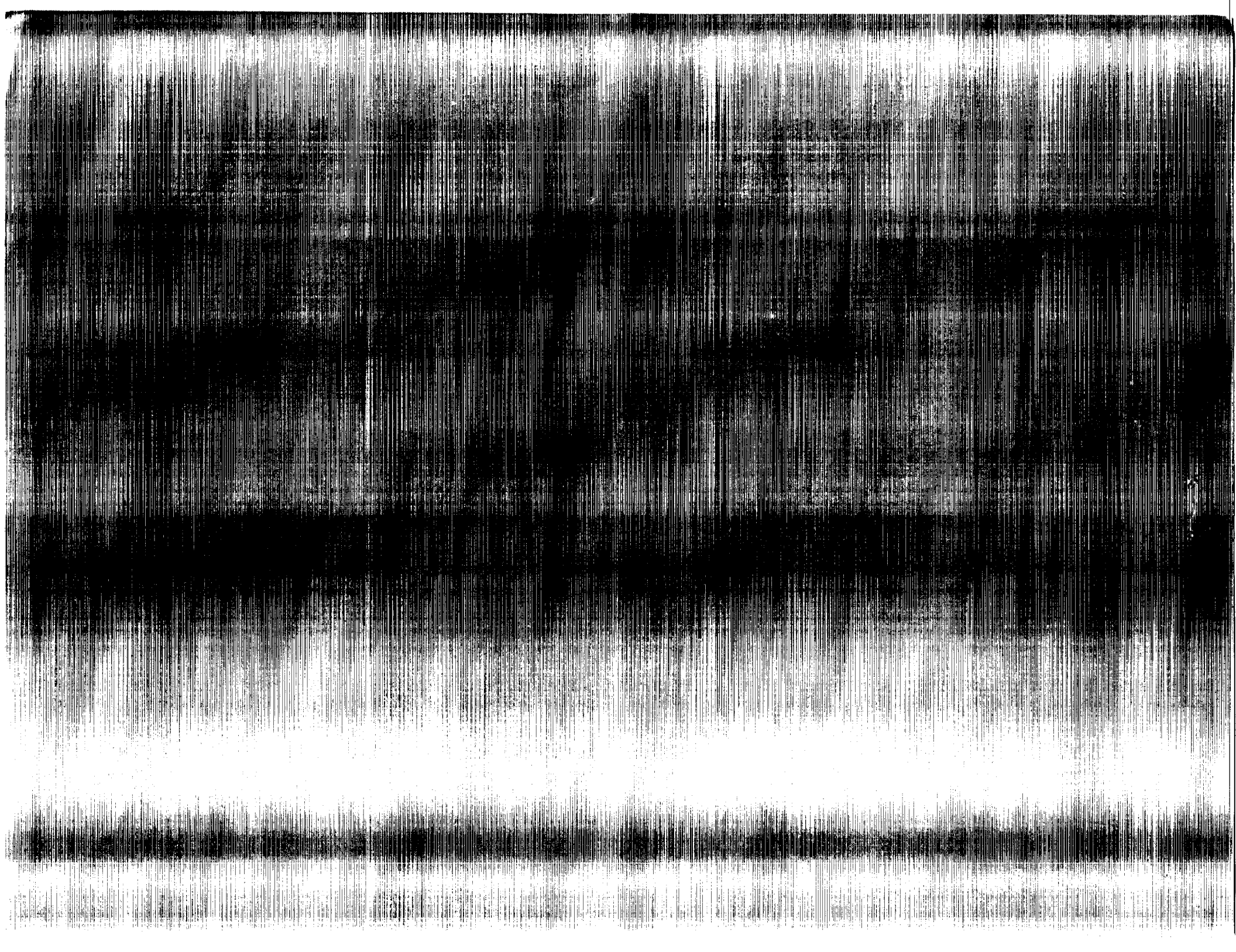
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NASA Geodynamics Program: Annual Report and Bibliography

*NASA Office of Space Science and Applications
Washington, D.C.*



National Aeronautics and
Space Administration
Office of Management
Scientific and Technical
Information Division

1990



FOREWORD

This Report provides a summary of the major activities of the NASA Geodynamics Program during 1988 and 1989. It includes a bibliography of published reports where the research on which the paper was based was either funded by the Program or was related to the Program by virtue of interagency or international agreements.

Previous annual reports on the Geodynamics Program's progress were issued for 1979, 1980, 1981, 1982, and 1983 (NASA, 1980; NASA, 1981; NASA, 1982; NASA, 1983a; and NASA, 1984a). An overview of the Program was published in 1983 (NASA, 1983b). A report which summarized the Program's achievements from its initiation in 1979 through 1987 was published in 1988 (NASA, 1988a).

The year 1989 marks the tenth anniversary of the formation of the Geodynamics Program. In the past decade, substantial progress has been made in decisive determinations of the motions of the major tectonic plates; in the mapping of crustal deformation near plate boundaries; in the measurement of the Earth's rotational dynamics; in the establishment of an international service based on space techniques for monitoring Earth orientation; and in the modeling of the Earth's gravity and magnetic fields.

In July 1989, the NASA Geodynamics Branch and the NASA Geology Program were brought together to form the NASA Solid Earth Science (SES) Branch.

In August 1989, we were saddened by the passing away of Dr. Edward A. (Ted) Flinn, III, one of the architects of the NASA Geodynamics Program and a principal contributor to the success of its international involvement.



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SECTION I. INTRODUCTION

A. PROGRAM INITIATION

The NASA Geodynamics Program was initiated in 1979 to coalesce the emerging technologies of Satellite Laser Ranging (SLR), Lunar Laser Ranging (LLR), and Very Long Baseline Interferometry (VLBI) - all having the potential for the detection of tectonic plate motion and crustal deformation - and the use of satellites for mapping the geopotential fields into a coherent program for the study of the solid Earth.

A chronology of major Program activities from 1979 to 1987 was published in 1988 (NASA, 1988a). The chronology for 1988 and 1989 is provided herein (Section III).

B. PROGRAM OBJECTIVES

The goals of the Geodynamics Program have been:

- o *To contribute to the understanding of the dynamics and evolution of the solid Earth; and in particular, the processes that result in movement and deformation of the tectonic plates;*
- o *To obtain measurements of the Earth's rotational dynamics and its gravity and magnetic fields in order to understand better the internal dynamics of the Earth.*

The Geodynamics Program was subdivided into three areas: Earth Dynamics, Crustal Motion, and Geopotential Research.

The objectives in the *Earth Dynamics* area have been to develop models of polar motion and Earth rotation and to relate studies of global plate motion to the dynamics of the Earth's interior. This is expected to lead to an increased understanding of the global structure of the Earth and the evolution of the crust and lithosphere. The research includes studies of the dynamic interaction between different regions of the Earth's tectonic features, as well as the interaction between the solid Earth, atmosphere, and oceans. A significant portion of this includes activities performed under the Crustal Dynamics Project (CDP), through highly accurate measurements of Earth rotation and polar motion.

Field measurements and modeling studies of crustal deformation in various tectonic settings were the primary focus of the *Crustal Motion* research. Activities in this area provide measurements, analyses, and models which describe the accumulation and release of crustal strain and the crustal motion between and within the North American, Pacific, Eurasian, South American, and Australian Plates. A principal result of this research has been the development of quantitative descriptions of geophysical and

geological constraints on the motion of measurement sites through refinements of global and regional plate motion models.

Geopotential Research uses space and ground measurements to model the Earth's gravity and magnetic fields. A large part of the effort includes the development of new analysis techniques and software systems. Studies of the Laser Geodynamics Satellite (LAGEOS-I) orbit and the orbits of other near-Earth satellites contribute to the gravity field studies. Other data used in constructing the field models include gravity field data derived from satellite altimetry, satellite-to-satellite tracking and gravity gradiometry; magnetic field data from satellite magnetometers; and ancillary data.

C. CRUSTAL DYNAMICS PROJECT

A major element of the Program, the CDP, was initiated in 1979 to develop the SLR and VLBI techniques and to implement global networks of fixed and mobile SLR and VLBI stations, with the cooperation of many countries, for measurements of plate motion and regional deformation. Although other satellites are used, the SLR measurements rely mainly on ranging to LAGEOS-I which was launched in 1976. LAGEOS-II, which is to be launched in late 1991, is expected to improve further the accuracy and efficiency of SLR. The application of VLBI to precise geodesy has made use of the techniques and global facilities developed for astronomical studies of radio sources.

The management responsibility for the CDP was assigned to the Goddard Space Flight Center (GSFC) with support from the Jet Propulsion Laboratory (JPL). In 1982, Lunar Laser Ranging (LLR) was included in the CDP. In the decade which has followed, the CDP has grown into an international research effort leading toward the understanding of earthquakes and the dynamics of the crust and upper mantle of the Earth. Twenty-three countries are participating in the development and use of these geodetic techniques. Twelve of these countries have formed a consortium, - Working Group of European Geo-Scientists for the Establishment of Networks for Earthquake Research (WEGENER), - which is working with the CDP in the Mediterranean Laser (Medlas) Project to monitor the crustal deformation in the Mediterranean Basin.

While helping to build and deploy SLR, LLR, and VLBI facilities world-wide, the CDP has also developed the technology to improve the accuracy and reliability of the field measurements. Most of the systems which comprise the world-wide network are now capable of measuring the motion of any one site with respect to another with a precision of better than 1 cm/year. This has resulted, for the first time, in the direct measurement of the motion of most of the major plates and the deformation of the Earth's crust in the western U.S., Alaska, and the Mediterranean.

The history of the development of the SLR, LLR, and VLBI techniques and the global networks that currently exist are described in NASA, 1988a. The status and plans of the CDP and the

WEGENER/Medlas consortium, through 1991, are outlined in Section II A and C, respectively.

While the CDP is scheduled to finish its activities at the end of fiscal year 1991, the current measurement program will be continued through 1991, with some changes to reflect the emerging GPS techniques as embodied in the recommendations of the NASA Geophysics Workshop held in Coolfont, WV, in 1989 (report in preparation). In addition, the CDP is committed to providing SLR tracking for the European Space Agency (ESA) Remote Sensing Satellite (ERS-1) to be launched in 1990 and the NASA Ocean Topography Experiment (TOPEX) to be launched in 1992.

Beyond 1991, NASA has chosen to continue and to improve on the work of the CDP by establishing a new level of effort program. The objectives of the new program, while similar to those of the CDP, will require an expansion of global networks through increased international participation; improved accuracies and greater temporal resolution of measurements; and more detailed studies of the deformation at plate boundaries

D. GLOBAL POSITIONING SYSTEM

NASA development of receivers which use signals from the Global Positioning System (GPS) satellites was initiated at JPL in the late 1970's. In 1983, the U.S. Congress directed NASA to initiate a program for the study of crustal deformation in the Caribbean Basin using GPS. This program now includes developmental experiments in southern California; measurements across the spreading ridge in the Gulf of California; and measurements in Central America, South America, Australia, and New Zealand. These measurement campaigns are coordinated with other countries, with U.S. institutions, and with other U. S. agencies

During the past two years the development and use of the GPS technique has improved rapidly. The precision of the GPS measurements for regional crustal deformation studies is now believed to be comparable to that of mobile SLR and VLBI systems. However, additional data are required to verify that the GPS measurement of global tectonic deformation rates are also comparable.

E. GEOPOTENTIAL FIELDS

1. Gravity Field and Geoid

During the past decade, significant improvements have been made to the accuracy and resolution of models of the Earth's global gravity field and geoid. This has amounted to about a factor of two improvement in gravity field modeling and a factor of about 5-10 improvement in the geoid.

Gravity Field modeling has made extensive use of the SLR data acquired using LAGEOS-I and Starlette (a French satellite) and altimetric measurements using the Geodynamic Experimental Ocean

Satellite (GEOS-3) and the Ocean Dynamics Monitoring Satellite (SEASAT). However, the goal of developing models with an accuracy of a few milligals (mgals) for spatial resolution of 100km or less has not been achieved due to the lack of *in situ* satellite data.

The scientific requirements for these data are discussed in the report of a Gravity Field Workshop that was held in Colorado Springs, CO, in 1987 (NASA, 1987). To meet these requirements there are several planning activities, studies, and instrument developments which are currently underway. These include a spacecraft which will carry a French gradiometer (GRADIO) - the ESA Applications and Research Involving Space Techniques Observing the Earth's field from Low Earth Orbiting Spacecraft (ARISTOTELES) mission; use of GPS and SLR tracking of the Gravity Probe-B (GP-B); and a NASA spacecraft which will carry a University of Maryland cryogenic gradiometer -the Superconducting Gravity Gradiometer Mission (SGGM).

2. Magnetic Field

The first satellite dedicated to mapping the Earth's magnetic field, the Magnetic Field Satellite (MAGSAT), was launched in 1979. MAGSAT provided the first truly global survey of the vector components of the geomagnetic field. Its measurements were used to construct the International Geomagnetic Reference Field (IGRF) for 1980 and to study crustal magnetic anomalies. The geomagnetic field is known to undergo local changes of several hundred nanoTesla (nT) due apparently to motion of the Earth's core. In addition, some ground observatory data indicate a sudden change with time in the third derivative ("magnetic jerk") of the main dipole field. The scientific interest in confirming that the "magnetic jerk" is real, and possibly related to core-mantle interaction, and the need to update the IGRF have generated requirements for a satellite mission capable of long-term surveys of the field. This has resulted in NASA/Centre Nationale d'Etudes Spatiales (CNES) studies of a Magnetic Field Explorer (MFE)/Magnolia mission, and studies by NASA and ESA of the possibility of adapting boom-mounted magnetometers to the ARISTOTELES mission.

F. *GEOPHYSICS WORKSHOPS*

The first Workshop dedicated to studies of the solid Earth and oceans was held in Williamstown, MA, in 1969 (NASA, 1970). The results of this Workshop formed the basis of the NASA Earth and Oceans Dynamics Applications Program, the predecessor of the Geodynamics Program. The first Geodynamics Workshop was held at Airlie House in Virginia in 1983 (NASA, 1984b). In early 1988, plans were initiated for a second Geodynamics Workshop to be held in 1989, with the intent of developing the Program's details for the next decade. Prior to the 1989 Workshop, NASA supported the participation of U.S. scientists and engineers in an international Workshop held in Erice, Italy, in July 1988 (Mueller and Zerbini).

In response to an impending reorganization, the 1989 Geodynamics Workshop was extended to include geology and was re-formulated to develop the NASA Solid Earth Science (SES) Program for the next decade. This Workshop was held at Coolfont, WV, in July 1989.

The report of the 1989 Geophysics and the SES Program Plan will be published in 1990. This plan outlines five major initiatives for the next decade. These include:

1. The development of Global Geophysical Networks (GGNs) comprised of approximately 200 geophysical stations for studies of plate motion and deformation (this has been named FLINN -Fiducial Laboratory for an International Natural science Network) and regional networks (named DSGS -Densely Spaced Geodetic Systems) for monitoring tectonic activity in active areas.
2. The study of the formation, degradation, erosion, and redistribution of soils; the effects of climatic changes on the land surface; and climate-tectonic interactions.
3. The mapping of the Earth's global land surface topography at moderate resolution, with the acquisition of high resolution data for regional and local areas.
4. The acquisition of gravity and magnetic field measurements with accuracies and resolutions and, for magnetics, duration of measurement period needed to support investigations of the solid Earth.
5. The study of volcanoes to document the interaction of volcanic eruptions with the atmosphere and the short-term climatic effects of volcanic activity.

SECTION II. PROGRESS, STATUS, AND PLANS

A. CRUSTAL DYNAMICS PROJECT

The observing program of the CDP is guided by the Project's scientific objectives. Most of the Project's effort is in understanding the motions occurring in California and Alaska along the plate boundary in western North America, and the determination of global plate motion, especially with respect to North America. The distribution of presently occupied sites in the global SLR network provides a basic framework for the study of plate motion. This is complemented by a network of VLBI observatories, especially between North American sites and those in the northern Pacific and Eurasia. Regional deformation observations in western North America are mainly accomplished with the VLBI systems. In the Mediterranean region, the CDP is participating with WEGENER in a long-term set of SLR measurements. A summary of the CDP activities is reported in Frey and Bosworth, 1988.

During 1988 and 1989, the CDP continued its regular program of fixed and mobile SLR and VLBI measurements. Overall, during the two years, the combined NASA and National Geodetic Survey (NGS) programs involved 23 countries in SLR and VLBI observations using 38 fixed systems and 8 mobile systems, with the latter having completed 84 site visits.

Because of planned upgrades to the Transportable Laser Ranging Systems (TLRS), observations in 1988 with these systems were limited to Cabo San Lucas, Mexico; Westford, MA; Mojave, CA; and Otay Mountain, CA. In 1989 all four TLRSs were in the field: TLRS-1 was in Europe to support WEGENER/Medlas studies of crustal deformation and movement; TLRS-2 and TLRS-3 conducted studies of the relative motions of the Pacific, Nazca, and South American Plates (TLRS-2 shuttled between Huahine, French Polynesia, and Easter Island, and TLRS-3 began measurements at Cerro Tololo, Chile); TLRS-4 visited Ensenada, Mexico, and Cabo San Lucas, Mexico, to study (with the fixed laser at Mazatlan, Mexico) the spreading of the Gulf of California. TLRS-4 also participated in studies of the regional deformation of the North American Plate immediately following the October 17, 1989 Loma Prieta earthquake by making measurements at Mojave, CA.

The mobile VLBI systems (MV-2 and -3) had a banner year in 1988. In addition to measurements of regional deformation in the western U.S. from 18 sites (some 29 site visits) using MV-2 and MV-3, MV-2 participated in studies of the interaction of the North American and Pacific Plates by making measurements across the Aleutian Trench from sites in Alaska and Canada. In 1989, NASA and NGS agreed to exclusive use of MV-3 for NGS programs. However, because of the scientific, and possible societal, importance of the Alaskan studies, the 1988 Alaskan Campaign was repeated. As a consequence, the number of sites in the western U.S. was reduced to 10 (15 site visits).

Following the Loma Prieta earthquake, two mobile VLBI systems were deployed to three previously established VLBI sites in the earthquake area: Fort Ord (near Monterey, CA), the Presidio (in San Francisco, CA), and Point Reyes, CA. From repeated VLBI occupations of these sites since 1983, the pre-earthquake rates of deformation have been determined with respect to a North American reference frame with one sigma formal standard errors of about 1mm/yr. The VLBI measurements immediately following the earthquake showed that the Fort Ord site was displaced 49 ± 4 mm at an azimuth of $11 \pm 4^\circ$ and that the Presidio site was displaced 12 ± 5 mm at an azimuth of $148 \pm 13^\circ$. No anomalous change was detected at Point Reyes with a one sigma uncertainty of 4mm. The estimated displacements at Fort Ord and the Presidio agree with static displacements predicted on the basis of a coseismic slip model.

During 1988 and 1989, the accuracy of the fixed SLR and VLBI systems was demonstrated at certain sites at the subcentimeter-level. Plans were made for further improvements with the goal of achieving the few mm-level.

Over the past decade, global plate motion studies using data provided by both SLR and VLBI systems have largely confirmed the expected motion for most plates. Figure II-1 shows recent measurements of plate motions along specific baselines, as determined from SLR systems. Figure II-2 shows a similar result for VLBI observations in the Pacific, represented this time as motion of the individual sites with respect to the stable interior of the North American Plate. These direct measurements of plate motion are important: they provide the first proof that the plates move as plate tectonic theory suggests, and that the motion over short time scales is similar to that determined from long-term geologic averages.

Both VLBI and SLR systems are engaged in measurement of the relative motion between the North American and Pacific Plates near the plate boundary in California. Figure II-3 shows vector site motions in the western U.S. with respect to interior North America, as measured by VLBI. For reference, the long-term velocity of the Pacific Plate relative to the North American Plate as estimated by the Northwestern University Velocity Model 1 (NUVEL-1) plate motion model (DeMet, et.al., 1989) is shown. The data indicate that the velocities measured near the plate boundary are several tens of mm/year less than those modeled for the plates as rigid bodies (50mm/year). The difference between the far-field motion and the near-field motion has potentially important implications for the earthquake hazard problem in California, as it may be related to how stress is distributed and stored within boundary zones between two large moving plates. These results are based on solutions developed by GSFC, analyses by other groups, such as NGS, the University of Texas at Austin, and the Smithsonian Astrophysical Observatory, have produced similar results.

Another result documented by the CDP is the regional deformation in the plate boundary zone in Alaska, where the Pacific Plate converges upon, and is consumed under, the North American Plate. Figure II-3 also shows vector site motions in Alaska and the

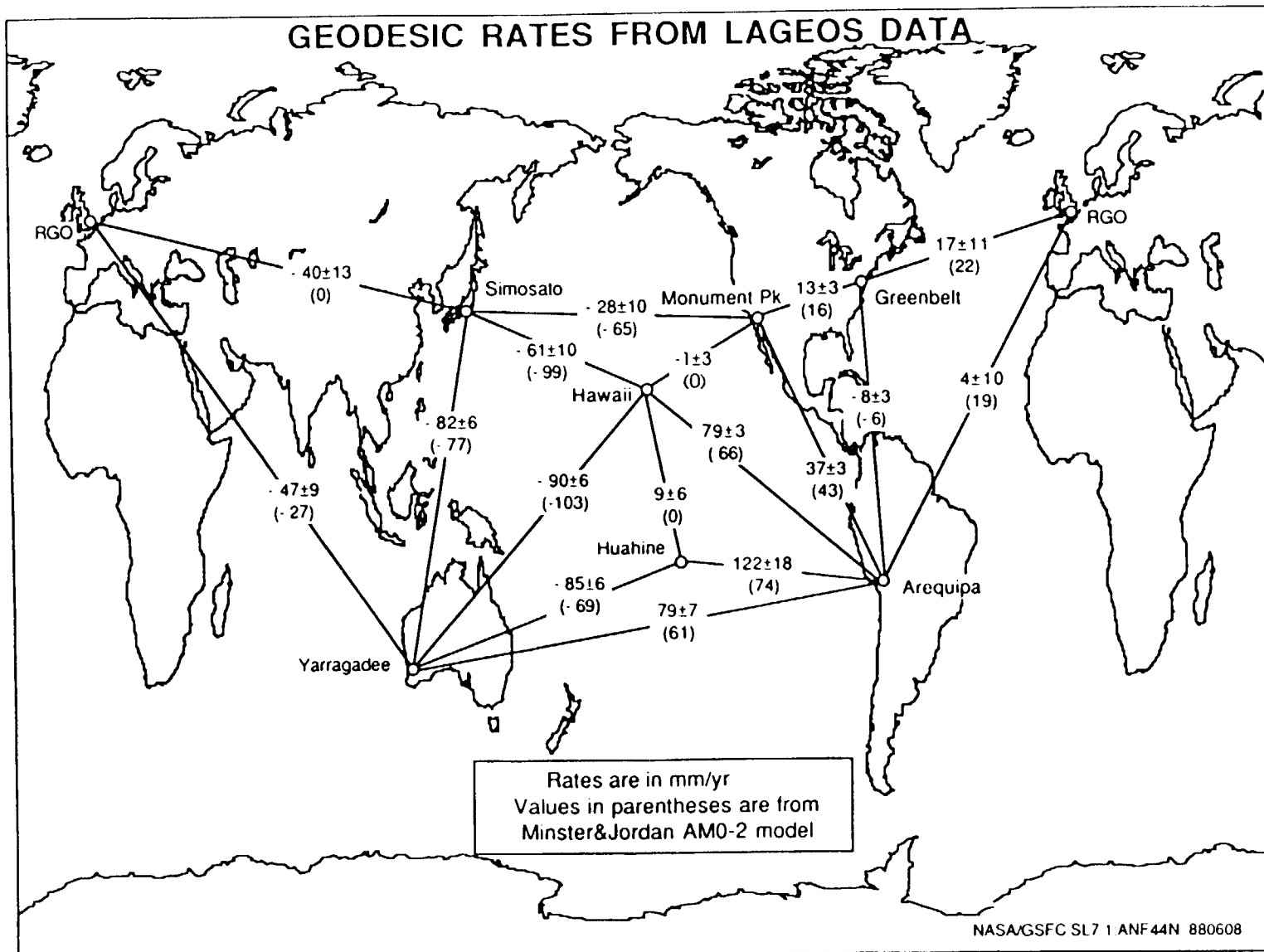


Figure II-1 Rate of change of baseline lengths from Satellite Laser Ranging data for selected baselines between North America, Eurasia, and the Pacific. Rates are in mm/year, in a reference system where the motions are with respect to the underlying mantle. In parentheses are the "predicted" rates based on long-term geological averages.

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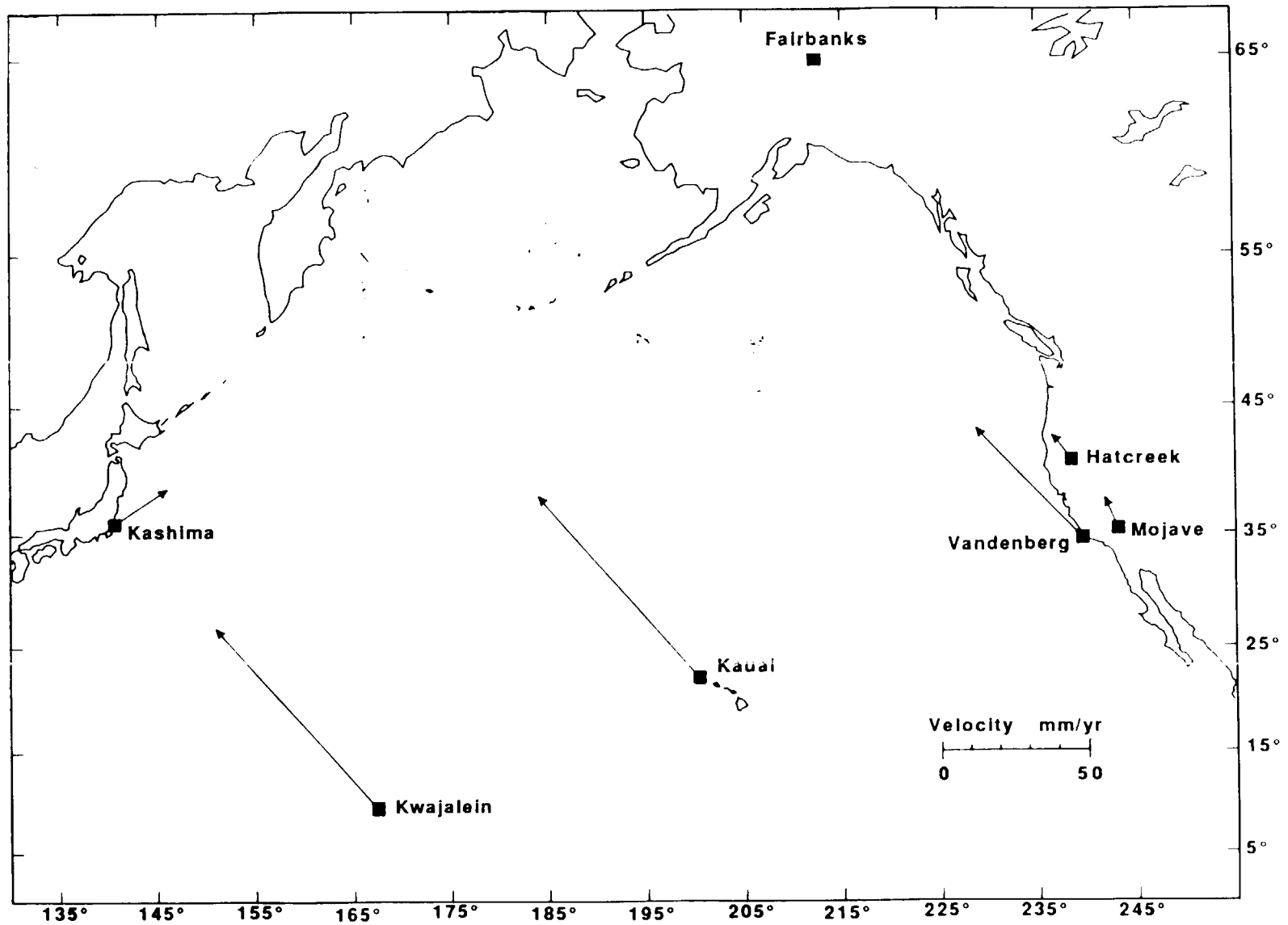


Figure II-2 Observed motions of Very Long Baseline Interferometry (VLBI) sites in the Pacific. Motions are calculated with respect to an North American Plate site at Fairbanks, AK, assumed fixed. The observed motions for Vandenberg, Kauai, and Kwajalein are very close to the predicted motions based on long-term geological averages, and clearly show how the Pacific Plate is sliding northwestward past the North American Plate.

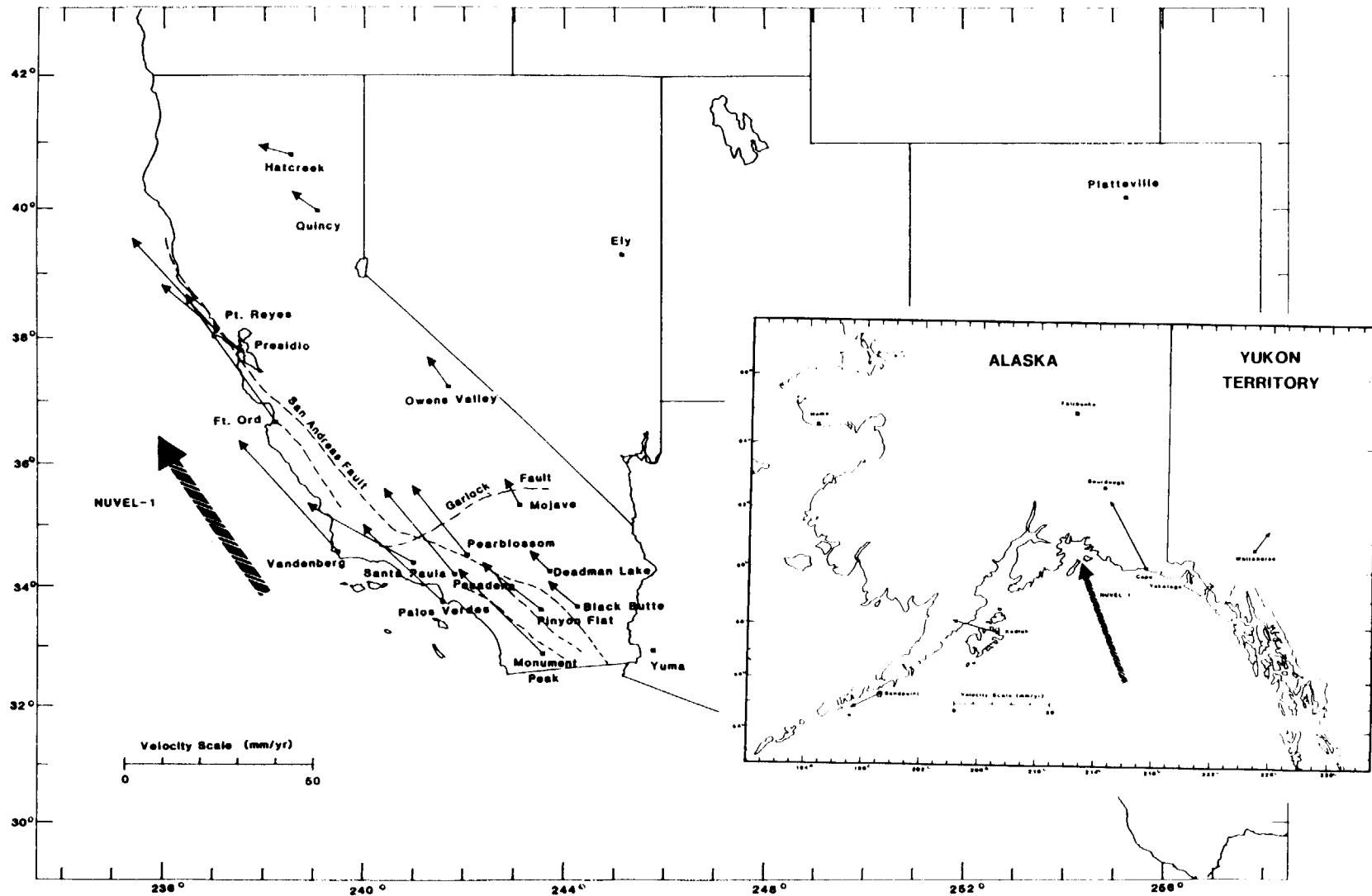


Figure II-3 Motion of VLBI sites along the North American-Pacific Plate boundary in California and Alaska (insert). For comparison, the predicted motion of the Pacific Plate with respect to North America based on NUVEL-1 is shown. Note the departure of the motion of Kodiak and Sand point in Alaska from the expected plate motion.

Yukon Territory with respect to interior Alaska, as determined by VLBI. For reference, the long-term velocity of the Pacific Plate relative to the North American Plate offshore of southern Alaska, as given by the NUVEL-1 plate motion model, is shown. It is clear that several of these sites show relatively large motions of 30-40mm/year, which may be related to the seismic potential of this area. Several of these sites are located in "seismic gaps" where large earthquakes have not occurred in recent times, despite the prolific seismicity in the surrounding areas.

It is planned that most of the current SLR and VLBI measurements will be continued through fiscal year 1991.

B. VLBI/SLR TECHNIQUE COMPARISONS

VLBI and SLR are the two most accurate techniques yet developed for determining geocentric site coordinates on a worldwide scale. Both techniques have been under development for more than twenty years with the aim of providing fundamental data which will lead to an understanding of contemporary tectonic processes. Since 1980, the CDP has undertaken to prove the accuracy of the techniques through blind comparisons of the geodetic information produced by each.

The first comparison results were published in 1985 (Kolenkiewicz et. al.,). Baseline length results for 22 baselines involving 7 sites were compared. The mean level of agreement was 10+/-12mm with an rms scatter about the mean of 52mm. No attempt was made to compare Cartesian station positions directly because of the small number and poor distribution of stations.

By 1989 the number of locations where VLBI/SLR comparisons could be made had increased to 16 and had taken on a worldwide distribution including sites in the mid-Pacific Ocean, Australia, and China. The GSFC VLBI analysis group and the SLR analysis team at the University of Texas agreed to carry out a blind comparison of geocentric site coordinates. Because no effort had been made to make the terrestrial reference frames of the VLBI and SLR analysis systems identical, it was necessary to determine a 7-parameter transformation relating the two reference frames. The transformation consisted of a three-component translation which related the origins of the frames, a three-component rotation which related the orientation of the frames, and a scale factor which related the overall scales of the two frames. After the transformation was applied to the VLBI coordinates they were compared to the SLR values. The weighted rms residual differences for the 16 sites were found to be 19, 26, and 22mm, respectively, in the X, Y, and Z coordinates. These differences are approximately two times the uncertainty in the translation of the coordinate system origin and are consistent with the uncertainties in the individual site components from the two techniques. The results validate the VLBI and SLR techniques for determining Cartesian coordinates at well under the 50mm level achieved for baseline lengths in 1985.

In October 1989, a VLBI observing session was carried out at the Goddard Optical Test Facility (GORF), a location with a monument with well determined SLR coordinates. Thus, a 17th site became available for comparison. When the VLBI coordinates were transformed to the SLR frame using the transformation discussed above and the results compared with the SLR coordinates, the differences were 9, 15, and 2mm, respectively, for the X, Y, and Z components. Considering the 10-15mm level uncertainty in the translation of the origin these are essentially perfect results.

C. WEGENER/Medlas

Medlas was organized in 1981 by a consortium of European countries (WEGENER). The project plan calls for the use of a mix of European fixed and mobile SLR systems and U.S. mobile SLR systems for studies of crustal motion in the Mediterranean Basin. The consortium includes the Federal Republic of Germany (FRG), The Netherlands, the U.S., Austria, Italy, Great Britain, France, Switzerland, Greece, Turkey, Israel, and Egypt. Modular Transportable Laser Ranging Systems (MTLRS) are provided by the Institute fur Angewandte Geodaesie (IfAG) of the FRG (MTLRS-1), the Technical Institute of Delft (MTLRS-2), and NASA (TLRS-1). The Italian Space Agency (ASI) is expected to start construction of two other mobile systems which will join the WEGENER/Medlas studies in the early 1990's. The locations of the fixed and mobile laser sites in Europe are shown in Figure II-4.

The first Medlas Campaign used MTLRS-1 and -2 and was conducted in 1986. This Campaign involved sites in Italy, Turkey, and Greece. In 1987, these systems were joined by TLRS-1. Due to a number of constraints, NASA and WEGENER agreed to revise the Medlas plan to provide for Mediterranean observations on alternate years beginning in 1989 and for MTLRS-1 to visit the U.S. between Mediterranean Campaigns. To implement this plan, MTLRS-1 visited the U.S. in 1988 and acquired observations at VLBI sites in Richmond, FL; Owens Valley, CA; and Platteville, CO. These sites were chosen to support studies recommended by the Commission for Coordination of Space Techniques for Geodesy and Geodynamics (CSTG) of the International Union of Geodesy and Geodynamics (IUGG) and the International Astronomical Union (IAU) Joint Working Group on the Establishment and Maintenance of a Conventional Terrestrial Reference System (COTES). During 1988, MTLRS-2 remained in Europe for observations and upgrades.

In December 1988, MTLRS-1 returned to Europe for the 1989 Medlas Campaign and was joined in early 1989 by TLRS-1. The 1989 Medlas Campaign included 13 sites: 7 by MTLRS-1, 4 by TLRS-1, and 2 by MTLRS-2. In 1990, MTLRS-1 will return to the U.S. for continuation of the COTES measurements. It will be followed later by TLRS-1 which stayed in Europe to complete part of the 1989 schedule.

The next Medlas Campaign is planned for 1992. Meanwhile, WEGENER is developing plans for the extensive use of GPS to densify measurements in the Mediterranean Basin and is exploring

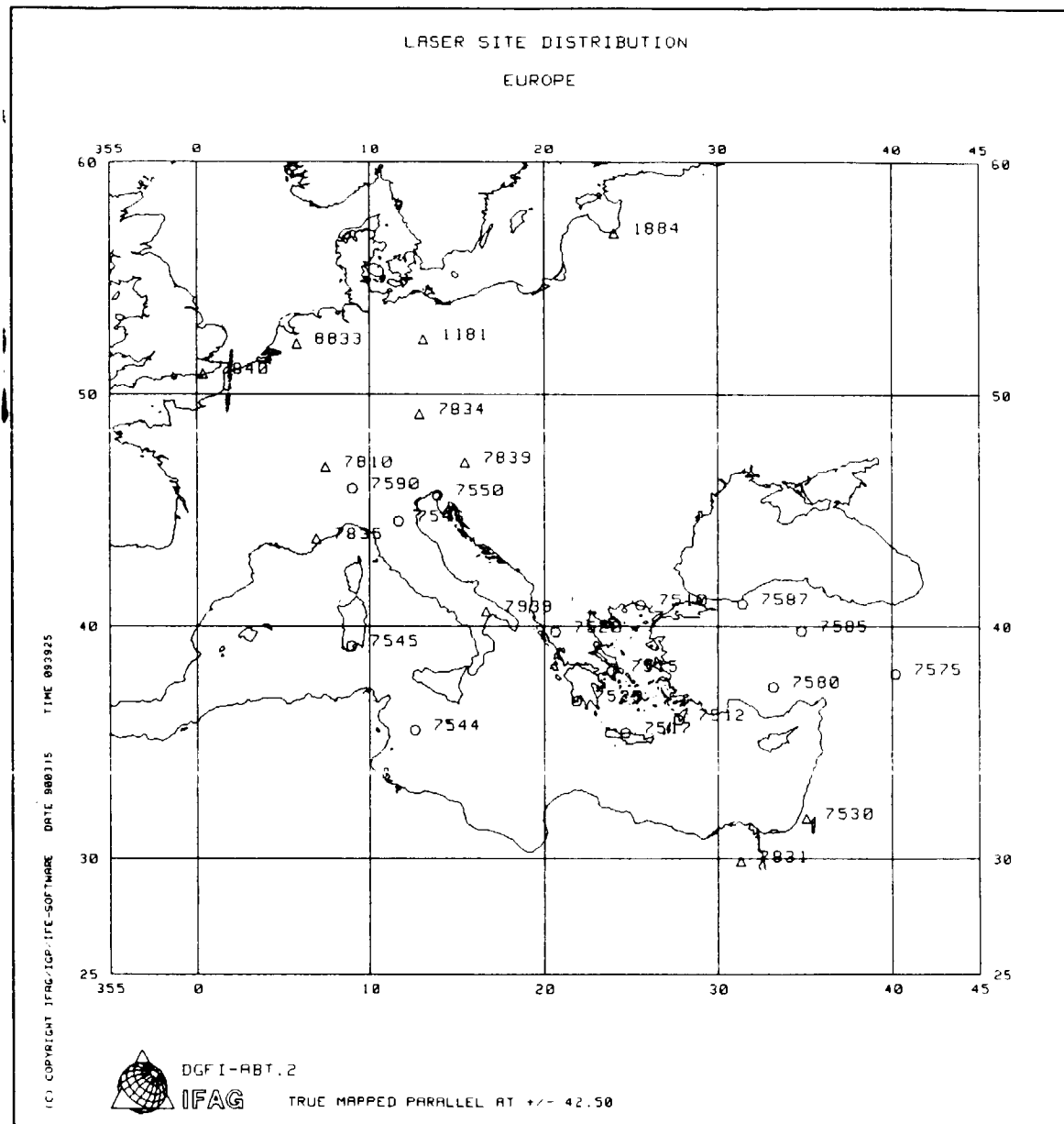


Figure II-4 Distribution of SLR sites contributing regularly with observations to the WEGENER/Medlas Project. Fixed stations identified with triangles. Stations occupied by mobile system identified with circles.

the possibility of extending SLR studies to areas other than the Mediterranean.

Results of the WEGENER/Medlas Campaigns have been presented at several meetings of the CDP Investigators Working Group (IWG), and at special WEGENER/Medlas symposiums held in Bologna, Italy, in 1987 (Baldi and Zerbini, 1988); and in Scheveningen, The Netherlands, in 1988 (Wakker, 1990).

D. GLOBAL POSITIONING SYSTEM APPLICATIONS

In January 1988, JPL coordinated and managed the Central And South America (CASA) Uno 88: a comprehensive GPS data acquisition campaign to monitor crustal deformation in central and north-western South America. Sites are located in Costa Rica, Panama, Colombia, Venezuela, and Ecuador. CASA Uno 88 required the first implementation of a globally-distributed GPS satellite tracking network to improve orbit determination necessary to compensate for the poor satellite geometry over South America. This was the largest GPS experiment to date to measure tectonic plate motion, acquiring 590 station days of data from 44 GPS receivers in 13 countries. Over 25 different institutions contributed to the success of this campaign.

In October 1988, JPL sent a Rogue GPS receiver to the Deep Space Network (DSN) site in Canberra, Australia and a TI-4100 to Black Birch, New Zealand, in support of a NGS global tracking experiment (GOTEX).

A GPS field campaign in Mexico (GEOMEX 89) was the first reoccupation and extension of GEOMEX 85. This joint experiment with Oregon State University was successfully carried out during two weeks of May 1989. The extension of the network added 7 sites in Mexico which span the Gulf of California, and included a site on Guadalupe Island. In the U.S., 8 additional sites were occupied including sites at Hatcreek, CA; Westford, MA;, and Richmond, FL, where Rogue receivers were deployed.

During August and September 1989, JPL supported a GPS campaign on the island of Sumatra, Indonesia. This support included providing logistical planning and deploying a Rogue GPS receiver to Wellington, New Zealand. The receiver was sent early to New Zealand to also provide fiducial support for the reoccupation of a site in the South Pacific.

Following the October 1989 Loma Prieta earthquake, JPL fielded a team to monitor post-seismic relaxation in the epicentral region. Using the Rapid Static Survey (RSS) technique recently developed at JPL measurements were taken for about 5 minutes every day for 6 days at each of 10 sites with a single roving GPS receiver. Two stationary receivers were operated simultaneously to provide a baseline to which the location of the roving receiver could be referred. The RSS technique involves fast resolution of cycle ambiguities in carrier phase data which depends on the availability of both carrier phase and high precision pseudo-range

data. Presently, the Rogue is the only GPS receiver with this capability.

Two major experiments are proposed for 1991: one experiment will attempt to measure the relative plate motion between Tibet and China; and the other experiment will measure the convergence of the Nazca and South American Plates.

GPS data analysis activities in 1988 and 1989 included: final processing and reporting on the experiments of November 1985 in Baja, CA, and June 1986 in the northern Caribbean (see Figure II-5); complete analysis of the January 1988 CASA Uno experiment; and preliminary processing of the Spring 1989 GEOMEX campaign. This now provides data for some baselines which span 4 years (March 1985 - April 1989) and has resulted in direct observation of plate motions which are consistent in magnitude and comparable in precision (both long term and short term) with results from VLBI and SLR. The precision of the vertical components has frequently surpassed that of VLBI both day-to-day and year-to-year.

A study covering a time span of 3.5 years has been nearly completed in which good agreement is demonstrated between VLBI- and GPS-determined rates in southern California, and in which the first rate estimates for an offshore island have been determined.

Overall, the time required to process data from a typical field campaign has been reduced by more than an order of magnitude, and accuracies in horizontal baseline components (as determined by comparison with VLBI) have improved from the typical several parts in 10^8 two years ago to, in many cases, 5 to 10 parts in 10^9 . Length precisions of parts in 10^9 have been demonstrated for baselines up to 5,600 km (Lichten, in press).

The Geodynamics Program has supported the development of new GPS receivers capable of range measurements with accuracies at the cm-level and phase measurements with accuracies at the mm-level. Receivers with these capabilities will be needed for the implementation of FLINN and DSGS. The development of the first of the new receivers, Rogue, has been completed, and the technology has been transferred to industry.

Some features that the Rogue receiver has pioneered are:

- Digital tracking (eliminating interchannel bias);
- On-board software which solves for position and clock offset using signals from only two GPS satellites. (Other receivers require at least 4 satellites.)
- The capability to start automatically when power is turned on without a *priori* knowledge of the receiver location, time of day, or satellite ephemerides;
- Excess CPU capacity which allows the future addition of "smart receiver" algorithms;

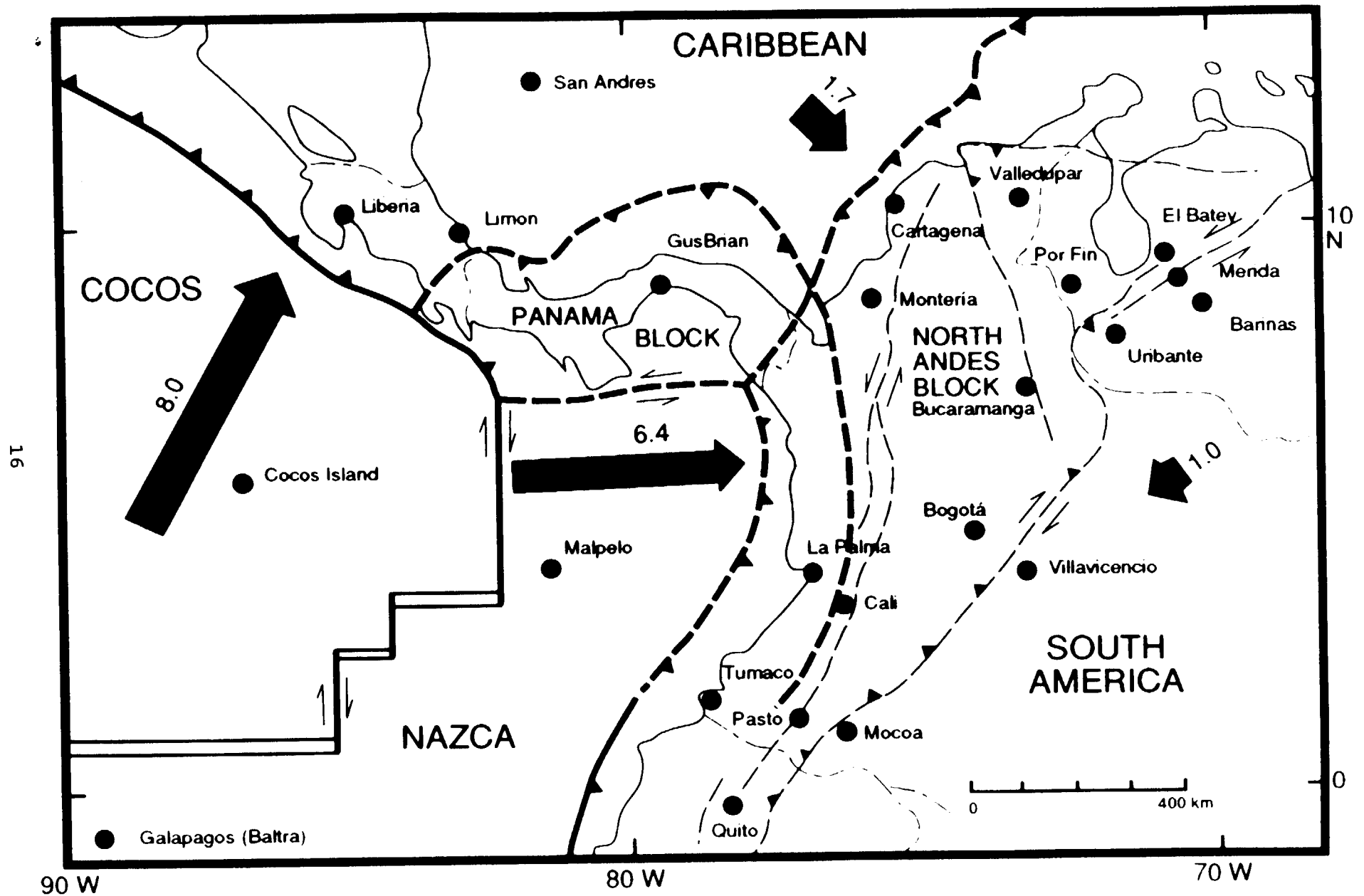


Figure II-5 Central and South America (CASA UNO 1988) GPS site locations.

- Accurate range measurements, allowing the application of automated phase connection algorithms as well as enabling rapid static survey techniques;
- Use of the P-code when available, switching to dual frequency non-code processing when encryption is on;
- Non-code processing which provides full cycle phase ambiguity, in comparison to the half cycle provided by other receivers;
- Low multipath antennas which have demonstrated an order of magnitude reduction of multipath error.

Three Rogues have been fabricated at JPL and three more have been procured from industry. Rogues have been used in CASA Uno, GOTEX, and GEOMEX; and in investigating the post-seismic relaxation following the Loma Prieta earthquake. Four Rogues have also been procured for the DSN. These receivers were used to measure the Earth's ionospheric content during the Voyager/Neptune encounter on August 25, 1989.

The Rogue design is compatible with the new generation of gate array technology, which enables the same level of accuracy to be implemented in a package (TurboRogue) which will be less expensive (targeted at \$15K vs. \$100K), and lighter (7kg vs. 30kg) and which will require less power (30 watts vs. 180 watts).

The chip design for an advanced Rogue, TurboRogue, has been completed, and simulations are currently being made to validate its performance. Initial contacts have been made with industry to ensure a rapid transfer of this new technology.

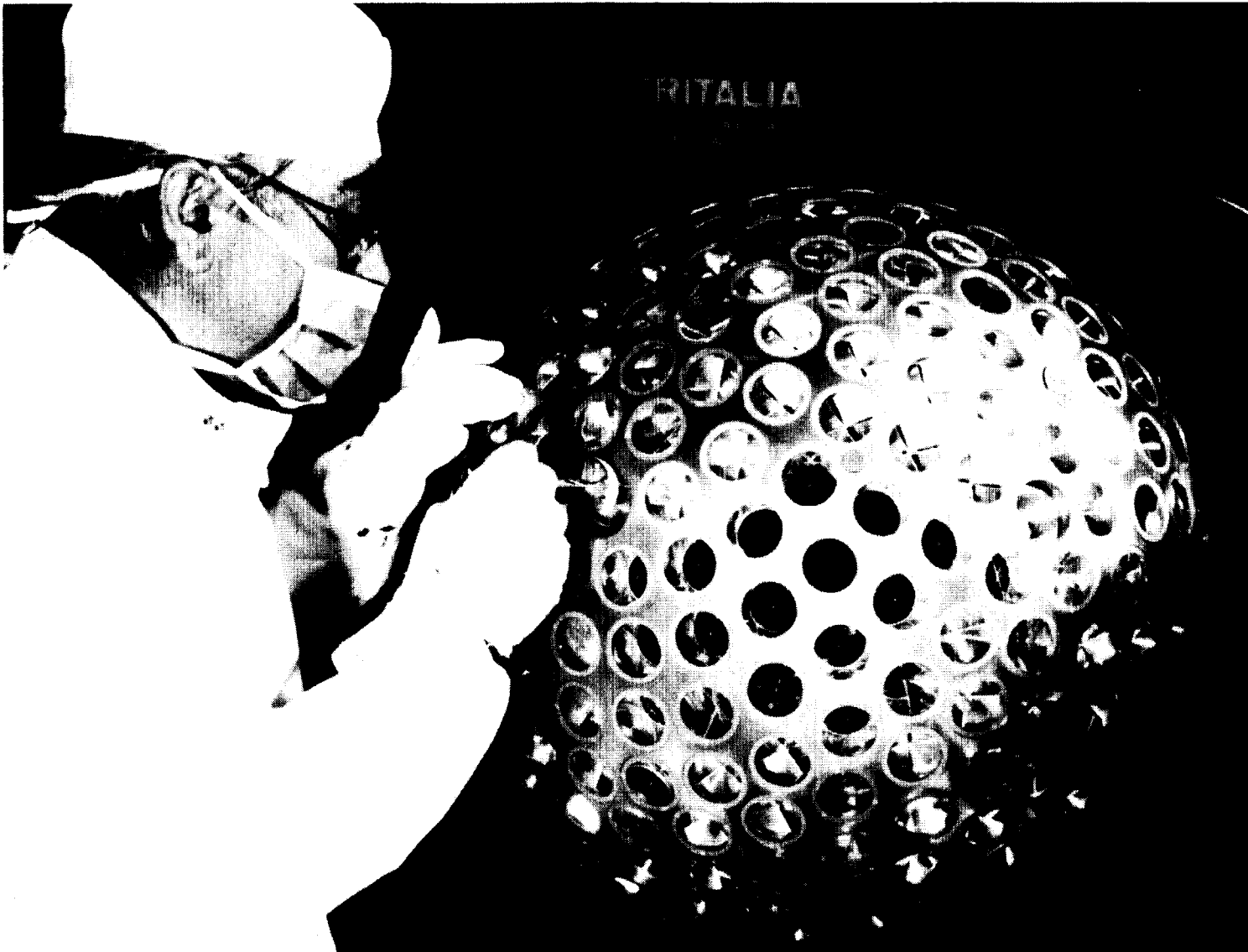
Studies of marine geodesy requires GPS measurements of the attitude of the surface platform to accuracies not previously attained. In order to verify this capability, two Rogue GPS receivers were installed on the NASA DC8 research aircraft and used to demonstrate the measurement of aircraft attitude during flight to an accuracy of 0.02° .

E. FLIGHT MISSIONS

1. LAGEOS-II

LAGEOS-II was initiated in 1984 as a cooperative mission between the Consiglio Nazionale della Ricerche/Piano Spaziale Nazionale (CNR/PSN) of Italy, since renamed Agenzia Spaziale Italiana (ASI), and NASA. It is expected to be launched in 1991 aboard the National Space Transportation System (NSTS) using the Italian Research Interim Stage (IRIS) which ASI is developing as an Italian national space project.

Essentially identical to LAGEOS-I (launched by NASA in 1976), the surface of LAGEOS-II is covered by 426 equally-spaced laser Cube Corner Retroreflectors (CCRs) of which four are germanium and the rest (422) are made of fused silica (Figure II-6).



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Figure II-6 LAGEOS-II Spacecraft.

In 1988, Aeritalia under contract to ASI, completed the fabrication of the LAGEOS-II spacecraft. The spacecraft was shipped to GSFC and optical characterization testing was performed on the spacecraft. At the completion of characterization testing the spacecraft was returned to Aeritalia for storage, pending delivery to the Kennedy Space Center (KSC) in 1991 for launch.

At KSC, the LAGEOS-II spacecraft and a LAGEOS Apogee Stage (LAS) will be attached to the IRIS and installed into the NSTS. After release from the NSTS, the IRIS will be used to transfer the LAGEOS-II/LAS to an orbital altitude of 5900km and an orbital inclination of about 41° . The LAS will provide the impulse to circularize the orbit at 5900km, with an eccentricity of less than 0.02 and to attain the final 52° inclination.

ASI will integrate and deliver the LAGEOS-II/LAS/IRIS flight system to NASA; support the NSTS launch, flight, and landing operations; and command IRIS and LAS to insert the LAGEOS-II satellite into the planned orbit. NASA has provided existing ground support equipment, hardware, and software remaining from the LAGEOS-I mission, and performed the optical characterization tests. NASA will also provide technical consultation to support ASI assembly and integration of LAGEOS-II/LAS/IRIS, launch the package on NSTS as a payload of opportunity, determine its orbit, and coordinate LAGEOS-II data acquisition by NASA and other countries' SLR systems.

LAGEOS-II, is a passive satellite dedicated to laser ranging. Along with LAGEOS-I, it is expected to improve by approximately a factor of two the accuracies of the geodetic quantities produced by LAGEOS-I alone. SLR tracking of the two satellites will greatly enhance research in the areas of plate tectonics, regional crustal deformation, geodetic reference frames, Earth orientation, gravity field modeling, and Earth and ocean tides.

In 1988, NASA and ASI issued a joint research announcement requesting proposals for investigations which would use LAGEOS-II data. The announcement provided for investigators in Europe, Africa, and the middle East to submit proposals to ASI: all other countries were to submit proposals to NASA. The proposals received were evaluated separately by the two Agencies. In early 1989: NASA selected 14 and ASI selected 12 LAGEOS-II investigations and investigators. These investigators will be formed into a LAGEOS-II Science Working Group.

2. LAGEOS-III

It has been suggested that placing another LAGEOS spacecraft into an orbit supplementary to that of LAGEOS-I would permit the detection of the Lense-Thirring (frame-dragging) effect predicted by General Relativity. This mission is primarily related to astrophysics. However, since a third LAGEOS would also contribute to a number of SES objectives, it is also of interest to the SES Program.

The geodetic and frame-dragging precessions can be measured via laser ranging to a LAGEOS spacecraft launched into a carefully-

oriented Earth orbit. Geodetic precession produced as the Earth moves around the sun and frame-dragging caused by the Earth's rotation combine to precess the line of nodes of the orbit. Orbital measurements of LAGEOS-I would be compared with orbital measurements of a new spacecraft (LAGEOS-III) which will have a supplementary orbital inclination. This combined geometry cancels non-relativistic precession contributions due to the Earth's non-sphericity. The tracking technology required is no different from that presently used for LAGEOS-I, but the accuracy requirement for inserting LAGEOS-III into the correct orbit is very strict if the non-relativistic effects are to cancel at the desired level. This two-spacecraft concept is conceptually similar to an earlier suggestion of using two counter-orbiting satellites in polar orbit to cancel non-relativistic effects and measure the relativistic precession (Van Patten and Everitt, 1976).

After an initial error analysis by the University of Texas at Austin, NASA and ASI formed study groups in May 1988 to conduct a more detailed analysis and to establish feasibility through a comprehensive numerical simulation. At about the same time, NASA Headquarters established a LAGEOS-III Science Advisory Group to provide guidance to the study groups, to monitor the study results for NASA, and to estimate the accuracy of the recovery of the Lense-Thirring effect using this approach.

The report of the Science Advisory Group to be released in early 1990 is expected to conclude that at the 70% confidence level the recovery accuracy would be in the range of 7% to 17%.

3. Magnetic Field Explorer/Magnolia

A combination of the MFE and Magnolia has been proposed as a single NASA/CNES mission for long-term measurements of the geomagnetic field.

A NASA/CNES Study Team was formed to conduct both a conceptual study (Ousley, et. al., 1987) and a system definition study (Ousley and Runavot, 1988). The Study Team recommended that NASA and CNES undertake a cooperative project combining long-term magnetic field measurements with simultaneous electric field measurements. Essentially the report recommended an equitable distribution of effort (launch vehicle, spacecraft, instruments and ground operations) and provided a basic spacecraft/mission concept to accomplish the joint scientific objectives.

Data from the MAGSAT mission provided an accurate description of the main geomagnetic field in 1980 (Langel, et. al., 1985). Another such mission of longer duration is required to obtain a description of the field at a later epoch together with measurements of the temporal variation at the epoch. The combination of data from the two missions would give an estimate of the temporal change between missions. These measurements would greatly enhance our understanding of the physical processes involved in the generation of the magnetic field and of the nature of the source regions, and would provide a valuable set of data for both solid Earth and space plasma physics studies.

A knowledge of the detailed time and space dependence of the geomagnetic field at the Earth's surface can be used to study the properties of the fluid motion in the core. The actual values of the fluid velocity in the upper core may be recoverable from the magnetic data, and a sufficiently long time series may give insight into the forces which drive the dynamo. Current plans for polar orbiting platforms do not include magnetometry until the late 1990's. Thus, in order to maximize chances of obtaining continuous magnetic field monitoring beginning in the mid 1990's, a MFE/Magnolia minimum mission lifetime of 4 years is required.

A MFE/Magnolia mission launched in early 1995 on Ariane 4, initially into a 600km, 86° inclination orbit, is needed for the study of the higher harmonics of the core field and meets the mission objectives. The baseline mission includes four magnetometers (two from NASA and two from CNES) and an electric field experiment using six 13-meter extendable antennae similar to those flown on the Dynamics Explorer Mission. In addition to its basic magnetic field investigation, MFE/Magnolia will investigate large scale electric field structures and their relationship with ionospheric currents, study the global direct current electric field, and carry out a comprehensive investigation of the vector electric field.

The study effort between NASA AND CNES continues and a decision on a cooperative mission is expected in FY 1991.

4. ARISTOTELES

The ARISTOTELES mission is intended to investigate the structure and dynamics of the crust and mantle of the Earth. As planned by ESA, ARISTOTELES will carry a two-dimensional array of highly accurate (one part in 10^{10} g) electrostatic accelerometers which are arranged to measure the gradients of the Earth's gravity field. This mission meets the 10^{-2} E accuracy and 100km resolution measurement requirement needed for many SES studies (NASA, 1987).

Since the structure and dynamics of the crust are reflected in both the gravity and magnetic field data, composite measurements of gravity and magnetic fields at the same spatial resolution should provide a much more complete picture. Consequently, ESA and NASA have discussed the possible contribution by NASA, to the presently planned mission, of scalar and vector magnetometers, a GPS receiver for improved orbital tracking, and the provision of a Delta-2 type launch vehicle.

Under the proposed scenario, ARISTOTELES would orbit the Earth at 200km for 6-8 months before moving to 500-800km for the remainder of the mission duration (3-4 years). Magnetic field measurements at the higher altitude would complement MFE/Magnolia measurements and provide for continuous measurements of the main field until EOS is in orbit.

The initial ESA study for the baseline mission (without magnetometers) has been completed and a new study is underway to

determine the mission/spacecraft impact and the additional cost associated with adding the magnetometers.

The solar cycle dictates that the ideal time for launch is late 1996 to mid 1977 to minimize atmospheric drag during the initial low altitude phase of the mission.

5. Gravity Probe-B

The GP-B mission of the NASA Astrophysics Division is planned for launch in 1997 to detect to about 1% the Lense-Thirring effect predicted by General Relativity. The concept is to use an extremely precise set of cryogenic gyros to measure during one year the anticipated frame-dragging of about 42mas. To achieve the needed measurement accuracy, the GP-B is designed to be "drag-free": helium gas boil-off is used to compensate for all non-gravitational forces. It is this "drag-free" feature which makes GP-B of interest to the SES Program. Studies have shown that with its polar orbit and orbital altitude of approximately 600km, accurate tracking of GP-B over a period of several years is capable of significantly improving our knowledge of the intermediate wave-length components of the Earth's gravity field.

The tracking accuracy needed is of the order of a few tens of centimeters, and can be achieved by augmenting the mission by the addition of a GPS receiver and CCRs.

6. Geoscience Laser Ranging System

Knowledge of the strain surrounding regional and local fault zones is fundamental to the understanding of crustal movements. A precise and viable method for rapid and frequent strain measurements can now be achieved due to advances in laser technology and the ability to range with lasers from a stable platform in space. A variation of this method can be applied to acquire altimetric topographical data for studies in several Earth-sensing disciplines. Some examples are: ice sheet volume in oceanography; rift valley delineation in geomorphology; and cloud-top heights in meteorology. The ranging and altimetry techniques are combined in the Geoscience Laser Ranging System (GLRS), a facility instrument being developed by NASA/GSFC to fly on EOS.

The GLRS will perform geodetic quality observations to determine the intersite distance and relative height between fixed CCRs arrayed about fault zone surfaces, and to measure vertical height to the Earth surface along the nadir orbital track. In the first mode, the laser beam points at individual CCRs in order and the range time from the generation of the laser pulse to the pulse return is measured. As described below, the range measurements are made by transmitting pulses at both 532 and 355nm. The round trip travel time for the green pulse is measured to provide the basic range measurement. This travel time is measured to 10ps, corresponding to a range precision of 1.5mm. The range measurement is corrected for atmospheric propagation delay by measuring the relative flight times of the green and ultraviolet pulses to an accuracy of 2ps using a streak camera detector. This

measurement obviates the need for ground atmospheric sensors. The altimetry profiling is similar, except that it requires no correction; the beam is diffusely reflected off the surface, and the waveform to the return pulse is electronically analyzed.

A conceptual diagram for the GLRS is shown in Figure II-7. The laser transmitter generates pulses at three wavelengths at the rate of 40pps, with a divergence of 0.1mr. The 1064nm infrared pulse is used for altimetry. The 532nm green pulse and the 355nm ultraviolet pulses are used for laser ranging. Laser ranging to a CCR begins when the pair outgoing range pulses trips an event timer. The pulses are aimed at the CCRs with the pointing mirror. They travel to the CCR, are reflected, return in a wide pattern to intercept the instrument, and are then relayed by the pointing mirror into the 18cm receiving telescope. The angle and light intensity of a portion of the green return pulse are detected by an angle tracker for feedback to the controller, which directs the gimballed motion of the beam pointing mirror. When the green light is detected by a photo-multiplier, it stops the time-of-flight measurement. Some green light along with the 355nm pulse is also detected in the streak camera which measures the pulse separation of the returned 532nm and 355nm pulses.

GLRS will have star trackers, and will make use of the EOS three-axis gyro and GPS receiver to provide position and attitude information for the pointing system and to locate the altimeter pulses on the nadir track to 5 arcseconds. Ranging measurement data, target location data, control commands, and software programs for operation are handled by the system computer.

Simulations have been conducted to estimate the accuracy with which baseline lengths, heights, and orbital parameters can be determined using typical GLRS data. Noise-limited calculations indicate uncertainties of 2 to 3mm for a typical CCR grid; the noise-plus-bias uncertainty is less than 1cm for distances up to 250km, with vertical accuracies better than 1.5cm. By tuning the orbital parameters, the orbit error is less than a few tens of centimeters over a 3 to 16 day period.

Conceptual design studies were completed in 1989 and system definition studies are to be completed in 1990. In 1989, NASA selected 13 investigators for the GLRS. These investigators were formed into a team which is guiding the development of the GLRS system.

The GLRS is scheduled to be placed into orbit aboard the second EOS platform.

7. Superconducting Gravity Gradiometer Mission

The development of a cryogenic, three-axis, gravity gradiometer (SGG) has been underway at the University of Maryland since 1980. Initially, it was planned that the Superconducting Gravity Gradiometer (SGG), would have an accuracy of $10^{-2}E$. In 1983, a conference on gradiometry for space concluded that an accuracy of at least $3 \times 10^{-3}E$ would be needed (NASA, 1984c).

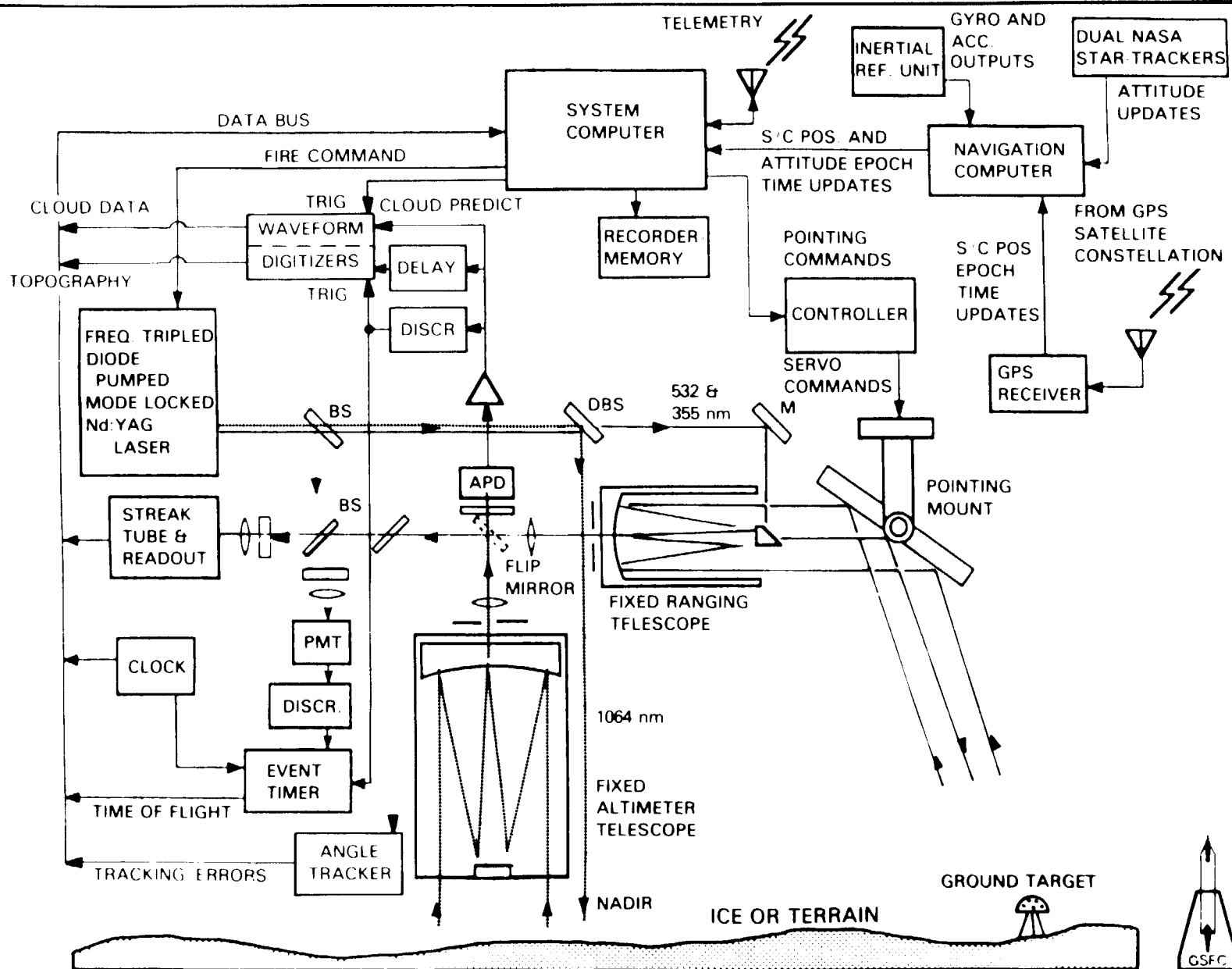


Figure II-7 Geoscience Laser Ranging System.

An interagency study team was formed in 1985 under the direction of the Marshall Space Flight Center (MSFC) to evaluate methods of testing the gradiometer in space and to develop spacecraft design concepts suitable for the SGGM. The principal report of the SGGM Study Team was published in 1988 (NASA, 1988b). An Executive Summary of the report was published in 1989 (NASA, 1989). The Study Team recommended the use of a NSTS-launched free-flyer for testing the SGG. In 1990, studies will be initiated to determine the feasibility of carrying the SGG on a NSTS-supported platform.

In 1988, the first tests of a three-axis SGG instrument (Model-II) were successfully completed, and work was started on an improved version (Model-III). Tests of a single-axis of Model-III were initiated in early 1989. These tests continued through most of 1989, and it is now expected that a fully tested laboratory version of the SGG will be available by the end of 1991.

SGGM will benefit greatly from the experience of the ARISTOTELES experiment and its higher resolution will enable studies of lithospheric phenomena, while the spatial resolution of ARISTOTELES will bring insight to mantle convection processes.

SECTION III. PROGRAM CHRONOLOGY: 1988-1989

A. 1988

JANUARY 1988

- The Haleakala, Hawaii, Lunar Laser Ranging Station was modified to add a path length compensator. With the modification and a new Microchannel Photomultiplier Tube performance was improved to 2cm (rms).
- A GPS receiver was installed at Haleakala, Hawaii.
- The Israeli Space Agency approved funding for the upgrade of the Bar Giyyora SLR Station.
- A report was issued on the gravity workshop held in Colorado Springs in February 1987.
- The GPS CASA Uno 88 campaign was conducted in central and northwestern South America: it involved 44 GPS receivers in 13 countries.

FEBRUARY 1988

- The second VLBI Technology Workshop was held near Monterey, CA.
- First mobile VLBI campaign of 1988 was initiated; data were acquired at nine sites, using three VLBI base stations.
- The first VLBI South Pacific Campaign involved stations at Kokee Park, Hawaii; Kashima, Japan; Shanghai, China; and Tidbindilla, Australia.
- Testing of TLRs-3 was completed and it was deployed to Mojave, CA; TLRs-2 returned to Easter Island.
- A joint PSN/NASA LAGEOS-II Research Announcement was released.
- A NASA VLBI Panel was established by the Geodynamic Program Office: the purpose was to evaluate and recommend the role of VLBI in the 1990's.
- Since the Geopotential Research Mission (GRM) was terminated, the GRM Science Steering Group was disbanded.
- The first test of the Model-II three-axis gravity gradiometer was successfully completed by the University of Maryland.
- A draft of a revised Five-Agency MOU, which superceded the MOU signed in 1981, was distributed to the agencies for review and comment.

MARCH 1988

- The fourteenth CDP Investigator's Working Group meeting was held at JPL.
- The LLR MOWG met to review data from stations in Haleakala, Hawaii; MLRS, TX; and Graz, France (CERGA).
- TLRs-1 was refurbished and shipped to Cabo San Lucas, Mexico; TLRs-4 completed final checkout at the Goddard Optical Ranging Facility (GORF); and TLRs-2 completed its tour at Easter Island and was shipped to Huahine, French Polynesia.
- As part of the WEGENER exchange program, MTLRS-1 arrived in the U.S. for a tour of Richmond, FL; Westford, MA; Owens Valley, CA; and Platteville, CO.
- The first of the new HP A400 computers was installed at the Fairbanks, Alaska, VLBI Station.
- The Washington VLBI Correlator was upgraded to the same configuration as the Haystack VLBI Correlator.
- The MLRS was closed down in preparation for the move to its new site on Mt. Folkes.
- A new agreement was drafted with CNES for continuation of measurements at Huahine, French, Polynesia.
- A NASA Water Vapor Radiometer Panel (WVR) was established by the Geodynamic Program Office to evaluate the effectiveness of WVRs for VLBI. The first meeting was held at JPL.
- NASA/CNES meetings on MFE/Magnolia were held to discuss new start possibilities.

APRIL 1988

- The USGS Brush Station was approved as a replacement for the Fort Ord VLBI site.
- A troublesome VLBI-GPS discrepancy at Mojave, CA, was identified as a survey problem.
- The new Shanghai, China, VLBI station joined stations in Hawaii and Japan in a Pacific Plate Motion Experiment.
- The second mobile VLBI campaign of 1988 was initiated; it included nine mobile sites and four base stations.
- The first meeting of the VLBI Panel was held at NASA Headquarters. The Panel heard reports from NGS, NSF, USNO, and NRAO on their projected needs for VLBI measurements.

- The MFE/Magnolia Phase-B Study Team Report was released.

MAY 1988

- A contract was signed with Universidad Nacional de San Agustin, Peru, for continued operation of the Arequipa SLR Station.
- The CDP was informed that the Wuchang Laser Station in China began tracking and that China was willing to send data to the CDDIS.
- The seventh LAGEOS-II Science Working Group met at Matera, Italy.
- The first geodetic VLBI experiment to use the 34m antenna at Tidbindilla, Australia, was conducted.
- Two Rogue GPS receivers were flown on the NASA DC-8 to verify kinematic attitude determination for submarine geodetic system development.
- The NASA Geodynamic Program initiated plans for a Geodynamics Workshop in the summer of 1989 to develop a program for the next decade.

JUNE 1988

- The J0-3 WVR was sent to Sweden to participate in intercomparison tests with the Onsala radiometer and balloon-borne instruments.
- The CDP was informed that the Hawaiian VLBI Station may be turned over to the U.S. Air Force.
- NGS installed a GPS receiver at Fort Davis, TX.
- TLRs-1 was at Cabo San Lucas, Mexico; TLRs-2 was in Huahine, French Polynesia; TLRs-3 completed its tour at Mojave, CA, and moved to Otay Mountain, CA; and MTLRs-1 was at Richmond, FL.
- A revised CDP site catalogue was released.
- MV-3 was shipped to Israel as a replacement for MV-1, which was scrapped.
- Coolfont, WV, was selected as the site for the 1989 Geodynamics Workshop.

JULY 1988

- The NASA Geodynamics Program investigators participated in an international workshop on The Interdisciplinary Role of Space Geodesy held in Erice, Sicily.

- The fourth Alaskan VLBI Campaign was started: MV-3 went to Hawaii and MV-2 went to Alaska. The Campaign involved five sites: Kodiak, Sand Point, Sourdough, and Yakataga (all in Alaska), and Whitehorse in Canada. Base stations used were Mojave, CA; Fairbanks, Alaska; and Westford, MA.

AUGUST 1988

- The 1988 VLBI Atlantic-Pacific Experiment was completed.
- ASI was established and replaced the previous PSN.
- A VLBI Mark-III system was installed at the DSN Station in Madrid, Spain.
- TLRs-1 was at Haystack, MA; TLRs-2 was at Huahine, French Polynesia; TLRs-3 was at Otay Mountain, CA; and MTLRs-1 was at Platteville, CO.
- NBS WVR tests were underway in Boulder, CO. The purpose was to compare NBS, NASA, and commercial radiometers.
- The Kootwijk SLR Station in The Netherlands terminated operations.
- NASA received 22 proposals and ASI received 10 proposals in response to a joint LAGEOS-II Research Announcement.
- The NASA 1989 Geodynamics Workshop was expanded to include planning for the NASA Geology Program.

SEPTEMBER 1988

- TLRs-2 was shipped to Easter Island; TLRs-1 was at Westford, MA; and MTLRs-1 was at Lampedusa, Italy.
- A meeting was held at Haystack, MA, to develop plans for improving VLBI accuracy.
- Chapman Conferences on GPS and gravity were held at Ft. Lauderdale, FL.

OCTOBER 1988

- The fourth mobile VLBI campaign of 1988 was started: data were acquired at 13 mobile sites and 6 base stations including the first VLBA station at Pie Town, NM.
- TLRs-3 was at GORF in preparation for shipment to Chile; TLRs-1 completed its tour at Westford, MA, and returned to GORF for update; and MTLRs-1 was at Owens Valley, CA.
- NASA GPS receivers were sent to Australia and New Zealand to support the NGS GOTEX experiment.
- The CDP IWG meeting in Munich, FRG, was attended by over 200 participants.

- A LAGEOS-II SWG meeting was held to discuss optical tests and the possibility of thermal testing.
- A LLR Management Operations Working Group (MOWG) meeting at the Centre d'Etudes et de Recherches Geodynamique et Astronomiques (CERGA) reviewed improvements to the CERGA Station and discussed the technical status and development of LLR stations.
- ESA requested that the NASA Geodynamics Program support SLR tracking of ERS-1.

NOVEMBER 1988

- The LAGEOS-II spacecraft laser characterization tests were started.
- VLBI managers of 12 U.S. stations and 5 foreign stations met at GSFC to discuss new developments in hardware, software, and data analysis.
- MV-2 was at JPL; MV-3 was at Presidio, CA.
- MTLRS-1 completed its tour at Owens Valley, CA, and prepared to return to Europe.
- The Superconducting Gravity Gradiometer Mission Study Team Report (Vol. II-NASA TM 4091) was issued: work was started on the Executive Summary (Vol. I-NASA TM 4091).
- The panels for the 1989 Geodynamics/Geology Workshop at Coolfont, WV, were established and invitations were sent to the proposed participants.

DECEMBER 1988

- At the Fall AGU, twenty-five papers were presented by Geodynamics investigators on plate motion, Earth rotation, and crustal deformation.
- A MOU was discussed with the Korean Space Agency.
- NGS installed new GPS receivers at Mojave, CA; Westford, MA; and Richmond, FL.
- VLBI operations at the Owens Valley Radio Observatory were terminated.
- A draft agreement was initiated with the National Technical University in Greece.
- MTLRS-1 returned to FRG.
- The Geodynamics Program established the NASA GPS Panel to recommend criteria for replacing the mobile VLBI, plans for use of GPS, and to define NASA's role in GPS

applications. The first meeting of the Panel was held in San Francisco in conjunction with the American Geophysical Union (AGU) meeting.

B. 1989

JANUARY 1989

- The first of the Block-II GPS satellites was launched.
- TLRS-4 was completed and was deployed to Mojave, CA; MV-2 moved to Presidio, CA.
- Plans for the NASA 1989 mobile VLBI observing program were restricted to use of MV-2; MV-3 will be used exclusively for NGS programs.
- The USSR launched the Etalon-1 satellite (similar to LAGEOS-I, but in a 19,000km orbit).
- A NASA team conducted a review of the SLR/LLR Station in Orroral, Australia, and participated in a Critical Design Review of the Saudi Arabian Laser Ranging Observatory.
- NASA and ASI selected 23 LAGEOS-II investigations.

FEBRUARY 1989

- Tests of the Pie Town, NM, VLBI antenna, the first of ten VLBA stations, showed formal uncertainties of 5mm in the horizontal and 20mm in the vertical.
- A meeting was held at JPL to discuss CDP SLR support of TOPEX tracking.
- At a pre-Coolfont meeting of Panel Co-chairs held at GSFC the panel structure for the 1989 Geophysics Workshop (previously Geodynamics/Geology Workshop) and the proposed program objectives were revised.
- NASA announced the selection of 13 investigations for the EOS/GLRS.
- A meeting of the SGGM Study Team was held at the University of Maryland.

MARCH 1989

- A 32-meter VLBI antenna at Noto, Sicily, was completed.
- In support of the 1989 WEGENER Campaign, TLRS-1 was shipped to Athens, Greece.
- At a GPS meeting in Las Cruces, NM, a paper by the University of Berne showed uniform movement of the Yakataga, AK, site at 8cm/yr for the past five years.

- A meeting of SLR network personnel and GSFC electro-optics engineers was held to coordinate improvements in SLR technology.
- The Five-Agency MOU was distributed to the agencies for signature.

APRIL 1989

- The sixteenth CDP IWG was held at JPL: 110 papers and posters were presented. The meeting was held in conjunction with investigators of the NASA Geology Program.
- Global intercomparisons of VLBI and SLR solutions for 16 locations showed an overall rms agreement for all stations of 39mm.
- A pre-Coolfont meeting was held to review initial drafts of position papers prepared by the Panels.
- A VLBI Mark-III system was shipped to Noto, Sicily, to begin preparations for an operational test.
- A MOU was drafted between NASA and the USNO to provide for shared operations and funding for the Fairbanks, AK, and the Kokee Park, HI, VLBI Stations.
- MTLRS-1 was at Lampedusa, Italy; TLRS-1 was at Roumeli, Greece; TLRS-2 completed operations at Huahine, French Polynesia, and was preparing to move to Easter Island; TLRS-3 was at GORF, and TLRS-4 was preparing to leave Mojave, CA, to go to Mexico.
- An Atmospheric Moisture Intercomparison Study was initiated at the Wallops Flight Facility. The comparisons among different techniques yielded similar results.
- MV-2 was at Platteville, CO.
- The CSTG Subcommittee on Space Geodetic Measurement Sites held its first meeting at JPL. The purpose of the Subcommittee is to recommend site catalog and survey standards.
- The WEGENER/Medlas Campaign for 1989 was rescheduled due to TLRS-1 shipping problems and technical problems with the MTLRS-2. In the new schedule, MTLRS-2 and TLRS-1, together, will occupy five sites while MTLRS-1 will occupy four sites.
- A meeting of the LAGEOS-II SWG was held to review results of the laser characterization tests.

MAY 1989

- The GPS GeoMex 89 experiment was conducted: measurements were made across the Gulf of California and on Guadalupa Island.
- A pre-Coolfont meeting of Panel Co-chairs was held to review the revised panel position papers and to finalize preparations for the Workshop.
- A draft of the NASA VLBI Panel Report was mailed to the Co-chairs for the Coolfont Workshop.
- MTLRS-1 was at Lampedusa, Italy; MTLRS-2 remained in The Netherlands due to laser problems.

JUNE 1989

- The Geodynamics Program participated in an Italian workshop held in Trevi, Italy, on the scientific objectives and plans for ARISTOTELES.
- The fourth International Conference on the WEGENER/Medlas Project was held at Scheveningen, The Netherlands, to discuss results and compare data analysis techniques of six independent groups.
- The Program Panel for the Coolfont Workshop met to develop a draft of the program plan for the next decade.
- TLRS-1 completed measurements at the Roumeli, Crete, site and was enroute to Yigilca, Turkey; MTLRS-1 was at Karitsa, Greece.
- MV-3 stopped at GORF on its way to Europe.
- The LAGEOS-II Ground Operations Working Group met at KSC.

JULY 1989

- The 1989 NASA Geophysics Workshop was held at Coolfont, WV, and was attended by 130 participants from 11 countries and 4 other federal agencies.
- The fifth Alaskan Campaign was initiated; MV-2 was at Sand Point, AK.
- At the first stop on its European tour, reimbursed by IfAG, MV-3 was at Helsinki, Finland.
- NGS terminated VLBI operations at Fort Davis, TX.
- NASA Headquarters reorganized the Geodynamics and Geology Programs into the SES Branch.
- TLRS-1 was in Yigilca, Turkey.

- The USSR launched Etalon-II.
- The LAGEOS-II Pre-Storage Review was held at Turino, Italy.

AUGUST 1989

- The Coolfont Program Panel completed a first draft of a report on the major initiatives for the NASA Solid Earth Science Program for the 1990's.
- The Hawaii Kokee Park 9-meter Station was transferred to CDP: the CDP will provide multi-agency support for other investigations.
- MV-2 was at Whitehorse, Canada; MV-3 was at Bergen, Norway.
- MTLRS-1 was at Yozgat, Turkey; MTLRS-2 was at Askites, Greece; TLRS-3 was at GORF for a performance check and for validation of new software; TLRS-4 was at Ensenada, Mexico.
- The first Noto, Sicily, VLBI experiments were performed.
- As part of its Global Sea Level Program, NGS shipped a Mark-III to Tasmania, Australia.
- The final NASA VLBI Panel Report was delivered to Headquarters.

SEPTEMBER 1989

- Analysis of 1989 Alaskan data showed that Kodiak, Sand Point, and Sourdough continue to move relative to Fairbanks in a manner consistent with previous years. An 8 cm "jump" in the Cape Yakatoga data was confirmed.
- MV-3 completed observations at Brest, France, and moved to Grasse, France.
- MTLRS-1 was at Diyarbakir, Turkey; MTLRS-2 was at Askites, Greece; TLRS-1 was at Yigilca, Turkey; TLRS-2 was at Huahine, French Polynesia, and was preparing to move to Easter Island; TLRS-3 was at GORF; and TLRS-4 was at Ensenada, Mexico.
- The WEGENER Management Board held a meeting in Bad Bodenderf, FRG, to discuss future plans.

OCTOBER 1989

- The seventh International Symposium on Laser Ranging Instrumentation was held at Matera, Italy.
- The seventeenth CDP IWG meeting held at GSFC was attended by 145 people, including representatives of seven countries.

- The first meeting of the European Laser (EurLas) Network was held in Matera, Italy.
- MTLRS-1 was at Kattavia, Greece; and TLRS-1 was at Melengiclik, Turkey.
- MV-2 and -3 made post-Loma Prieta earthquake observations at three sites in California: the Presido in San Francisco, Fort Ord, and Point Reyes.
- GPS Rogue receivers were deployed and a Rapid Static Survey technique was used to measure post-seismic relaxation in the epicentral region following the earthquake.

NOVEMBER 1989

- TLRS-1 moved to Xrisokelleria, Greece; MTLRS-1 was at Askites, Greece.
- TLRS-4 completed measurements in Ensenada, Mexico, and was diverted to Mojave, CA, for post-Loma Prieta earthquake observations.

DECEMBER 1989

- Reports on the results of the NASA Geophysics Workshop and the Loma Prieta earthquake observations were reported at the Fall AGU.
- TLRS-1 moved to Punta sa Menta, Italy.
- The upgraded Moblas-2 at Bar Giyyora, Israel, successfully ranged to LAGEOS-II and Ajisai.
- A Mark-III VLBI terminal was shipped to Noto, Italy, to support measurements of Intra-European geodetic ties.
- A major failure occurred in the Moblas-7 slip ring assembly.
- A LAGEOS-II Flight Safety Review was held at JSC.
- A GPS receiver was installed at the Goldstone complex of the DSN.
- A Rogue receiver was mounted in a buoy to test marine operability and multipath environment for submarine applications.
- The VLSI gate array design for the TurboRogue GPS receiver was completed.

REFERENCES

- Baldi, P., and Susanna Zerbini, eds., *Proceedings of the Third International Conference on the WEGENER/MEDLAS Project*, Bologna, Italy, May 25-27, 1987, University of Bologna, 1988.
- DeMets, C., R.G. Gordon, D.F. Argus, and S. Stein, *Current Plate Motions*, submitted to *Geophys. J. R. Astron. Soc.*, 1989.
- Frey, H.V., and J.M. Bosworth, *Measuring Contemporary Crustal Motions: NASA's Crustal Dynamics Project*, *Earthquakes and Volcanoes*, USGS, 20, 3, 1988.
- Kolenkiewicz, R., J. Ryan, and M. Torrence, *A Comparison Between Lageos Laser Ranging and Very Long Baseline Interferometry Determined Baseline Lengths*, *J. Geophys. Res.*, 90, B11, 1985.
- Langel, R. A., and R. Estes, *The Near-Magnetic Field at 1980 Determined from MAGSAT Data*, *J. Geophys. Res.*, 90, B3, 1985.
- Lichten, S.M., *Towards GPS Orbit Accuracy of Tens of Centimeters*, *Geophys. Res. Lett.*, (in press), 1990.
- Mueller, I.I., and S. Zerbini, eds., *Proceedings of the International Workshop on The Interdisciplinary Role of Space Geodesy*, Erice, Sicily, Italy, July 23-29, 1988, Springer-Verlag, May 1988.
- NASA, 1970: *The Terrestrial Environment: Solid Earth and Ocean Physics*, NASA CR-1579, April, 1970.
- NASA, 1980: *NASA Geodynamics Program Annual Report for 1979*, NASA TM 81978, National Aeronautics and Space Administration, Washington, DC, May 1980.
- NASA, 1981: *NASA Geodynamics Program: Annual Report for 1980*, NASA TM 84010, National Aeronautics and Space Administration, Washington, DC, October 1981.
- NASA, 1982: *NASA Geodynamics Program Annual Report for 1981*, NASA TM 85126, National Aeronautics and Space Administration, Washington, DC, August 1982.
- NASA, 1983a: *NASA Geodynamics Program: Annual Report for 1982*, NASA TM 85842, National Aeronautics and Space Administration, Washington, DC, 1983.
- NASA, 1983b: *The NASA Geodynamics Program: An Overview*, NASA TM 2147, National Aeronautics and Space Administration, Washington, DC, 1983.
- NASA, 1984a: *NASA Geodynamics Program: Fifth Annual Report*, NASA TM 87359, National Aeronautics and Space Administration, Washington, DC, 1984.

NASA, 1984b: *Report of the Geodynamics Workshop*, NASA Conference Publication 2325, National Aeronautics and Space Administration, Washington, DC, 1984.

NASA, 1984c: *Spaceborne Gravity Radiometers*, Proceedings of a Workshop held at the Goddard Space Flight Center, Greenbelt, Maryland, February 28 - March 2, 1983, W.C. Wells, ed, NASA Conference Publication 2305, 1984.

NASA, 1987: *Geophysical and Geodetic Requirements for Global Gravity Field Measurements, 1987-2000*, Report of a Gravity Workshop, Colorado Springs, CO, November 1987.

NASA, 1988a: *NASA Geodynamics Program-Summary Report: 1979-1987*, NASA TM 4065, National Aeronautics and Space Administration, Washington, DC, 1988.

NASA, 1988b: *Superconducting Gravity Gradiometer Mission, Volume II: Study Team Technical Report*, S.H. Morgan and H.J. Paik, eds, NASA TM 4091, MSFC, 1988.

NASA, 1989: *Superconducting Gravity Gradiometer Mission, Volume I: Study team Executive Summary*, S.H. Morgan and H.J. Paik, eds, NASA TM 4091, MSFC, 1989.

Ousley, G., C. Bouzat, and J. Runavot, *Magnetic Field Explorer/Magnolia - Joint NASA/CNES Phase A Study Report*, NASA/CNES, 1987.

Ousley, G., and J. Runavot, *Magnetic Field Explorer/Magnolia Joint NASA/CNES Phase B Study*, GSFC, April 1988.

Van Patten, R. A., and C. W. F. Everitt, *Possible Experiment with Two Counter-Rotating Satellites to Obtain a New Test of Einstein's General Theory of Relativity and Improved Measurements in Geodesy*, *Phy. Rev. Letts.*, V36, N12, 629-632, March 1976.

Wakker, K.F., (Chairman), *Fourth International Conference on the WEGENER/Medlas Project*, Scheveningen, The Netherlands, June 7-9, 1989, Delft University of Technology, 1990.



GLOSSARY OF ACRONYMS AND ABBREVIATIONS

AGU	American Geophysical Union
Ajisai	Satellite with CCRs (Japan)
ARISTOTELES	Applications and Research Involving Space Techniques Observing the Earth's Field from Low Earth Orbiting Satellite
ASI	Agenzia Spaziale Italiana
CASA	Central And South America (GPS experiment)
CCRS	Corner Cube Retroreflectors
CDDIS	Crustal Dynamics Data Information System
CDP	Crustal Dynamics Project
CERGA	Centre d'Etudes et de Recherches Geodynamique et Astronomiques
cm	Centimeter
CNES	Centre Nationale d'Etudes Spatiales (France)
CNR	Consiglio Nazionale della Ricerche (Italy)
COTES	Joint Working Group on the Establishment and Maintenance of a Conventional Terrestrial Reference System
CSTG	Commission for Coordination of Space Techniques for Geodesy and Geodynamics
DSGS	Densely Spaced Geodetic Systems
DSN	Deep Space Network
E	Eotvos Unit (10^{-9} sec ⁻²)
EOS	Earth Observing System
ERS-1	ESA Remote Sensing Satellite
ESA	European Space Agency
Etalon	Satellite with CCRs (USSR)
FLINN	Fiducial Laboratory for an International Natural science Network
FRG	Federal Republic of Germany
GEOMEX	Geodesy in Mexico
GEOS	Geodynamic Experimental Ocean Satellite
GGN	Global Geophysical Networks
GLRS	Geoscience Laser Ranging System
GORF	Goddard Optical Research Facility
GoTex	Global Tracking Experiment
GP-B	Gravity Probe-B
GPS	Global Positioning System
GRM	Geopotential Research Mission
GRMSSG	GRM Science Steering Group
GSFC	Goddard Space Flight Center
IAU	International Astronomical Union
IfAG	Institut fur Angewandte Geodaesie (FRG)
IGRF	International Geomagnetic Reference Field
IRIS	Italian Research Interim Stage (Italy)
IUGG	International Union for Geodesy and Geodynamics
JPL	Jet Propulsion Laboratory
JSC	Johnson Space Center
Km	Kilometer
KSC	Kennedy Space Center
LAGEOS-I	Laser Geodynamics Satellite (U.S.)
LAGEOS-II	Laser Geodynamics Satellite (Italy)
LAS	LAGEOS Apogee Stage

LLR	Lunar Laser Ranging
Magnolia	Magnetic Field Satellite (France)
MAGSAT	Magnetic Field Satellite (U.S.)
Medlas	Mediterranean Laser Project (WEGENER)
MFE	Magnetic Field Explorer (U.S.)
mgal	Milligal (10^{-3} cm sec $^{-2}$, approximately 10^{-6} g)
MLRS	McDonald Laser Ranging Station
mm	Millimeter
Moblas	Mobile Laser
MOU	Memorandum of Understanding
MOWG	Management Operations Working Group
mr	Milliradian
ms	Millisecond
MSFC	Marshall Space Flight Center
MTLRS	Modular Transportable Laser Ranging System
MV	Mobile VLBI
NASA	National Aeronautics and Space Administration
NBS	National Bureau of Standards
NGS	National Geodetic Survey
nm	Nanometer
NOAA	National Oceanic and Atmospheric Administration
NRAO	National Radio Astronomy Observatory
ns	Nanosecond
NSF	National Science Foundation
NSTS	National Space Transportation System
nT	NanoTesla
NUVEL-1	Tectonic Plate Model (DeMets)
OSSA	Office of Space Science and Applications (NASA)
pps	Pulses per second
ps	Picosecond
PSN	Piano Spaziale Nazionale (Italy)
rms	Root mean sum
RSS	Rapid Static Survey (GPS)
SEASAT	Ocean Dynamics Monitoring Satellite
SES	Solid Earth Science
SGG	Superconducting Gravity Gradiometer
SGGM	Superconducting Gravity Gradiometer Mission
SLR	Satellite Laser Ranging
SSG	Science Steering Group
Starlette	Satellite with CCRs (France)
SWG	Science Working Group
TLRS	Transportable Laser Ranging Station
TOPEX	Ocean Topography Experiment
USGS	United States Geological Survey
USNO	United States Naval Observatory
VLBA	Very Long Baseline Array
VLBI	Very Long Baseline Interferometry
VLSI	Very Large Scale Integrated circuit
WEGENER	Working group of European Geo-scientists for the Establishment of Networks for Earthquake Research
WVR	Water Vapor Radiometer

BIBLIOGRAPHY

1. Crustal Dynamics

Aardoom, L., On strain in geodetic baseline networks, *Dept. of Geodesy Report, 19, Delft Univ. of Tech.*, 1983.

Aardoom, L., B. van Gelder, and E. Vermaat, Design of SLR networks for studies of crustal dynamics, *Report of the Dept. of Geodesy, Mathematical and Physical Geodesy, 83.3, Delft Univ. of Tech.*, 1984.

Achilli, V., P. Baldi, S. Zerbini, F. Broccio, V. Cagnetti, P. Marsan, A. Gubellini, and M. Unguendoli, Comparison between GPS and ground based distance measurements in the Messina Straits area, *Bolletino di Geofisica Teorica ed Applicata, XXX, 119-120, 361-369, 1988.*

Allen, S., Global coordinate orientation effects on ARIES baseline, *EOS, Trans. AGU, 64, 18, 1983.*

Allenby, R., Andean tectonics: Implications for satellite geodesy, *NASA TM 86160, NASA/GSFC, 1984.*

Anderson, A.J., Scandinavian studies of recent crustal movements and the space geodetic network, *NASA Conference Report 2115, NASA, Washington, DC, 1979.*

Anderson, A.J., Combined space geodetic and geophysical measurements for studies of crustal movement in Scandinavia, *Proc. IAU Colloquium 56, Reference Coordinate Systems for Earth Dynamics, D. Reidel, 1980.*

Anderson, A.J., Precise space geodetic baseline measurements of Scandinavia in support of NASA's crustal dynamics program, *Proc. 3rd International Symposium on Satellite Positioning, Phys. Sci. Lab., New Mexico University, Las Cruces, 1982.*

Anderson, S., and K. Burke, Suture zones of the Grenville Province, *Geol. Soc. Amer. Memoir, Proterozoic Studies, 1983.*

Angevine, C., D. Turcotte, and J. Ockendon, Geometrical form of aseismic ridges, volcanoes, and seamounts, *J. Geophys. Res. 89, B13, 1984.*

Arkani-Hamed, J., et al., Delineation of Canadian sedimentary basins from Magsat data, *Earth Planet. Sci. Lett., 70, 148-156, 1984.*

Arkani-Hamed, J., et al., Comparison of Magsat and low-level aero-magnetic data over the Canadian Shield: Implications for GRM, *Can. J. Earth Sci., 22, 1241-1247, 1985.*

- Arkani-Hamed, J., W. Urquhart, and D.W. Strangway, Scalar magnetic anomalies of Canada and northern United States derived from Magsat data, *J. Geophys. Res.*, 90, B3, 2599-2608, 1985.
- Arkani-Hamed, J., and D.W. Strangway, An interpretation of magnetic signatures of aulacogens and cratons in Africa and South America, *Tectonophysics*, 113, 257-269, 1985.
- Arkani-Hamed, J., and D.W. Strangway, Band-limited global scalar magnetic anomaly map of the Earth derived from Magsat data, *J. Geophys. Res.*, 91, 8193-8203, 1986.
- Arur, M., P. Bains, and J. Lal, Anomaly map of Z component of Indian subcontinent from magnetic satellite data, *Proc. Indian Acad. Sci. (Earth Planet. Sci.)*, 94, 111-115, 1985.
- Aydin, A., and A. Nur, Evolution of pull-apart basins and their scale independence, *Tectonics* 1, 91, 1982.
- Backus, G., J. Park, and D. Garbasz, On the relative importance of the driving forces of plate motion, *Geophys. J. R. Astron. Soc.*, 67, 1981.
- Baldi, P., and S. Zerbini, Crustal movements in the Mediterranean Basin: Simulation of a satellite-laser ranging network, *Bollettino di Geodesia e Scienze Affini*, Anno XLII, 3, 1983.
- Baldi, P., P. Gasperini, and S. Zerbini, Geodetic positioning by satellite Doppler observations, *Bollettino di Geofisica Teorica ed Applicata*, XXVII, 108, 295-301, 1986.
- Baldi, P., B. Benciolini, P. Gasperini, L. Mussio, F. Sanso, and S. Zerbini, Simulations for the PDN85 Doppler campaign, *Bollettino di Geodesia e Scienze Affini*, Anno XLV, 1, 73-82, 1986.
- Baldi, P., S. Zerbini, H. Drewes, Ch. Reigber, and V. Achilli, Combined terrestrial and space techniques in the Calabrian Arc project, *CSTG Bulletin, International Coordination of Space Techniques for Geodesy and Geodynamics*, 10, 115-123, 1988.
- Baranowski, J., J. Armbruster, L. Seeber, and P. Molnar, Focal depths and fault plane solutions of earthquakes and active tectonics of the Himalaya, *J. Geophys. Res.*, 89, B8, 1984.
- Beavan, J., E. Hauksson, S.R. McNutt, R. Bilham, and K.H. Jacob, Tilt and seismicity changes in the Shumagin Seismic Gap, *Science*, 222, 322-325, 1983.
- Beavan, J., R. Bilham, and K. Hurst, Coherent tilt signals observed in the Shumagin Seismic Gap: Detection of time-dependent subduction at depth?, *J. Geophys. Res.*, 89, 4478-4492, 1984.
- Beckman, B., On geodesy with the global positioning system: Caribbean and Pacific scenarios, *EOS, Trans. AGU*, 64, 45, 1983.

Beckman, B., and C. Hilderbrand, Requirements for GPS geodesy at one centimeter precision in the Caribbean, *EOS, Trans. AGU*, 64, 18, 1983.

Beetz, H., B. Richter, and P. Wolf, Messungen im lokalen hohen- und schwereuberwachungsnetz im bereich der Station Wettzell, *Institut fur Angewandte Geodasie*, 1983.

Bentley, C., Investigation of Antarctic crust and upper mantle using Magsat and other geophysical data, *Tenth Quarterly Progress Report*, 1982.

Bentley, C., Magsat magnetic anomalies over Antarctica and the surrounding oceans, *Geophys. Res. Lett.*, 9, 1982.

Bergman, E.A., and S. Solomon, Oceanic intraplate earthquakes and stresses near large bathymetric features, *EOS, Trans. AGU*, 63, 1982.

Bergman, E.A., and S. Solomon, Do oceanic as well as continental plates have "stress provinces?", *Abstracts, Fifth Annual NASA Geodynamics Program Conference*, 1983.

Bergman, E.A., and S. Solomon, Source studies of near-ridge earthquakes: Implications for the early evolution of oceanic lithosphere, *EOS, Trans. AGU*, 64, 1983.

Bergman, E.A., and S. Solomon, Source mechanisms of earthquakes near mid-ocean ridges from body waveform inversion: Implications for the early evolution of oceanic lithosphere, *J. Geophys. Res.*, 89, 1984.

Bergman, E.A., and S. Solomon, Intraplate stress, *Encyclopedia of Structural Geology and Plate Tectonics*, 1984.

Bergman, E.A., J. Nabelek, and S. Solomon, An extensive region of off-ridge normal-faulting earthquakes in the southern Indian Ocean, *J. Geophys. Res.*, 89, 1984.

Bergman, E.A., S. Bratt, and S. Solomon, Thermoelastic stress: How important as a cause of earthquakes in young oceanic lithosphere?, *EOS, Trans. AGU*, 65, 1984.

Blewitt, G., S. Lichten, L. Skrumeda, P. Kroger, M. Kornreich, U. Lindqwister, P. Kroger, S. Pogorelc, and J. Freymueller, GPS versus VLBI baselines: A three year history, *Chapman Conference on GPS Measurements for Geodynamics*, Ft. Lauderdale, FL, September 1988.

Blewitt, G., S. Lichten, U. Lindqwister, P. Kroger, L. Skrumeda, M. Kornreich, and W. Bertiger, Validation of centimeter-level GPS baseline accuracy and stability, *Crustal Dynamics Project 15th Principal Investigators Working Group*, Munich, FRG, October 1988.

Bilham, R., and D. Simpson, Indo-Asian convergence and the 1913 survey line connecting the Indian and Russian triangulation surveys, *Int. Karakoram Project*, 1, Columbia Univ., 1984.

- Bills, B.G., Thermoelastic bending of the lithosphere: Implications for basin subsidence, *Geophys.J. R. Astron. Soc.*, 75, 1983.
- Bird, P., and J. Baumgardner, Fault friction, regional stress, and crust mantle coupling in southern California from finite element models, *J. Geophys. Res.*, 89, 1932-1944, 1984.
- Bird, P., and R.W. Rosenstock, Kinematics of present crust and mantle flow in southern California, *Bull. Geol. Soc. Amer.*, 95, 946-957, 1984.
- Black, R., Geophysical processing and interpretation of Magsat satellite magnetic anomaly data over the U.S. midcontinent, *Master of Science Thesis, Dept. of Geology, University of Iowa*, 1-116, 1981.
- Boccaletti, M., R. Nicolich, and L. Tortorici, The Calabrian Arc and the Ionian Sea in the dynamic evolution of the central Mediterranean, *Marine Geology*, 55, Elsevier Science Pub., 1984.
- Bock, Y., The use of baseline measurements and geophysical models for the estimation of crustal deformations and the terrestrial reference system, *Dept. of Geodetic Sci. and Survey Report 337, Ohio State University*, 1982.
- Bock, Y., Estimating crustal deformations from a combination of baseline measurements and geophysical models, *Bull. Geodesique*, 57, 294-311, 1983.
- Bock, Y., Centimeter-level baseline estimation with GPS interferometry, *Marine Geodesy*, 9, 187-197, 1985.
- Bock, Y., et al., Establishment of three-dimensional geodetic control by interferometry with the global positioning system, *J. Geophys. Res.*, 90, B9, 1985.
- Boschi, E., et al., Selection of geodynamic sites for mobile laser systems in Italy, *Bollettino di Geodesia e Scienze Affini*, Univ. of Bologna, 1984.
- Bostrom, R., Crustal extension under ice loading, *Mod. Geol.*, 8, 1984.
- Bostrom, R., Westward Pacific drift and the tectonics of eastern Asia, *Tectonophysics*, 102, 1984.
- Bowin, C., and C. Monster, Geology of the Dominican Republic: ARC polarity reversal and effects of cessation of subduction, *Woods Hole Ocean. Inst.*, 1984.
- Brown, L., and R. Reilinger, Crustal movement, *Rev. Geophys. Space Phys.*, 21, 1983.
- Brown, L., and R. Reilinger, Epirogenic and intraplate movement, *EOS, Trans. AGU*, 64, 1983.

Brown, L., and M. Golombek, Tectonic rotations within the Rio Grande Rift: Evidence from paleomagnetic studies, *J. Geophys. Res.*, 90, 1, 1985.

Buck, W., and M. Toksoz, Thermal effects of continental collisions: Thickening a variable viscosity lithosphere, *Tectonophysics*, 100, 53-69, 1983.

Burke, K., Two problems of intracontinental tectonics - Relevation of old mountain belts and subsidence of intracontinental basins, *Proc. International Conference on Intracontinental Earthquakes*, J. Petrowski and C. Allen, eds., Skopje, 1981.

Burke, K., J. Dewey, W. Kidd, and A. Sengor, Continental collisions analogous to that forming the Qinghai-Xizang Plateau, *Geological and Ecological Studies of the Winghamai-Xizang Plateau*, Science Press, 1981.

Burke, K., W. Kidd, and D. Turcotte, Tectonics of basaltic volcanism, *Basaltic Volcanism, Chapter 6*, Lunar and Planetary Institute, 1981.

Burke, K., C. Cooper, J. Dewey, P. Mann, and J. Pindell, Caribbean tectonics and relative plate motions, *Geol. Soc. Amer. Memoir, Caribbean Studies*, 1983.

Cagnetti, V., V. Achilli, P. Baldi, and S. Zerbini, Seismotectonic of the southern Tyrrhenian and Calabrian Arc: The Calabrian Arc project, *Proc. Third International Conference on the WEGNER/Medias Project*, Bologna, May 25-27, 1987, 61-70, 1988.

Caporali, A., F. Palutan, A. Cenci, and S. Casotto, Polar motion and European baselines determined by analysis of satellite laser ranging data, *Univ. di Padova*, 1985.

Caputo, M., Physical constraints for the estimates of strain on the Earth's surface, *Bollettino di Geodesia Scienze Affini*, 2, 1982.

Caputo, M., and L. Piere, Seismicity in the Messina Straits: Geodetic and geophysical observations, *Earth Evolution Science*, 3, 1982.

Caputo, M., Are there one-to-one relations between magnitude, moment, intensity, and acceleration of the ground?, *Geophys. J. Astron. Soc.*, 72, 1983.

Caputo, M., Determination of the creep, fatigue and activation energy from constant strain rate experiment, *Tectonophysics*, 91, 1983.

Caputo, M., The occurrence of large earthquakes in southern Italy, *Tectonophysics*, 99, 1983.

Caputo, M., R. Console, A. Begriekov, V. Keilis-Borok, and T. Sidorenko, Long-term premonitory seismicity patterns in Italy, *Geophys. J. R. Astron. Soc.*, 75, 1983.

Caputo, M., Altimetry data and the elastic stress tensor of subduction zones, *Progress Report on NASA Grant NAG5-94*, Texas A&M Univ., November 1984.

Caputo, M., V. Manzetti, and R. Nicelli, Topography and its isostatic compensation as a cause of seismicity; A revision, *Tectonophysics*, III, 1985.

Carmichael, R.S., Use of Magsat anomaly data for crustal structure and mineral resources in the U.S. midcontinent, *Quarterly Progress Reports, NASA Contract NAS5-26425*, 1981.

Carmichael, R.S., and R.A. Black, An analysis and use of Magsat magnetic data for interpretation of crustal structure and character in the U.S. mid-continent, *Phys. Earth Planet. Int.*, 44, 333-347, 1986.

Chao, B.F., and R.S. Gross, Global geodetic and gravitational effects of earthquakes, *EOS, Trans. AGU*, 67, 258, 1986.

Chao, B.F., and R.S. Gross, The global geodynamic effect of the Macquarie Ridge earthquake, *EOS, Trans. AGU*, 70, 1197, 1989.

Chapman, M., and M. Talwani, Geoid anomalies over deep sea trenches, *Geophys. J. R. Astron. Soc.*, 68, 1982.

Chase, C., and M. McNutt, The geoid: Effect of compensated topography and uncompensated oceanic trenches, *Geophys. Res. Lett.*, 9, 28-32, 1982.

Chase, C., The geological significance of the geoid, *Ann. Rev. Earth Planet Sci.*, 13, 97-118, 1985.

Chen, C., W. Chen, and P. Molnar, The uppermost mantle P-wave velocities beneath Turkey and Iran, *Geophys. Res. Lett.*, 7, 1980.

Chen, W., and P. Molnar, Constraints on the seismic wave velocity structure beneath the Tibetan Plateau and their tectonic implications, *J. Geophys. Res.*, 86, 1981.

Chen, W., and P. Molnar, Constraints on the seismic wave velocity structure beneath the Tibetan Plateau, *Proc. of the Symposium on the Tibetan Plateau*, Beijing, 1982.

Chi, S., and R. Reilinger, Geodetic evidence for subsidence due to groundwater withdrawal in many parts of the U.S., *J. of Hydrology*, 67, 1984.

Christodoulidis, D., and D. Smith, Update: San Andreas Fault experiment, *NASA TM 86123, NASA/GSFC*, 1984.

Christodoulidis, D., et al., Observing tectonic plate motions and deformations from satellite laser ranging, *J. Geophys. Res.*, 90, B11, 1985.

Clark, T.A., B.E. Corey, J.L. Davis, T.A. Herring, H.F. Hinteregger, C.A. Knight, J.I. Levine, G. Lundqvist, C. Ma, E.F. Nesman, R.B. Phillips, A.E.E. Rogers, B. Ronnang, J.W. Ryan, B.R. Schupler, D.B. Shaffer, I.I. Shapiro, N.R. Vandenberg, J.C. Webber, and A.R. Whitney, Precision geodesy using the MKIII very-long-baseline interferometer system, *IEEE Trans. on Geosci. and Remote Sensing*, GE-23, 438-449, 1985.

Clark, T.A., D. Gordon, W.E. Himwich, C. Ma, A. Mallama, and J.W. Ryan, Determination of relative site motions in the western United States using the Mark III VLBI, *J. Geophys. Res.*, 92, 12, 741-750, 1987.

Cohen, S.C., Postseismic rebound due to creep of the lower lithosphere and asthenosphere, *Geophys. Res. Lett.*, 8, 1981.

Cohen, S.C., Relationships among the slopes of lines derived from various data analysis techniques and the associated correlation coefficient, *Geophysics*, 46, 1981.

Cohen, S.C., and T. Peck, Reports on crustal movements and deformations, *NASA TM 83872*, NASA/GSFC, 1981.

Cohen, S., A multilayer model of time-dependent deformation following an earthquake on a strike-slip fault, *J. Geophys. Res.*, 87, 5409-5421, 1982.

Cohen, S.C., and M. Kramer, Crustal deformation associated with viscoelastic relaxation of a thin asthenosphere, *EOS, Trans. AGU*, 64, 858, 1983.

Cohen, S.C., Finite element viscoelastic models, *Workshop on Geodynamic Modeling*, Mass. Inst. of Tech., 1983.

Cohen, S.C., Crustal deformation and earthquakes, *NASA TM 86123*, NASA/GSFC, 1984.

Cohen, S.C., Geophysical interpretation of satellite laser ranging measurements of crustal movement in California, *NASA TM 86148*, NASA/GSFC, 1984.

Cohen, S.C., Postseismic deformation due to subcrustal viscoelastic relaxation following dip-slip earthquakes, *J. Geophys. Res.*, 89, B6, 1984.

Cohen, S.C., and M. Kramer, Crustal deformation, the earthquake cycle, and models of viscoelastic flow in the asthenosphere, *Geophys. J. R. Astron. Soc.*, 78, 735-750, 1984.

Cohen, S., and R. Morgan, Intraplate deformation due to continental collisions: A numerical study of deformation in a thin viscous sheet, *NASA TM 86235*, NASA/GSFC, 1985.

- Coles, R.L., G. Haines, G. Jansen van Beek, A. Nandi, and J. Walker, Magnetic anomaly maps from 40° N to 83° N derived from Magsat satellite data, *Geophys. Res. Lett.*, 9, 4, 281-284, 1982.
- Coles, R.L., Magsat scalar magnetic anomalies at northern high latitude, *J. Geophys. Res.*, 90, 2576-2582, 1985.
- Cox, B., and R. Richardson, Elastic and viscous modeling of plate driving forces for the Nazca Plate, *EOS, Trans. AGU*, 64, 1983.
- Dahlen, F., J. Suppe, and D. Davis, Mechanics of fold-and-thrust belts and accretionary wedges (continued): Cohesive Coulomb theory, *J. Geophys. Res.*, 89, 1984.
- Dalmayrac, B., and P. Molnar, Parallel thrust and normal faulting in Peru and constraints on the state of stress, *Earth Planet. Sci. Lett.*, 55, 1981.
- Das, S., and C.H. Scholz, Theory of time-dependent rupture in the Earth, *J. Geophys. Res.*, 86, 6039-6051, 1981.
- Das, S., and C.H. Scholz, Off-fault aftershock clusters by shear stress increase, *Bull. Seis. Soc. Amer.*, 72, 1-14, 1982.
- Das, S., and C.H. Scholz, Why large earthquakes do not nucleate at shallow depths, *Nature*, 305, 1983.
- Davidson, J.M., et al., Mobile VLBI results for 1980 to 1982, *EOS, Trans. AGU*, 64, 18, 1983.
- Davidson, J.M., et al., Radio interferometric measurement of the JPL/Owens Valley/Goldstone baselines using the mobile VLBI systems: 1980-1982, *EOS, Trans. AGU*, 64, 65, 1983.
- Davidson, J.M., and D.W. Trask, Utilization of mobile VLBI for geodetic measurements, *IEEE Trans. on Geosci. and Remote Sensing*, GE-23, 4, 1985.
- Davis, D.M., Thin-skinned deformation and plate driving forces associated with convergent margins, *Ph.D. Thesis, Mass. Inst. of Tech.*, 1983.
- Davis, J.L., T.A. Herring, and I.I. Shapiro, VLBI geodesy: 2 parts-per-billion precision in length determinations for trans-continental baselines, *Proc. IAU Symposium No. 129, The Impact of VLBI on Astrophysics and Geophysics*, M. Reid and J. M. Moran, eds., 367-368, D. Reidel, 1988.
- DeMets, C., R.G. Gordon, S. Stein, and D.F. Argus, A revised estimate of Pacific-North America motion and implications for western North America Plate boundary zone tectonics, *Geophys. Res. Lett.*, (in press), 1988.
- DeMets, C., and S. Stein, Present-day kinematics of the Rivera Plate and implications for tectonics in southwestern Mexico, *J. Geophys. Res.*, (submitted), 1989.

Denison, R.E., E.G. Lidiak, M.E. Bickford, and E.B. Kisvarsanyi, Geology and geochronology of Precambrian rocks in the central interior region of the United States, *U.S. Geol. Survey, Prof. Paper 1241-C, C1-C20*, 1984.

Dixon, T., M. Golombek, and C. Thornton, Constraints on Pacific Plate kinematics and dynamics with global positioning system (GPS) measurements, *IEEE Trans. on Geosci. and Remote Sensing, GE-23, 4*, 1985.

Dixon, T.H., D.M. Tralli, G. Blewitt, and J.P. Dauphin, Geodetic baselines across the Gulf of California using the global positioning system, *Am. Assoc. Petroleum Geol.*, (in press), 1989.

Dixon, T.H., G. Blewitt, K. Larson, D. Agnew, B. Hager, P. Kroger, and W. Strange, The June 1989 global positioning system experiment in southern California, *EOS, Trans. AGU*, (in press), 1989.

Dixon, T.H., G. Gonzalez, E. Katsigris, S. Lichten, Geodetic measurements with the global positioning system across the northern Caribbean Plate boundary, *J. Geophys. Res.*, (submitted), 1989.

Drewes, H., V. Achilli, P. Baldi, F. Broccio, V. Cagnetti, R. De Marco, E. Geiss, P. Marsan, G. Milana, Ch. Reigber, H. Tremel, and S. Zerbini, The Calabrian Arc project, *Proc. Third International Conference on the WEGNER/Medlas Project*, Bologna, May 25-27, 1987, 147-152, 1988.

Elders, W., et al., Crustal spreading in southern California, *Science*, 178, 4056, 15-24, 1982.

Engaln, J.F., and S. Stein, Constraints (?) on Easter Platelet tectonics (Abs.), *EOS, Trans. AGU*, 64, 310, 1983.

England, P., Constraints on extension of continental lithosphere, *J. Geophys. Res.*, 88, 1145-1152, 1983.

England, P., and G. Houseman, On the geodynamic setting of kimberlite genesis, *Earth Planet. Sci. Lett.*, 67, 1984.

England, P., and M. Bickle, Constraints on Archaean thermal and tectonic regimes, *J. Geol.*, 92, 353-367, 1984.

England, P., and G. Houseman, Role of lithospheric strength heterogeneities in the tectonics of Tibet and neighbouring regions, *Nature*, 315, 297-301, 1985.

England, P., G. Houseman, and L. Sonder, Length scales for continental deformation in convergent, divergent, and strike-slip environments: Analytical and approximate solutions for a thin viscous sheet model, *J. Geophys. Res.*, 90, 3553-3557, 1985.

Eubanks, T., J. Steppe, and M. Spieth, Possible detection of tectonic motion using Earth orientation measurements, *EOS, Trans. AGU*, 65, 45, 1984.

- Frey, H.V., Magsat scalar anomalies and major tectonic boundaries in Asia, *Geophys. Res. Lett.*, 9, 41, 299-302, 1982.
- Frey, H.V., Magsat scalar anomaly distribution: The global perspective, *Geophys. Res. Lett.*, 9, 41, 277-280, 1982.
- Frey, H.V., Magsat and POGO magnetic anomalies over the Lord Howe Rise: Evidence against a simple continental crustal structure, *J. Geophys. Res.*, 90, 2631-2639, 1985.
- Frey Mueller, J.T., and M.P. Golombek, Geometry and treatment of fiducial networks: Effect on GPS baseline precision in South America. *Geophys. Res. Lett.*, 15, 1467-1469, 1988.
- Gaposchkin, E., and S. Zerbinì, Determination of interstation baselines by satellite laser ranging scalar translocation, *Annales Geophysicae*, 1, 1983.
- Glazner, A., and G. Schubert, Flexure of the North American lithosphere above the subducted Mendicino Fracture Zone and the formation of east-west faults in the Transverse Ranges, *J. Geophys. Res.*, 90, B7, 1985.
- Goad, C., and B. Remondi, Initial relative positioning results using the global positioning system, *Bull. Geodesique*, 58, 193-210, 1984.
- Golembek, M., G. McGill, and L. Brown, Tectonic and geologic evolution of the Expanola Basin of the Rio Grande Rift: Structure, rate of extension, and relation to the state of stress in the western United States, *Tectonophysics*, 94, 483-507, 1983.
- Golembek, M., Fault type predictions from stress distributions on planetary surfaces: Importance of fault initiation depth, *J. Geophys. Res.*, 90, 3065-3074, 1985.
- Golombek, M.P., and G.A. Lyzenga, Implications of VLBI measurements on Pacific-North American Plate motions in southern California, *EOS, Trans. AGU*, 66, 849, 1985.
- Gonzalez, G., T. Dixon, G. Blewitt, and D. Tralli, Assessing baseline precision of June 1986 northern Caribbean GPS data using cycle ambiguity resolution, *EOS, Trans. AGU*, 1989.
- Grange, F., et al., Tectonic implications of the microearthquake seismicity and fault plane solutions in southern Peru, *J. Geophys. Res.*, 89, B7, 1984.
- Grange, F., et al., The configuration of the seismic zone and the downgoing slab in southern Peru, *Geophys. Res. Lett.*, 11, 1, 1984.
- Hager, B., R. O'Connell, and A. Raefsky, Subduction, back-arc spreading and global mantle flow, *Tectonophysics*, 99, 1983.

Hager, B., Slab dip and length and the dynamics of back-arc opening and closing, *EOS, Trans. AGU*, 64, 1984.

Haines, G.V., et al., A Model of magnetic sources within the Earth's crust compatible with the field measured by the satellite Magsat, *Geol. J.*, 75, 125-156, 1984.

Haines, G.V., Magsat vertical field anomalies above 400 N from spherical cap harmonic analysis, *J. Geophys. Res.*, 90, B3, 2593-2598, 1985.

Hall, D., I. Noble, and T. Millar, Crustal structure of the Churchill-Superior boundary zone between 8⁰N and 98⁰W longitude from Magsat anomaly maps and stacked passes, *J. Geophys. Res.*, 90, B3, 2621-2630, 1985.

Harvey, B., et al., Results of the Australian geodetic VLBI experiment, *Australian J. Geodesy*, 38, 1983.

Hastings, D., On the tectonics and metallogenesis of west Africa: A model incorporating new geophysical data, *Geoexploration*, 20, 1982.

Hastings, D., ed., Geophysics, tectonics, and mineral deposits of Africa, *Geoexploration*, 20, 1982.

Haxby, W., et al., Digital images of combined oceanic and continental data sets and their use in tectonic studies, *EOS, Trans. AGU*, 64, 52, 1983.

Herring, T.A., B.E. Corey, C.C. Couselman III, I.I. Shapiro, B.O. Ronnang, O.E.H. Rydbeck, T.A. Clark, R.J. Coates, C. Ma, J.W. Ryan, N.R. Vandenberg, H.F. Hinteregger, C.A. Knight, A.E.E. Rogers, A.R. Whitney, and D.S. Robertson, Geodesy by radio interferometry: Intercontinental distance determinations with subdecimeter precision, *J. Geophys. Res.*, 86, 1647-1651, 1981.

Herring, T.A., I.I. Shapiro, T.A. Clark, C. Ma, J.W. Ryan, B.R. Schupler, C.A. Knight, G. Lundqvist, D.B. Shaffer, N.R. Vandenberg, B.E. Corey, H.F. Hinteregger, A.E.E. Rogers, J.C. Webber, A.R. Whitney, G. Elgered, B.O. Ronnang, and J.L. Davis, Geodesy by radio interferometry: evidence for contemporary plate motion, *J. Geophys. Res.*, 91, 8341-8347, 1986.

Hinze, W., R. Oliver, and R.R.B. von Frese, Euro-African Magsat anomaly-tectonic observations, *IUGG XVIII Gen Assembly, Programme and Abstracts*, 2, 1983.

Holdahl, S., Recomputation of vertical crustal motions near Palmdale, California, *J. Geophys. Res.*, 87, B11, 1982.

Houseman, G., D. McKenzie, and P. Molnar, Convective instability of a thickened boundary layer and its relevance for the thermal evolution of continental convergent belts, *J. Geophys. Res.*, 86, 1981.

- Hsui, A., and M. Toksoz, The evolution of thermal structures beneath a subduction zone, *Tectonophysics*, 60, 1979.
- Hsui, A., and M. Toksoz, Back arc spreading: Trench migration, continental pull or induced convection, *Tectonophysics*, 74, 1981.
- Hsui, A., B. Marsh, and M. Toksoz, On melting of the subducted oceanic crust beneath island arcs, *Tectonophysics*, 99, 1983.
- Humphreys, E., R. Clayton, and B. Hager, A tomographic image of mantle structure beneath southern California, *Geophys. Res. Lett.*, 11, 625-627, 1984.
- Ivins, E.R., G.A. Lyzenga, A. Raefsky, and R.S. Saunders, Effective anisotropy in the deformation of extensively faulted crustal blocks, *EOS, Trans. AGU*, 63, 1119, 1982.
- Ivins, E.R., and G.A. Lyzenga, Stress patterns in an interplate shear zone: An effective anisotropic model and implications for the Transverse Ranges, California, *Phil. Trans. R. Soc. London*, A, 318, 285-347, 1986.
- Ivins, E.R., New aspects of rotational dynamics within the North American-Pacific ductile shear zone, *Geophysical Monograph Series; Deep Structure and Past Kinematics of Accreted Terranes*, J. W. Hillhouse, ed., AGU, Wash., DC, 1989.
- Jackson, D., A. Cheng, and C. Liu, Tectonic motions and systematic errors in leveling and trilateration data for California, *Tectonophysics*, 97, 73-83, 1983.
- Johnson, B.D., Viscous remanent magnetization model for the Broken Ridge satellite magnetic anomaly, *J. Geophys. Res.*, 90, 2640-2646, 1985.
- Jordan, T.H., and J.B. Minster, Beyond plate tectonics: looking at plate deformation with space geodesy, *The Impact Of VLBI on Astrophysics and Geophysics*, M.J.Reid and J.M.Moran, eds., 341-350, IAU, 1988.
- Jordan, T.H., and J.B. Minster, Measuring crustal deformation in the American West, *Scientific American*, 256, 8, 1988.
- Jurdy, D.M., and R.G. Gordon, Global plate motions relative to the hotspots 64 to 56 m.y. B.P, *J. Geophys. Res.*, 89, 1984.
- Kadinsky-Cade, K., R. Reilinger, and B. Isacks, Surface deformation associated with the November 23, 1977 Cauçete, Argentina, earthquake sequence, *J. Geophys. Res.*, 90, B14, 1985.
- Kaniuth, K., H. Tremel, K. Stuber, H. Drewes, S. Zerbini, and P. Baldi, Evaluation of the 1988 Tyrrhenian - Pelagian (TYPE) GPS campaign, *Fourth International Conference on the WEGENER/Medlas Project*, Sheveningen, The Netherlands, June 7-9, Delft University of Technology, 1990.

Kasapoglu, K., and M. Toksoz, Tectonic consequences of the collision of the Arabian and Eurasian Plates: Finite element models, *Tectonophysics*, 100, 71-96, 1984.

Katsambalos, K., E. Livieratos, M. Marsella, and S. Zerbini, Geometric analysis of the crustal dynamics oriented European and Mediterranean network, *Manuscripta Geodaetica*, (in press), 1989.

Kellogg, J.N., T.H. Dixon, and R.E. Neilan, Central and South America GPS geodesy - CASA, *EOS, Trans. AGU*, 70, 649-656, 1989.

King, N., and J. Savage, Regional deformation near Palmdale, California, 1973-1983, *J. Geophys. Res.*, 89, 2471-2477, 1984.

Kolenkiewicz, R., Plate motion along the San Andreas Fault from satellite laser ranging, *EOS, Trans. AGU*, 65, 16, 1984.

Kolenkiewicz, R., J. Ryan, and M. Torrence, Geodetic measurements utilizing space techniques, *ISSTG Meeting Trans.*, Sopron, Hungary, July, 1984.

Kolenkiewicz, R., J. Ryan, and M. Torrence, A comparison between LAGEOS laser ranging and very long baseline interferometry determined baseline lengths, *J. Geophys. Res.*, 90, B11, 1985.

Kroger, P.M., K.S. Wallace, and G.A. Lyzenga, Empirical strain modeling in California using mobile VLBI measurements, *EOS, Trans. AGU*, 67, 913, 1986.

Kroger, P.M., K.S. Wallace, and G.A. Lyzenga, Empirical strain modeling in California using space geodetic data, *EOS, Trans. AGU*, 67, 257, 1986.

Kroger, P.M., G.A. Lyzenga, J.M. Davidson, and K.S. Wallace, Distribution of relative motion along the Pacific-North American Plate boundary determined from mobile VLBI measurements, *EOS, Trans. AGU*, 68, 284, 1987.

Kroger, P.M., G.A. Lyzenga, K.S. Wallace, and J.M. Davidson, Tectonic motion in the western United States inferred from very long baseline interferometry measurements, 1980-1986, *J. Geophys. Res.*, 92, 14151-14163, 1988.

Kroger, P.M., C. DeMets, P. Lundgren, G.A. Lyzenga, and G. Blewitt, Post-seismic GPS measurements of the Loma Prieta earthquake, *EOS, Trans. AGU*, 1990.

Kuhn, G.J. and H. Zaiman, Long wavelength magnetic anomaly map for southern Africa from Magsat, *Trans. Geol. Soc. S. Afr.*, 89, 9-16, 1986.

LaBrecque, J.L., and S.C. Cande, Observations of seamount anomalies in Magsat and sea surface magnetic data, *The Origin and Evolution of Seamounts*, 8, 1982.

- LaBrecque, J.L., S.C. Cande, and R.D. Jarrard, The intermediate wave length magnetic anomaly field of the north Pacific and possible source distribution, *J. Geophys. Res.* 90, 2549-2564, 1985.
- LaBrecque, J.L., and S.C. Cande, Intermediate wavelength magnetic anomalies over the central Pacific, *J. Geophys. Res.*, 89, 11, 124-134, 1984..
- LaBrecque, J.L., and C.A. Raymond, Seafloor spreading anomalies in the Magsat field of the north Atlantic, *J. Geophys. Res.*, 90, 2565-2575, 1985.
- Lachenbruch, A., J. Sass, and S. Galanis, Heat flow in southernmost California and the origin of the Salton Trough, *J. Geophys. Res.*, 90, B8, 1985.
- Lambeck, K., Some geodetic aspects of the plate tectonics hypothesis, *Reference Coordinate Systems for Earth Dynamics*, E.M. Gaposchkin and B. Kolaczek, eds., D. Reidel, 87-101, 1981.
- Lambeck, K., C. Penney, S. Nakiboglu, and R. Coleman, Subsidence and flexure along the Pratt-Welder Seamount Chain, *J. Geodynamics*, 1, 29-60, 1983.
- Langel, R.A., J. Phillips, and R. Horner, Initial scalar magnetic anomaly map from Magsat, *Geophys. Res. Lett.*, 9, 4, 269-271, 1982.
- Langel, R.A., and L. Thorning, A satellite magnetic anomaly map of Greenland, *Geophys. J. R. Astron. Soc.*, 71, 3, 599-612, 1982.
- Langel, R.A., and L. Thorning, Satellite magnetic field over the Nares Strait Region, *Nares Strait: A Central Conflict in Plate Tectonics Studies of the Arctic*, P.R. Doves and J.W. Ken, eds., Medd., Gronland Geosci., 1982.
- Larsen, S., and R. Reilinger, Recent measurements of crustal deformation related to the Socorro Magma Body, *New Mexico Geological Society Guidebook*, 34, 1983.
- Li, V., and J. Rice, Pre-seismic progression and great earthquake instabilities at plate boundaries, *J. Geophys. Res.*, 88, 4231-4246, 1983.
- Li, V., and J. Rice, Precursory surface deformation in great plate boundary earthquake sequences, *Bull. Seis. Soc. Amer.*, 73, 1415-1434, 1983.
- Li, V., and C. Kisslinger, Stress transfer and nonlinear stress accumulation at subduction type plate boundaries - Application to the Aleutians, *Pure Appl. Geophys.*, 122, 6, 1984.
- Lichten, S.M., Estimation of continental baselines with multi-day Arc GPS orbits demonstrates 1 Part in 10^8 GPS/VLBI consistency, *Crustal Dynamics Principal Investigators Meeting*, Munich, FRG, October 1988.

- Lidiak, E.G., Basement rocks of the main interior basins of the midcontinent, *University of Missouri at Folla Journal*, 3, 5-24, 1982.
- Lidiak, E.G., V.M. Ceci, W.J. Hinze, and J.P. McPhee, Tectonic framework of basement rocks in the eastern midcontinent, *Geol. Soc. Amer., Abstracts with Programs*, 15, 627, 1983.
- Lidiak, E.G., D.W. Yuan, W.J. Hinze, M.B. Longacre, and G.R. Keller, Correlation of tectonic provinces of South America and the Caribbean with Magsat anomalies, *10th Caribbean Geological Conference*, Aug. 1983, Cartagena, Colombia, 1983.
- Liu, C., D. Sandwell, and J. Curray, The negative gravity field over the 85° E Ridge, *J. Geophys. Res.*, 87, 1982.
- Liu, H., Geodynamics of crustal deformation and seismotectonic block movements in central Europe, *NASA TM 86123*, NASA/GSFC, 1984.
- Loo, H.Y., Three-dimensional numerical analysis of continental margin basin deformation related to large earthquake development, *Proc. 27th International Geological Congress*, Mass. Inst. of Tech., 1984.
- Longacre, M.B., Satellite magnetic investigation of South America, *M.Sc., Thesis, Purdue University*, 1981.
- Longacre, M.B., W.J. Hinze, and R.R.B. von Frese, A satellite magnetic model of northeastern South American aulacogens, *Geophys. Res. Lett.*, 9, 4, 318-321, 1982.
- Louie, J., et al., Fault slip in southern California, *Bull. Seis. Soc. Amer.*, 75, 3, 811-833, 1985.
- Lowman, P., Crustal evolution in silicate planets: Implications for the origin of continents, *J. Geol.*, 84, 1976.
- Lowman, P., and H. Frey, A geophysical atlas for interpretation of satellite-derived data, *NASA TM 79722*, NASA/GSFC, 1979.
- Lowman, P., A global tectonic activity map, *Bull. Int. Assoc. Engineering Geology*, 23, 1981.
- Lowman, P., Formation of the earliest continental crust: Inferences from the Scourian Complex of northwest Scotland and geophysical models of the lower continental crust, *Precambrian Res.* 24, Elsevier Science Pub., 1984.
- Luhr, J., et al., Active rifting in southwestern Mexico: Manifestations of an incipient eastward spreading-ridge jump, *Geology*, 13, 54-57, 1985.
- Lyon-Caen, H., and P. Molnar, Gravity anomalies and the structure of western Tibet and the southern Tarim Basin, *Geophys. Res. Lett.* 11, 12, 1984.

Lyzenga, G.A., and T.C. Wallace, Numerical synthesis of surface deformations following the Mammoth Lake earthquake sequence, *EOS, Trans. AGU*, 62, 401, 1981.

Lyzenga, G., and K. Wallace, Southern California strain rates derived from VLBI observations, *EOS, Trans. AGU*, 64, 18, 1983.

Lyzenga, G., K. Wallace, and J. Fanselow, Strain changes from 1980 through 1982 on the southern California mobile VLBI net: Results and implications, *EOS, Trans. AGU*, 64, 45, 1983.

Lyzenga, G.A., K.S. Wallace, J.L. Fanselow, and A. Raefsky, Constraints on the tectonics of southern and central California derived from space geodetic observations, *EOS, Trans. AGU*, 65, 992, 1984.

Lyzenga, G., K. Wallace, and J. Fanselow, Modeling of the surface static displacements and fault plane slip for the 1979 Imperial Valley earthquake, *JPL Geodesy and Geophys. Preprint*, 107, 1984.

Lyzenga, G.A., Space geodetic observations and the tectonics of California, *EOS, Trans. AGU*, 66, 382, 1985.

Lyzenga, G.A., and A. Raefsky, Stress accumulation and the earthquake cycle in vertically offset transform shear zones, *EOS, Trans. AGU*, 66, 1066, 1985.

Lyzenga, G.A., A. Raefsky, and B.H. Hager, Time-predictable recurrence at subduction zones?, *EOS, Trans. AGU*, 67, 904, 1986.

Lyzenga, G.A., and M.P. Golombek, North American-Pacific relative plate motion in southern California from interferometry, *Science*, 233, 1181-1183, 1986.

Lyzenga, G.A., K.S. Wallace, A. Raefsky, P.M. Groth, and J.L. Fanselow, Tectonic motions in California inferred from very long baseline interferometry observations, 1980-1984, *J. Geophys. Res.*, 91, 9473-9487, 1986.

Lyzenga, G.A., and A. Raefsky, Propagation of stress and displacement in the earthquake cycle: Two-dimensional models, *EOS, Trans. AGU*, 69, 1432, 1988.

Lyzenga, G.A., and A. Raefsky, The state of crustal stress in the presence of recurrent strike-slip earthquakes, *EOS, Trans. AGU*, 70, 1354, 1989.

Lyzenga, G.A., A. Raefsky, and S.G. Mulligan, Models of recurrent strike-slip earthquake cycles and the state of crustal stress, *J. Geophys. Res.*, (submitted), 1990.

Mann, P., and K. Burke, Structure and stratigraphy of the northern Wagwater Belt, Jamaica, *Trans. Ninth Caribbean Geological Congress*, Santo Domingo, 1, 1983.

Mann, P., F. Taylor, K. Burke, and R. Kulstad, Subaerially exposed Holocene coral reef, Enriquillo Valley, Dominican Republic, *Bull. Geo. Soc. Amer.*, 1983.

Mann, P., M. Hempton, D. Bradley, and K. Burke, Development of pull-apart basins, *J. Geol.*, 91, 529-554, 1983.

Mann, P., and K. Burke, Neotectonics of the Caribbean, *Reviews of Geophys. and Space Phys.*, 22, 4, AGU, 1984.

Marsella M., and S. Zerbini, Baseline variations in the Mediterranean area derived from LAGEOS data analysis, *Fourth International Conference on the WEGENER/Medlas Project*, Sheveningen, The Netherlands, June 7-9, Delft University of Technology, 1990.

Marsh, B., J. Marsh, and R. Williamson, On gravity From SST, geoid from Seasat, and plate age and fracture zones in the Pacific, *J. Geophys. Res.*, 89, B7, 1984.

Marsh, J., F. Lerch, and R. Williamson, Precision geodesy and geodynamics using Starlette laser ranging, *J. Geophys. Res.*, 90, B11, 1985.

McCaffrey, R., R. Molnar, S. Roecker, and Y. Joyodiwiry, Micro-earthquake seismicity and fault plane solutions related to arc-continent collision in the eastern Sunda Arc, Indonesia, *J. Geophys. Res.*, 90, B6, 1985.

McCann, W., and L. Sykes, Subduction of aseismic ridges beneath the Caribbean Plate: Implications for the tectonics and seismic potential of the northeastern Caribbean, *J. Geophys. Res.*, 89, B7, 1984.

McGarr, A., Analysis of states of stress between provinces of constant stress, *J. Geophys. Res.*, 87, B11, 1982.

Meehan, T., G. Blewitt, K. Larson, and R. Neilan, Baseline results of the Rogue GPS receiver from CASA Uno, *EOS, Trans. AGU*, 69, 44, 1988.

Minster, J.B., and T.H. Jordan, Present day plate motions, *J. Geophys. Res.*, 83, 5331-5354, 1978.

Minster, J.B., and T.H. Jordan, Vector constraints on Quaternary deformation of the western United States east and west of the San Andreas Fault, *Tectonics and Sedimentation Along the California Margin: Pacific Section S.E.P.M.* 38, 1-16, J.K. Crouch and S.B. Bachman, eds., 1984.

Minster, J.B., and T.H. Jordan, Vector constraints on western U.S. deformation from space geodesy, neotectonics, and plate motions, *J. Geophys. Res.*, 92, B6, 4798-4804, 1987.

Mishra, D.C., and M. Venkatraydu, Magsat scalar anomaly map of India and a part of Indian Ocean-magnetic crust and tectonic correlation, *Geophys. Res. Lett.*, 12, 781-784, 1985.

- Molnar, P., and D. Gray, Subduction of continental lithosphere: Some constraints and uncertainties, *Geology*, 7, 1979.
- Molnar, P., and P. Tapponier, A possible dependence of tectonic strength on the age of the crust in Asia, *Earth Planet. Sci. Lett.*, 52, 1981.
- Molnar, P., and W. Chen, Constraints of the amount of north-south shortening in Tibet during the Cenozoic, *Proc. of the Symposium on the Tibetan Plateau*, Beijing, 1982.
- Molnar, P., Structure and tectonics of the Himalaya: Constraints and implications of geophysical data, *Ann. Rev. Earth Planet. Sci.*, 12, 1984.
- Molnar, P., and W. Chen, S-P wave travel time residuals and lateral inhomogeneity in the mantle beneath Tibet and the Himalaya, *J. Geophys. Res.*, 89, B8, 1984.
- Molnar, P., and J. Stock, A method for bounding uncertainties in combined plate reconstructions, *J. Geophys. Res.*, 90, B14, 1985.
- Morelli, C., Promontorio Africano o microplacca Adriatica? (African promontory or Adriatic microplate?), *Bollettino di Oceanologia Teorica ed Applicata*, 2, 2, Univ. di Trieste, 1984.
- Mueller, I.I., Space geodetic techniques and geodynamics, *Proc. First International Symposium on Crustal Movements in Africa*, 1981.
- Negi, J.G., P. Agarwal, and N. Thakur, Vertical component Magsat anomalies and Indian tectonic boundaries, *Proc. Indian Acad. Sci. (Earth Planet. Sci.)*, 94, 35-41, 1985.
- Negi, J.G., et al., Crustal magnetisation-model of the Indian subcontinent through inversion of satellite data, *Tectonophysics*, 122, 123-133, 1986.
- Negi, J.G., et al., Prominent Magsat anomalies over India, *Tectonophysics*, 122, 345-356, 1986.
- Neilan, R.E., T.H. Dixon, T.K. Meehan, W.G. Melbourne, J.A. Scheid, J.N. Kellogg, and J. Stowell, Operational aspects of CASA Uno: The first large scale international geodetic network, *IEEE Trans. Instr. and Measur.* 38, 648-651, 1989.
- Noble, I.A., Magsat anomalies and crustal structure of the Churchill-Superior Boundary Zone, *M.Sc. Thesis, Univ. of Manitoba, Winnipeg*, 1983.
- Palutan, F., et al., First results from satellite laser ranging activity at Matera, *5th Int. Workshop on Laser Rang. Instr.*, Royal Greenwich Obs., 1984.
- Parrott, M.H., Interpretation of Magsat anomalies over South America, *M.Sc. Thesis, Purdue Univ.*, 1-95, 1985.

Parsons, I.D., J.F. Hall, and G.A. Lyzenga, Relationships between the average offset and the stress drop for two-and-three-dimensional faults, *Bull. Seis. Soc. Amer.*, 78, 931-945, 1988.

Pavlis, E., and I.I. Mueller, The effect of Earth orientation errors in baseline determination, *Bull. Geodesique*, 57, 3, 1983.

Pavlis, E., On the geodetic applications of simultaneous range differences to LAGEOS, *J. Geophys. Res.*, 90, B11, 1985.

Phillips, R.J., and C.R. Brown, The satellite magnetic anomaly of Ahaggar: Evidence for African Plate motion, *Geophys. Res. Lett.*, 12, 697-700, 1985.

Piersma, H., K. Wakker, and B. Ambrosius, Numerical experiments on the estimation of relative station positions using single passes of LAGEOS and Starlette laser range observations, *Memorandum M-456, Delft Univ. of Tech.*, 1983.

Piuzzi, A., A. Souriau, and M. Souriau, Absolute movements in the Djibouti area in relation with seismic activity, *EOS, Trans. AGU*, 64, 1983.

Rajbanshi, K., et al., Comparison of Magsat anomalies over Indian region with POGO and ground data, *Indian Inst. of Geomagnetism*, 1983.

Reding, L., and R. Richardson, Ridge push forces: How important as a driving force?, *EOS, Trans. AGU*, 64, 1983.

Reilinger, R., and L. Brown, Neotectonic deformation, near surface movements and systematic errors in U.S. releveling measurements: Implications for earthquake prediction, *Earthquake Prediction - An International Review*, D.W. Simpson and P.G. Richards, eds., Maurice Ewing Series #4, AGU, 1981.

Reilinger, R., and J. Adams, Geodetic evidence for active landward tilting of the Oregon and Washington coastal ranges, *Geophys. Res. Lett.*, 9, 4, 1982.

Reilinger, R., Geodetic evidence for aseismic slip on the Brawley Fault, southern California, *EOS, Trans. AGU*, 64, 1983.

Reilinger, R., Coseismic and postseismic vertical movements associated with the 1940, M7.1 Imperial Valley, California, earthquake, *J. Geophys. Res.*, 89, 4531-4537, 1984.

Reilinger, R., M. Bevis, and G. Jurkowski, Tilt from releveling: An overview of the U.S. data base, *Tectonophysics*, 107, 315-330, 1984.

Reilinger, R., and K. Kadinsky-Cade, The earthquake deformation cycle in the Andean Back-Arc, western Argentina, *J. Geophys. Res.*, 90, B14, 1985.

- Renbarger, K.S., A crustal structure study of South America, *M.Sc. Thesis, Purdue University*, 1984.
- Ricard, Y., C. Froidevaux, and J. Hermance, Model heat flow and magnetotellurics for the San Andreas and oceanic transform faults, *Annales Geophysicae*, 1, Gauthier-Villars, 1983.
- Richardson, R., Inversion for the driving forces of plate tectonics, *IEEE Geosci. and Remote Sensing Symp. II*, 1983.
- Richardson, R., and B. Cox, Evolution of oceanic lithosphere: A driving force study of Nazca Plate, *J. Geophys. Res.*, 89, 1984.
- Ridgway, J.R., Preparation and interpretation of a revised Magsat satellite magnetic anomaly map over South America, *M.Sc. Thesis, Purdue University*, 1984.
- Ridgway, J.R., and W.J. Hinze, Magsat scalar anomaly map of South America, *Geophysics*, 51, 1472-1479, 1986.
- Rizos, C., and P. Wilson, Simulations on the application of satellite laser tracking for geodynamical studies in the eastern Mediterranean, *Institut fur Angewandte Geodasie*, 1983.
- Robertson, D.S., W.E. Carter, B.E. Corey, W.D. Cotton, C.C. Counselman III, I.I. Shapiro, J.J. Wittels, H.F. Hinteregger, C.A. Knight, A.E.E. Rogers, A.R. Whitney, J.W. Ryan, T.A. Clark, R.J. Coates, C. Ma, and J.M. Moran, Recent results of radio interferometric determinations of a transcontinental baseline, polar motion, and Earth rotation, *Time and the Earth's Rotation*, D.D. McCarthy and J.D.H. Pilkington, eds., D. Reidel, 217-224, 1979.
- Robertson, D.S., and W.E. Carter, Continental scale baselines determined by VLBI, *International Symposium on Space Techniques for Geodynamics, Proceedings 2*, Sopron, Hungary, 17-24, 1984.
- Ruder, M.E., Interpretation and modeling of regional crustal structure of the southeastern United States, *M.Sc. Thesis, Penn. State Univ.*, 1986.
- Ruegg, J., M. Kasser, and J. Lepine, Strain accumulation across the Asal-Ghoubbet Rift, Djibouti, East Africa, *J. Geophys. Res.*, 89, 6237-6246, 1984.
- Rundle, J.B., Models of crustal deformation, *Rev. Geophys. Space. Phys.*, 21, 1454-1458, 1983.
- Rundle, J.B., and J.H. Whitcomb, A model for deformation in Long Valley Caldera, 1980-1983, *J. Geophys. Res.*, 89, 9371-9380, 1984.
- Rundle, J.B., H. Kanamori, and K. McNally, An inhomogeneous fault model for gaps, asperities, barriers and seismicity migration, *J. Geophys. Res.*, 89, 10219-10231, 1984.

Rundle, J.B., Models for volcanic processes in Long Valley, California: Testing by continental drilling, *Proc. Symp. Observation of the Continental Crust Through Drilling*, Columbia University Press, 1984.

Rundle, J.B., and J.H. Whitcomb, Modeling crustal deformation in Long Valley Caldera, 1980-1983, *Proc. U.S. Geol. Survey Conf. on Volcanic Hazards in Long Valley, California*, 1985.

Rundle, J.B., An approach to modeling present day deformation in southern California, *J. Geophys. Res.*, 91, 1947-1959, 1986.

Rundle, J.B., and D.P. Hill, The geophysics of a restless caldera - Long Valley, California, *Ann. Rev. Earth Planet. Sci.*, 16, 251-271, 1988.

Ryan, J.W., T.A. Clark, R.J. Coates, C. Ma, W.T. Wildes, C.R. Gwinn, T.A. Herring, I.I. Shapiro, B.E. Corey, C.C. Counselman, H.F. Hinteregger, A.E.E. Rogers, A.R. Whitney, C.A. Knight, N.R. Vandenberg, J.C. Pigg, B.R. Schupler, and B.O. Ronnang, Geodesy by radio interferometry: Determinations of baseline vector, Earth rotation, and solid Earth tide parameters with the Mark-I very long baseline radio interferometry system, *J. Geophys. Res.*, 91, 1935-1946, 1986.

Ryan, J.W., and C. Ma, Crustal dynamics project data analysis 1987: Vol. 1. Fixed station VLBI geodetic results, *NASA TM 100682*, NASA/GSFC, 1987.

Ryan, J.W., NASA/crustal dynamics results: Station motions from global scale VLBI baselines, *EOS Trans. AGU*, 68, 284, 1987.

Saburi, Y., et al., The first U.S.-Japan VLBI test observation by use of K-3 system at the Radio Research Laboratories, *J. Radio Research Lab.*, 32, 132, 1984.

Sandwell, D., and G. Schubert, Geoid height-age relation from Seasat altimeter profiles across the Mendocino Fracture Zone, *J. Geophys. Res.*, 87, B5, 3949-3958, 1982.

Sandwell, D., and G. Schubert, Lithospheric flexure at fracture zones, *J. Geophys. Res.*, 87, B6, 4657-4667, 1982.

Sandwell, D., Thermomechanical evolution of oceanic fracture zones, *J. Geophys. Res.*, 89, 11401-11413, 1984.

Sauber, J., R. Reilinger, and M. Toksoz, Postseismic viscoelastic relaxation associated with the 1940 Imperial Valley earthquake, *EOS Trans. AGU*, 65, 1984.

Savage, J., Strain accumulation in western United States, *Ann. Rev. Earth Planet. Sci.*, 11, 11-43, 1983.

Savage, J., Local gravity anomalies produced by dislocation sources, *J. Geophys. Res.*, 89, 1945-1952, 1984.

- Savage, J., and G. Gu, A plate flexure approximation to postseismic and interseismic deformation, *J. Geophys. Res.*, 90, B10, 1985.
- Savage, J., and G. Gu, The 1979 Palmdale, California, strain event in retrospect, *J. Geophys. Res.*, 90, B12, 1985.
- Savage, J., M. Lisowski, and W. Prescott, Strain accumulation in the Rocky Mountain States, *J. Geophys. Res.*, 90, B12, 1985.
- Sawyer, D., et al., Extensional model for the subsidence of the northern United States Atlantic Continental Margin, *Geology*, 10, 134-140, 1982.
- Sawyer, D., Brittle failure in the upper mantle during extension of continental lithosphere, *J. Geophys. Res.*, 90, B4, 1985.
- Schilt, F., and R. Reilinger, Evidence for contemporary vertical fault displacement from precise leveling near the New Madrid seismic zone, western Kentucky, *Bull. Seis. Soc. Amer.*, 71, 1933-1942, 1981.
- Scholz, C.H., Scaling laws for large earthquakes: Consequences for physical models, *Bull. Seis. Soc. Amer.*, 72, 1982.
- Scholz, C.H., Scaling relations for strong ground motion in large earthquakes, *Bull. Seis. Soc. Amer.*, 72, 1903-1909, 1982.
- Scholz, C.H., and S. Hickman, Hysteresis in the closure of a nominally flat crack, *J. Geophys. Res.*, 88, B8, 1983.
- Scholz, C.H., Earthquake prediction and seismic hazard, *Earthquake Prediction Res.*, 4, 1984.
- Schubert, G., and Z. Garfunkel, Mantle upwelling in the Dead Sea and Salton Trough-Gulf of California leaky transforms, *Annales Geophysicae*, 2, 1984.
- Sengor, A., K. Burke, and J. Dewey, Tectonics of the North Anatolian Transform Fault, *Multidisciplinary Approach to Earthquake Prediction*, A. Isikara and A. Vogel, eds., Vieweg und Sohn, 1982.
- Shoberg, L.E., The Fennoscandian land uplift spectrum and its correlation with gravity, *Univ. of Uppsala*, 1983.
- Slade, M.A., G.A. Lyzenga, A. Raefsky, S. Hartzell, and R. Scott, Finite element modeling of the 1979 Imperial Valley earthquake, *EOS, Trans. AGU*, 63, 1119, 1982.
- Slade, M.A., et al., Stress field and seismic release in the Parkfield-Coalinga, California, region, *EOS, Trans. AGU*, 64, 1983.
- Slade, M.A., G.A. Lyzenga, and A. Raefsky, Modeling of the surface static displacements and fault plane slip for the 1979 Imperial Valley earthquake, *Bull. Seis. Soc. Amer.*, 74, 6, 1984.

Slade, M.A., G.A. Lyzenga, and A. Raefsky, 1960 Chile: Release mechanism for long-period seismic moment, *EOS, Trans. AGU*, 67, 309, 1986.

Smalley, R., D. Turcotte, and S. Solla, A renormalization group approach to the stick-slip behavior of faults, *J. Geophys. Res.*, 90, B2, 1985.

Smith, D., and D. Christodoulidis, Sensitivity of SLR baselines to errors in Earth orientation, *NASA TM 86123, NASA/GSFC*, 1984.

Smith, D., et al., A global geodetic reference frame from LAGEOS ranging (SL5.1AP), *J. Geophys. Res.*, 90, B11, 1985.

Snay, R., M. Cline, and E. Timmerman, Regional deformation of the Earth model for the San Diego region, California, *J. Geophys. Res.*, 88, 5009-5024, 1983.

Soller, D., R. Ray, and R. Brown, A new global crustal thickness map, *Tectonics*, 1, 1982.

Souriau, M., Plate motion in front of a trench and space geodesy, *Ann. Geophys.*, 37, 91-98, 1981.

Souriau, M., et al., Limitations of accurate satellite Doppler positioning for tectonics, An example, Djibouti, *Bull. Geodesique*, 58, 53-82, 1984.

Souriau, A., Geoid anomalies over Gorringer Ridge, North Atlantic Ocean, *Earth Planet. Sci. Letts.*, 68, 101-114, 1984.

Sovers, O., et al., Radio interferometric determination of intercontinental baselines and Earth orientation utilizing deep space network antennas: 1971 to 1980, *J. Geophys. Res.*, 89, 7597-7607, 1984.

Speed, R., Cenozoic collision of the Lesser Antilles Arc and continental South America and the origin of the El Pilar Fault, *Tectonics*, 4, 41-69, 1985.

Spieth, M.A., K.S. Wallace, and G.A. Lyzenga, Application of empirical strain modeling to crustal dynamics VLBI data in California, *EOS, Trans. AGU*, 66, 848, 1985.

Stein, S., J. Engeln, D. Wiens, K. Fujita, and R. Speed, Subduction seismicity and tectonics in the Lesser Antilles Arc, *J. Geophys. Res.*, 87, 1982.

Stein, S., et al., Slow subduction of old lithosphere in the Lesser Antilles, *Tectonophysics*, 99, 139-148, 1983.

Stolz, A., and E. Masters, Satellite laser range measurements of the 3200 km Orroral-Yarragadee baseline, *The Australian Surveyor*, 31, 1983.

Stolz, A., et al., Australian baselines measured by radio interferometry, *The Australian Surveyor*, 31, 1983.

Stolz, A., E. Masters, and B. Harvey, Use of space techniques to measure crustal motion in the Australian Region, *Bull. R. Soc. of New Zealand*, 1983.

Stolz, A., and K. Lambeck, Geodetic monitoring of tectonic deformation in the Australian region, *J. Geol. Soc. Aust.*, 30, 411-422, 1983.

Suarez, G., Earthquake mechanisms and the depth of faulting in the central Andes, *Earthquake Notes*, 52, 1981.

Suarez, G., P. Molnar, and B. Burchfiel, Seismicity, fault plane solutions, depth of faulting, and active tectonics of the Andes of Peru, Ecuador, and southern Columbia, *J. Geophys. Res.*, 88, B12, 1983.

Sykes, L., and S. Nishenko, Probabilities of occurrence of large plate rupturing earthquakes for the San Andreas, San Jacinto, and Imperial Faults, *J. Geophys. Res.*, 89, B7, 1984.

Tapley, B., B. Schultz, and R. Eanes, Station coordinates, baselines, and Earth rotation from LAGEOS laser ranging: 1976-1984, *J. Geophys. Res.*, 90, B11, 1985.

Taylor, P.T., Nature of the Canada basin: Implications from satellite derived magnetic anomaly data, *J. Alaska Geol. Soc.*, 2, 1-8, 1983.

Thatcher, W., Non-linear stress buildup and the earthquake cycle on the San Andreas Fault, *J. Geophys. Res.*, 88, 5893-5902, 1983.

Thatcher, W., and J. Rundle, A viscoelastic model for periodically recurring earthquakes in subduction zones, *J. Geophys. Res.*, 89, 7631-7640, 1984.

Toksoz, M., W. Buck, and A. Hsui, Crustal evolution and thermal state of Tibet, *Proc. Symposium on the Tibetan Plateau*, Beijing, 1982.

Tralli, D.M., and T.H. Dixon, A few parts in 10^8 geodetic baseline repeatability in the Gulf of California using the global positioning system, *Geophys. Res. Lett.*, 15, 353-356, 1988.

Truehaft, R., et al., The time variation of intercontinental baselines using VLBI, *EOS, Trans. AGU*, 64, 1983.

Turcotte, D.L., P. Tag, and R. Cooper, A steady-state model for the distribution of stress and strain on the San Andreas Fault, *J. Geophys. Res.*, 85, 6224-6230, 1980.

Turcotte, D.L., and S. Emerman, Mechanisms of active and passive rifting, *Tectonophysics*, 94, 39-50, 1983.

Turcotte, D.L., Mechanisms of crustal deformation, *J. Geol. Soc. Amer.*, 140, 1983.

Turcotte, D.L., J. Liu, and F. Kulhawy, The role of intracrustal asthenosphere on the behavior of major strike-slip faults, *J. Geophys. Res.*, 89, 7, 1984.

van Gelder, B., and L. Aardoom, SLR network designs in view of reliable detection of plate kinematics in the east Mediterranean, *Dept. of Geodesy Report 82.2, Delft Univ. of Tech.*, 1982.

Vassiliou, M., and B.H. Hager, The state of stress in subducting slabs as revealed by earthquakes analyzed by moment tensor inversion, *Earth Planet. Sci. Lett.*, 69, 195-202, 1984.

Vassiliou, M., B.H. Hager, and A. Rafsky, The distribution of earthquakes with depth and stress in subducting slabs, *J. Geodyn.* 1, CA Inst. of Tech., 1984.

Verheijen, A.J.M., S. Zerbini, A. Dall'Oglio, M. Marsella, and V. Rigotti, European baselines from LAGEOS - a semi-dynamic solution, *Proc. Third International Conference on the WEGENER/Medlas Project*, Bologna May 25-27, 1987, 279-290, 1988.

Vermaat, E., Site selection for MTLRS, *Dept. of Geodesy Report 83.2, Delft Univ. of Tech.*, 1983.

von Frese, R.R.B., W. Hinze, J. Sexton, and L. Braile, Regional magnetic models of the Mississippi Embayment, *EOS, Trans. AGU*, 62, 1981.

von Frese, R.R.B., W. Hinze, J. Sexton, and L. Braile, Verification of the crustal component in satellite magnetic data, *Geophys. Res. Lett.*, 9, 4, 293-295, 1982.

von Frese, R.R.B., Long-wavelength magnetic and gravity anomaly correlations of Africa and Europe, *IAGA Bulletin*, 47, 1983.

von Frese, R.R.B., Regional anomalies of the Mississippi River Aulacogen, *Geophysics*, 48, 1983.

von Frese, R.R.B., Regional geophysical analysis of Mississippi Embayment crustal structure, *112th Annual Meeting. of the Soc. of Mining Engineers, Technical Prog. and Abstracts*, 1983.

Von Frese, R.R.B., et al., Regional magnetic anomaly constraints on continental breakup, *Geology*, 14, 68-71, 1986.

Wahr, J., and M. Wyss, Interpretation of postseismic deformation with a viscoelastic relaxation model, *J. Geophys. Res.*, 85, 6471-6477, 1980.

Wakker, K., and B. Ambrosius, Some results of numerical experiments on the computation of the Kootwijk and Wettzell satellite laser ranging station coordinates, *Memorandum M-409, Delft Univ. of Tech.*, 1981.

- Wakker, K., B. Ambrosius, and L. Aardoom, Orbit determinations and European station positioning from satellite laser ranging, *J. Geophys. Res.*, 90, B11, 1985.
- Wallace, T.C., G.A. Lyzenga, and J.W. Given, A discrepancy between long- and short-period fault mechanisms of earthquakes near the Long Valley Caldera, *Bull. Seis. Soc. Amer.*, 1982.
- Wesnousky, S., C. Scholz, and K. Shimazaki, Deformation of an island arc: Rates of moment-release and crustal shortening in intraplate Japan determined from seismicity and Quaternary fault data, *J. Geophys. Res.*, 87, B8, 1982.
- Wesnousky, S., et al., Earthquake frequency distribution and the mechanics of faulting, *J. Geophys. Res.*, 88, B11, 1983.
- Wesnousky, S., et al., Historical seismicity and rates of crustal deformation along the margins of the Ordos Block, North China, *Bull. Seis. Soc. Amer.*, 74, 1767-1783, 1984.
- Whitman, J., C. Harrison, and G. Brass, Tectonic evolution of the Pacific Ocean Basin since 74 Ma, *Tectonophysics*, 99, 241-249, 1983.
- Willemann, R., and D. Turcotte, The role of lithospheric stress in the support of the Tharsis Rise, *J. Geophys. Res.*, 87, 9793-9801, 1982.
- Wilson, P., Crustal dynamics of the eastern Mediterranean, *CSTG Bulletin*, 5, Institut fur Angewandte Geodasie, 1983.
- Wolf, S.K., T.H. Dixon, and J. Freymueller, The effect of global tracking network on the precision of long baseline estimates from the CASA Uno global positioning system experiment, *Geophys. Res. Lett.*, (submitted), 1989.
- Wong, K., and M. Wyss, Cluster of foreshocks and preshocks in the Circum-Aegean Region, *Earthquake Pred. Res.*, Univ. of CO, 1983.
- Wyatt, F., Displacement of surface monuments: Horizontal motion, *J. Geophys. Res.*, 87, 1982.
- Wyatt, F., and D.C. Agnew, High-precision continuous deformation measurements in southern California (Abs.), *IUGG*, Hamburg, August, 1983.
- Wyss, M., Some earthquake precursors and their potential use in the Balkans, *Proc. UNESCO Seminar on Earthquake Prediction and Instrumentation*, Thessaloniki, 1981.
- Wyss, M., and M. Baer, Earthquake hazard in the Hellenic Arc, *Earthquake Prediction - An International Review, Maurice Ewing Series*, 4, AGU, 1982.
- Yang, M., and M. Toksoz, Time dependent deformation and stress relaxation after strike slip earthquakes, *J. Geophys. Res.*, 86, 2889-2901, 1981.

Zerbini, S., European baselines: preliminary results from LAGEOS laser ranging data, *Proc. 2nd WEGENER/Medlas Conference*, May 14-16, 1986, Dyonisos Satellite Observatory, Hellenic Committee of Geodesy and Geophysics, 1986.

Zoback, M.L., and M.D. Zoback, State of stress in the conterminous United States, *J. Geophys. Res.*, 85, 6113-6156, 1980.

2. Earth Structure and Dynamics

Allegre, C., and D. Turcotte, Geodynamic mixing in the mesosphere boundary layer and the origin of oceanic islands, *Geophys. Res. Lett.*, 12, 207-210, 1985.

Anderson, D.L., and J. Regan, Uppermantle anisotropy and the oceanic lithosphere, *Geophys. Res. Lett.* 10, 9, 1983.

Anderson, J.R., and R.D. Rosen, 1983: The latitude-height structure of 40-50 day variations in atmospheric angular momentum, *Atmos. Sci.*, 40, 1584-1591, 1983.

Angevine, C., and D. Turcotte, Correlation of geoid and depth anomalies over the Agulhas Plateau, *Tectonophysics*, 100, 43-52, 1983.

Arkani-Hamed, J., and D.W. Strangway, Lateral variations of apparent magnetic susceptibility of lithosphere deduced from Magsat data, *J. Geophys. Res.*, 90, 2655-2664, 1985.

Arkani-Hamed, J., and D.W. Strangway, Magnetic susceptibility anomalies of lithosphere beneath Eastern Europe and the Middle East, *Geophysics*, 51, 1711-1724, 1986.

Arkani-Hamed, J., and D.W. Strangway, An interpretation of magnetic signatures of subduction zones detected by Magsat, *Tectonophysics*, 133, 45-56, 1987.

Babcock, A.K., and D.D. McCarthy, Predicting variations in Earth rotation, *Proc. International Conference on Statistical Methods in Astronomy*, ESA Scientific and Technical Publications Branch, ESTEC, Noordwijk, The Netherlands, 167, 1983.

Babcock, A.K., Analysis and modeling of variations in length of day, *Phd. Thesis*, University of Virginia, 1984.

Babcock, A.K., and G.A. Wilkins, eds., *The Earth's Rotation and Reference Frames for Geodesy and Geodynamics*, Proc. IAU Symposium No. 128, October 1986, Coolfont, WV, Kluwer Academic Publishers, 1988.

Barnes, R., et al., Atmospheric angular momentum fluctuations, length-of-day changes and polar motion, *Proc. R. Soc. London*, A387, 31-73, 1983.

- Beavan, J., R. Bilham, and K. Hurst, Coherent tilt signals observed in the Shumagin seismic gap: Detection of time dependent subduction at depth, *J. Geophys. Res.*, 89, 4478-4492, 1984.
- Bergman, E.A., and S. Solomon, Source studies of near-ridge earthquakes: Implications for the early evolution of oceanic lithosphere, *EOS, Trans. AGU*, 64, 1983.
- Bergman, E.A., and S. Solomon, Source mechanisms of earthquakes near mid-ocean ridges from body waveform inversion: Implications for the early evolution of oceanic lithosphere, *J. Geophys. Res.*, 89, 1984.
- Bergman, E.A., S. Bratt, and S. Solomon, Thermoelastic stress: How important as a cause of earthquakes in young oceanic lithosphere?, *EOS, Trans. AGU*, 65, 1984.
- Bills, B.G., Thermoelastic bending of the lithosphere: Implications for basin subsidence, *Geophys. J. R. Astron. Soc.*, 75, 1983.
- Bird, P., and J. Baumgardner, Fault friction, regional stress, and crust mantle coupling in southern California from finite element models, *J. Geophys. Res.*, 89, 1932-1944, 1984.
- Bird, P., and R.W. Rosenstock, Kinematics of present crust and mantle flow in southern California, *Bull. Geol. Soc. Amer.*, 95, 946-957, 1984.
- Boschi, E., R. Sabadini, and D. Yuen, Transient polar motions and the nature of the asthenosphere for short timescales, *J. Geophys. Res.*, 90, B5, 1985.
- Bowin, C., Depth of principal mass anomalies contributing to the Earth's geoidal undulations and gravity anomalies, *Marine Geodesy*, 7, 61-100, 1983.
- Bowin, C., G. Thompson, and J. Schilling, Residual geoid anomalies in Atlantic Ocean Basin: Relationship to mantle plumes, *J. Geophys. Res.*, 89, B12, 1984.
- Brandeis, G., and B.D. Marsh, The convective liquidus in a solidifying magma chamber: A fluid dynamic investigation, *Nature* 339, 613-616, 1989.
- Buck, W., and M. Toksoz, Thermal effects of continental collisions: Thickening a variable viscosity lithosphere, *Tectonophysics*, 100, 53-69, 1983.
- Buck, W., and E. Parmentier, Convection beneath young oceanic lithosphere: Implications for thermal structure and gravity, *J. Geophys. Res.*, 91, B2, 1986.
- Calmant, S., and A. Cazenave, The elastic lithosphere under the Cook-Austral and Society Island, *Earth Planet. Sci. Lett.*, 77, 187-202, 1986.

Calmant, S., and A. Cazenave, Anomalous elastic thickness of the oceanic lithosphere in the south-central Pacific, *Nature*, 328, 236-238, 1987.

Calmant, S., J. Francheteau, and A. Cazenave, Elastic layer thickening with age of the oceanic lithosphere, *Geophys. J.*, (in press), 1988.

Caporali, A., F. Palutan, A. Cenci, and S. Casotto, Polar motion and European baselines determined by analysis of satellite laser ranging data, *Univ. di Padova*, 1985.

Caputo, M., Relaxation and free modes of a self-gravitating planet, *Geophys. J. R. Astron. Soc.*, 77, 1984.

Caputo, M., Spectral rheology in a sphere, *Int. Symp. on Space Tech. for Geo., Proc.*, 2, 1984.

Caputo, M., Altimetry data and the elastic stress tensor of subduction zones, *Progress Report on NASA Grant NAG5-94*, Texas A&M Univ., November 1984.

Carrigan, C., Multiple-scale convection in the Earth's mantle: A three-dimensional study, *Science*, 215, 1982.

Carter, W.E., Polar motion and Earth rotation, *Multidisciplinary Use of the Very Long Baseline Array, Proc. Workshop*, National Academy Press, 1983.

Carter, W.E., D.S. Robertson, and J.R. MacKay, Polaris Earth rotation time series, *Proc. IUGG General Assembly*, Hamburg, FRG, 1983.

Carter, W.E., D. S. Robertson, J.E. Pettey, B.D. Tapley, B. E. Schutz, R.J. Eanes, and M. Lufeng, Variations in the rotation of the Earth, *Science*, 224, 957-961, 1984.

Carter, W.E., and D.S. Robertson, IRIS Earth rotation and polar motion results, *International Symposium on Space Techniques for Geodynamics, Proceedings 1*, Sopron, Hungary, 214-222, 1984.

Carter, W.E., D.S. Robertson, and J.R. MacKay, Geodetic radio interferometric surveying: Applications and results, *J. Geophys. Res.*, 90, 4577-4587, 1985.

Carter, W.E., and D.S. Robertson, High frequency variations in the rotation of the Earth, *IEEE Trans. on Geosci. and Remote Sensing*, GE-23, 4, 369-372, 1985.

Carter, W.E., and D.S. Robertson, Studying the Earth by very long baseline interferometry, *Sci. Am.*, 255, 5, 44-52, 1986.

Carter, W.E., and D.S. Robertson, Projects Polaris and IRIS: Monitoring polar motion and UT1 by very long baseline interferometry, *Space Geodesy and Geodynamics*, A.J. Anderson and A. Cazenave, eds., Academic Press, 269-279, 1986.

- Carter, W.E., and D.S. Robertson, Accurate Earth orientation time series from VLBI observations, *Earth Rotation: Solved and Unsolved Problems*, A. Cazenave, ed., D. Reidel, 61-67, 1986.
- Carton, J.A., and J.M. Wahr, The pole tide in the deep ocean, *Proc. 9th International Symposium on Earth Tides*, August 1981, New York, 1983.
- Carton, J.A., and J.M. Wahr, Modelling the pole tide and its effect on the Earth's rotation, *Geophys. J. R. Astron. Soc.*, 84, 121-138, 1986.
- Cazenave, A., B. Lago, K. Dominh, and K. Lambeck, On the response of the ocean lithosphere to seamount loads from GEOS-3 satellite radar altimetry, *Geophys. J. R. Astron. Soc.*, 63, 233-252, 1980.
- Cazenave, A., B. Lago, and K. Dominh, Geoid anomalies over the northeast Pacific fracture zones from satellite altimeter data, *Geophys. J. R. Astron. Soc.*, 69, 15-31, 1982.
- Cazenave, A., B. Lago, and K. Dominh, Thermal parameters of the oceanic lithosphere estimated from geoid height data, *J. Geophys. Res.*, 88, 1005-1118, 1983.
- Cazenave, A., and K. Dominh, Geoid anomalies above the Louisville Ridge (South Pacific), *J. Geophys. Res.*, 89, 11171-11179, 1984.
- Cazenave, A., Thermal cooling of the oceanic lithosphere: Possible evidence for two distinct trends, *Nature*, 310, 401-403, 1984.
- Cazenave, A., Thermal cooling of the oceanic lithosphere: New constraints from geoid height data, *Earth Planet. Sci. Lett.*, 70, 395-407, 1984.
- Cazenave, A., K. Dominh, C. Allegre, and J. Marsh, Global relationship between oceanic geoid and topography, *J. Geophys. Res.*, 91, 11439-11450, 1986.
- Cazenave, A., C. Rosemberg-Borot, and M. Rabinowicz, Geoid lows at deep sea trenches, *J. Geophys. Res.*, 91, 1989-2005, 1986.
- Cazenave, A., and E. A. Okal, Use of satellite altimetry in studies of the oceanic lithosphere, *Space Geodesy. and Geodynamics.*, A.J. Anderson and A. Cazenave, eds., Academic Press, 1986.
- Cazenave, A., M. Monnereau, and D. Gibert, Seasat gravity undulations in the central Indian Ocean, *Phys. Earth Planet. Int.*, 48, 130-141, 1987.
- Cazenave, A., and K. Dominh, Global relationship between oceanic geoid and seafloor depth: New results, *Geophys. Res. Lett.*, 14, 1-5, 1987.

Cazenave, A., K. Dominh, M. Rabinowicz, and G. Ceuleneer, Geoid and depth anomalies over ocean swells and troughs: Evidence for an increasing trend of the geoid to depth ratio with age of plate, *J. Geophys. Res.*, 93, 8064-8077, 1988.

Ceuleneer, G., M. Rabinowicz, M. Monnereau, A. Cazenave, and C. Rosemberg-Borot, Viscosity and depth extent of the sub-lithospheric low-viscosity zone: constraints from geoid and depth over oceanic swells, *Earth Planet. Sci. Lett.*, 89, 84-102, 1988.

Chao, B.F., Excitation of normal modes on non-rotating and rotating Earth models, *Geophys. J. R. Astron. Soc.*, 68, 295-315, 1982.

Chao, B.F., Normal mode study of the Earth's rigid body motions, *J. Geophys. Res.*, 88, 9437-9442, 1983.

Chao, B.F., Autoregressive harmonic analysis of the Earth's polar motion using homogeneous ILS data, *J. Geophys. Res.*, 88, 10299-10307, 1983.

Chao, B.F., Analysis of the Earth's variable rotation, NASA TM 86123, NASA/GSFC, 1984.

Chao, B.F., Interannual length-of-day variation with relation to the Southern Oscillation/El Nino, *Geophys. Res. Lett.*, 11, 541-544, 1984.

Chao, B.F., On excitation of Earth's free wobble and reference frames, *Geophys. J. Astron. Soc.*, 79, 555-563, 1984.

Chao, B.F., On the excitation of the Earth's polar motion, *Geophys. Res. Lett.*, 12, 526-529, 1985.

Chao, B.F., Predictability of the Earth's polar motion, *Bull. Geodesique*, 59, 81-93, 1985.

Chao, B.F., Excitation of the Earth's Chandler Wobble by Southern Oscillation/El Nino, 1900-1979, NASA TM-86231, NASA/GSFC, 1985.

Chao, B.F., Reply to Hide, *Geophys. Res. Lett.*, 14, 247, 1987.

Chao, B.F., W.P. O'Connor, A.T.C. Chang, D.K. Hall, and J.L. Foster, Snow-load effect on the Earth's rotation and gravitational field: 1979-1985, *J. Geophys. Res.*, 92, 9415-9422, 1987.

Chao, B.F., and R.S. Gross, Changes in the Earth's rotation and low-degree gravitational field induced by earthquakes, *Geophys. J. R. Astron. Soc.*, 91, 569-596, 1987.

Chao, B.F., and W.P. O'Connor, Effect of a uniform sea level change on the Earth's rotation and gravitational field, *J. Geophys. Res.*, 93, 191-193, 1988.

Chao, B.F., W.P. O'Connor, and A.T.C. Chang, Snow-load excitation of the Earth's annual wobble, *Proc. IAU/IAG Symp.*, 128, 373-380, 1988.

Chao, B.F., and W.P. O'Connor, Global surface water-induced seasonal variations in the Earth's rotation and gravitational field, *J. Geophys. Res.*, 94, 263-270, 1988.

Chao, B.F., Correlation of interannual length-of-day variation with El Nino/Southern Oscillation, 1972-1986, *J. Geophys. Res.*, 93, 7709-7715, 1988.

Chao, B.F., Excitation of the Earth's polar motion due to mass variations in major hydrological reservoirs, *J. Geophys. Res.*, 93, 13811-13819, 1988.

Chao, B.F., Length-of-day variations caused by El Nino/Southern Oscillation and quasi-biennial oscillation, *Science*, 243, 923-925, 1989.

Chase, C.G., Subduction, the geoid, and lower mantle convection, *Nature*, 282, 464-468, 1979.

Chase, C.G., Oceanic island Pb: Two stage histories and mantle evolution, *Earth Planet. Sci. Lett.*, 52, 277-284, 1981.

Chase, C.G., and D. Sprowl, The modern geoid and ancient plate boundaries, *Earth Planet. Sci. Lett.*, 62, 314-320, 1983.

Chase, C.G., and P.J. Patchett, Stored mafic/ultramafic crust and early Archean mantle depletion, *Earth Planet. Sci. Lett.*, (in press), 1988.

Chen, C., W. Chen, and P. Molnar, The uppermost mantle P-wave velocities beneath Turkey and Iran, *Geophys. Res. Lett.*, 7, 1980.

Chen, W., and P. Molnar, Constraints on the seismic wave velocity structure beneath the Tibetan Plateau and their tectonic implications, *J. Geophys. Res.*, 86, 1981.

Chen, W., and P. Molnar, Constraints on the seismic wave velocity structure beneath the Tibetan Plateau, *Proc. Symposium on the Tibetan Plateau*, Beijing, 1982.

Christensen, U., and D. Yuen, Layered convection induced by phase transitions, *J. Geophys. Res.*, 90, B10, 1985.

Clark, S., H.V. Frey, and H. Thomas, Satellite magnetic anomalies over subduction zones: The Aleutian Arc anomaly, *Geophys. Res. Lett.*, 12, 41-44 1985.

Clark, T.A., B.E. Corey, J.L. Davis, T.A. Herring, H.F. Hinteregger, C.A. Knight, J.I. Levine, G. Lundqvist, C. Ma, E.F. Nesman, R.B. Phillips, A.E.E. Rogers, B. Ronnang, J.W. Ryan, B.R. Schupler, D.B. Shaffer, I.I. Shapiro, N.R. Vandenberg, J.C. Webber, and A.R. Whitney, Precision geodesy using the MKIII

very-long-baseline interferometer system, *IEEE Trans. on Geosci. and Remote Sensing*, GE-23, 438-449, 1985.

Cohen, S.C., Postseismic rebound due to creep of the lower lithosphere and asthenosphere, *Geophys. Res. Lett.*, 8, 1981.

Cohen, S.C., A multilayer model of time-dependent deformation following an earthquake on a strike-slip fault, *J. Geophys. Res.*, 87, 5409-5421, 1982.

Cohen, S.C., and M. Kramer, Crustal deformation associated with viscoelastic relaxation of a thin asthenosphere, *EOS, Trans. AGU*, 64, 858, 1983.

Cohen, S.C., Finite element viscoelastic models, *Workshop on Geodynamic Modeling*, Mass. Inst. of Tech., 1983.

Cohen, S.C., Postseismic deformation due to subcrustal viscoelastic relaxation following dip-slip earthquakes, *J. Geophys. Res.*, 89, B6, 1984.

Cohen, S.C., and M. Kramer, Crustal deformation, the earthquake cycle, and models of viscoelastic flow in the asthenosphere, *Geophys. J. R. Astron. Soc.*, 78, 735-750, 1984.

Council, J.L., and J. Achache, Magnetization gaps associated with tearing in the central America subduction zone, *Geophys. Res. Lett.*, 14, 1115-1118, 1987.

Dahlen, F., and I. Henson, Asymptotic normal modes of a laterally heterogeneous Earth, *J. Geophys. Res.*, 90, B14, 1985.

Daly, S., and A. Raefsky, On the penetration of a hot diapir through a strongly temperature dependent viscosity medium, *Geophys. J. R. Astron. Soc.*, 83, 3, 657-682, 1985.

Davis, D., and S. Solomon, True polar wander and plate-driving forces, *J. Geophys. Res.*, 90, B2, 1985.

Da-zhong, H., and J.M. Wahr, The post-glacial rebound constraint on deep mantle viscosity: A new analysis for a rotating Earth, *Slow Deformation and Transmission of Stress in the Earth*, AGU Monograph Series, S.C. Cohen, ed., 1-6, 1989.

Dickey, J.O., H.F. Fliegel, and J.G. Williams, Analysis of LAGEOS polar motion using lunar laser ranging, *EOS, Trans. AGU*, 62, 841, 1981.

Dickey, J.O., H.F. Fliegel, and J.G. Williams, Comparison of Earth rotation results using lunar laser ranging, *EOS, Trans. AGU*, 62, 17, 259, 1981.

Dickey, J.O., H. Fliegel, and J.G. Williams, Comparison of polar motion results using lunar laser ranging, *High-Precision Earth Rotation and Earth-Moon Dynamics: Lunar Distances and Related Observations*, Proc. IAU Colloquium 63, O. Calame, ed., D. Reidel, 1982.

- Dickey, J.O., H. Fliegel, and J.G. Williams, Universal time from laser ranging, *BIH 1981 Annual Report*, 1982.
- Dickey, J.O., J.G. Williams, and C. Yoder, Results from lunar laser ranging data analysis, *High-Precision Earth Rotation and Earth-Moon Dynamics: Lunar Distances and Related Observations*, *Proc. IAU Colloquium 63*, O. Calame, ed., D. Reidel, 1982.
- Dickey, J.O. and J.G. Williams, Earth rotation from lunar laser ranging, *Astron. and Astrophys., Supplement Series 54*, 1983.
- Dickey, J.O., J.G. Williams, and T.M. Eubanks, Earth rotation: Results from lunar laser ranging and an intercomparison study, *Proc. of the IAG Symposia, IUGG XVIIIth General Assembly, Hamburg, FRG, August 15-27, 1983*, H. Kautzelben, J.D. Bossler, G. Lachapelle, and A.M. Wassef, eds., Ohio State University, 2, 12-27, 1983.
- Dickey, J.O., J.G. Williams, X.X. Newhall, and C.F. Yoder, Geophysical application of lunar laser ranging, *Proc. IAG Symposia, IUGG XVIIIth General Assembly, Hamburg, FRG, August 15-27, 1983*, H. Kautzleben, J.D. Bossler, G. Lachapelle and A.M. Wassef, eds., Ohio State University, 2, 509-521, 1983.
- Dickey, J.O., et al., Modulation of the lunar tidal acceleration, *EOS, Trans. AGU, 64, 18*, 1983.
- Dickey, J.O., X.X. Newhall, and J.G. Williams, Earth orientation from lunar laser ranging, *Proc. IAG, Symposia 2*, 1983.
- Dickey, J.O., X.X. Newhall, and J.G. Williams, Earth orientation from lunar laser ranging and an error analysis of polar motion services, *Proc. IAG, Symposia 2*, 1983.
- Dickey, J.O., and J.G. Williams, Earth rotation: Results from lunar laser ranging (LLR) and an analysis of LAGEOS polar motion results, *EOS, Trans. AGU, 64, 45*, 1984.
- Dickey, J.O., T.M. Eubanks, and J.A. Steppe, The atmospheric excitation of the polar motion, *EOS, Trans. AGU, 65, 859*, 1984.
- Dickey, J.O., et al., Geophysical application of lunar laser ranging, *Proc. IAG, Symposia 2*, August 15-27, 1984.
- Dickey, J.O., J.G. Williams, and T.M. Eubanks, Earth rotation and polar motion: Results from lunar laser ranging and an intercomparison study, *Proc. IAG, Symposia 2*, 1984.
- Dickey, J.O., J.G. Williams, X.X. Newhall, and C. Yoder, Geophysical applications of lunar laser ranging, *Proc. IAG, Symposia 2*, 1984.
- Dickey, J.O., X.X. Newhall, and J.G. Williams, Submission to the BIH report for 1983: Earth orientation from lunar laser ranging, *BIH Annual Report*, 1984.

Dickey, J.O., and T.M. Eubanks, Earth rotation and polar motion: measurements and implications, *IEEE Trans. Geosci. and Remote Sensing*, GE-23, 373-384, 1985.

Dickey, J.O., and T.M. Eubanks, *The applications of space geodesy to Earth orientation studies*, Space Geodesy and Geodynamics, Academic Press, 1985.

Dickey, J.O., X.X. Newhall, and J.G. Williams, Multi-station lunar laser ranging analysis, *EOS, Trans. AGU*, 66, 18, 245, 1985.

Dickey, J.O., X.X. Newhall and J.G. Williams, Multi-station lunar laser ranging: An analysis of data quality and Earth rotation results, *Report on the MERIT-COTES Campaign on Earth Rotation and Referencing Systems, Part II: Proc. International Conference on Earth Rotation and the Terrestrial Reference Frame*, I.I. Mueller, ed., Ohio State University, 1, 274-286, 1985.

Dickey, J.O., X.X. Newhall, and J.G. Williams, Earth orientation from lunar laser ranging and an error analysis of polar motion services, *J. Geophys. Res.*, 90, B11, 1985.

Dickey, J.O., X.X. Newhall, and J.G. Williams, Earth rotation (UTO) from lunar laser ranging, *BIH Annual Report for 1984*, 1985.

Dickey, J., Activities and goals of the IUGG/IAG Special Study Group 5.98, *Proc. International Symposium on Space Techniques for Geodynamics*, Sopron, Hungary, July 9-13, 1984, 1985.

Dickey, J.O., T.M. Eubanks, and J.A. Steppe, Earth rotation data and atmospheric angular momentum, *NATO Advanced Research Workshop*, (co-sponsored by the Council of Europe), *Earth Rotation: Solved and Unsolved Problems*, NATO Advanced Institute Series C: Mathematical and Physical Sciences, A. Cazenave, ed., D. Reidel, 187, 137-162, 1986.

Dickey, J.O., and T.M. Eubanks, Atmospheric excitation of the Earth's rotation: Progress and Prospects, *Proc. International Symposium: Figure and Dynamics of the Earth, Moon and Planets*, special issue of the *Monograph Series of the Research Institute of Geodesy, Topography and Cartography*, September 15-20, 1986, Prague, Czechoslovakia, P. Holota, ed., 907-930, 1987.

Dickey, J.O., T.M. Eubanks, and R. Hide, Decade fluctuations in the Earth's rotation, *EOS, Trans. AGU*, 68, 2182, 1987.

Dickey, J.O., T.M. Eubanks, and R. Hide, Long-term and decade variations in Earth rotation and polar motion, *EOS, Trans. AGU*, 68, 1244, 1987.

Dickey, J.O., A.P. Freedman, K. Deutsch, J.A. Steppe, and T.M. Eubanks, Short-term prediction of length of day using atmospheric angular momentum data and the JPL Kalman filter, *EOS, Trans. AGU*, 69, 1153, 1988.

- Dickey, J.O., and S.L. Marcus, Earth rotation studies: Constraints on core-mantle torques and detection of the 1986-1987 El Nino, *EOS, Trans. AGU*, 70, 719, 1989.
- Dickey, J.O., Interconnection between kinematic and dynamical systems, *Reference Frames in Astronomy and Geophysics*, B. Kolaczek, J. Kovalevsky, and I.I. Mueller, eds., Kluwer Academic Publishers, 305-326, 1989.
- Dickey, J.O., T.M. Eubanks, and R. Hide, Interannual and decade fluctuations in the Earth's rotation, *Geophysical Monograph Series of the AGU, Proc. IUGG Interdisciplinary Symposium, Variations in the Earth's Rotation, IUGG XIX General Assembly, Vancouver, August 1987*, (in press), 1989.
- Dickey, J.O., Atmospheric excitation of the Earth's rotation, *General Meeting of the IAG, Edinburgh, Scotland, August 3-12, 1989, Earth's Rotation and Coordinate Reference Frames*, G.A. Wilkins, ed., Springer-Verlag, 1989.
- Dickey, J.O., Axial rate of the spin of the Earth, short-term dynamics of the solid Earth, *Interdisciplinary Role of Space Geodesy*, Springer-Verlag, 23-31, 1989.
- Dickey, J.O., T.A. Herring, R.J. O'Connell, D.E. Smylie, Introduction, *Short-term dynamics of the solid Earth, Interdisciplinary Role of Space Geodesy*, Springer-Verlag, 11-13, 1989.
- Dickey, J.O., Coordinator's Report: Atmospheric angular momentum studies, *Reports on the MERIT-COTES Campaign on Earth Rotation and Reference Systems, Part 1. Proc. third MERIT Workshop and the Joint MERIT-COTES Working Group Meetings*, G. Wilkins, ed., Royal Greenwich Observatory, (in press), 1989.
- Dickey, J.O., M. Ghil, and S.L. Marcus, A 30-60 Day oscillation in length of day and atmospheric angular momentum: Extratropical origin?, *General Meeting of the IAG, Edinburgh, Scotland, August 3-12, 1989, Earth Rotation and Coordinate Reference Frames*, G.A. Wilkins, ed., Springer-Verlag, (in press).
- Dickey, J.O., and B.E. Schutz, Earth rotation and reference frames studies: Goals for the 1990s, *EOS, Trans. AGU*, 70, 43, 1062, 1989.
- Dickey, J.O., M. Ghil, and S.L. Marcus, A 30-60 Day oscillation in atmospheric angular momentum: Extratropical origin?, *Proc. 7th Conference on Atmospheric Waves and Stability, Amer. Meteor. Soc.*, San Francisco, CA, 151, 1989.
- Dickey, J.O., and S.L. Marcus, Earth rotation studies: Constraints on core-mantle torques and detection of the 1986-1987 El Nino, *EOS, Trans. AGU*, 70, 719, 1989.
- Dickey, J.O., S.L. Marcus, and J.A. Steppe, An investigation of the Earth's angular momentum budget at high frequencies, *EOS, Trans. AGU*, 70, 1055, 1989.

Dickey, J.O., Final Report of the IUGG/IAG Special Study Group 5-98, *Atmospheric Excitation of the Earth's Rotation*, *Travaux de L'Association Internationale De Geodesie*, Tome 28, 476-490, C. Boucher, ed., IAG, Paris, 1989.

Dickman, S.R., The rotation of the ocean-solid Earth system, *J. Geophys. Res.*, 88, B8, 1983.

Dickman, S.R., The damping of the Chandler Wobble and the pole tide, *Proc. NATO Advanced Research Workshop on Earth's Rotation: Solved and Unsolved Problems*, A. Cazenave, ed., 203-228, D. Reidel, 1986.

Dragoni, M., D. Yuen, and E. Boschi, Global postseismic deformation in a stratified viscoelastic Earth: Effects on Chandler Wobble, *J. Geophys. Res.*, 88, 2240-2250, 1985.

Eanes, R.J., B.E. Schutz, and B.D. Tapley, Earth rotation from LAGEOS: The 1984 CSR systems, *EOS, Trans. AGU*, 65, 16, 187-188, 1984.

Ellsworth, K., G. Schubert, and C. Sammis, Viscosity profile of the lower mantle, *Geophys. J. Astron. Soc.*, 83, 1, 199-214, 1985.

Eubanks, T.M., J.A. Steppe, J.O. Dickey, and P.S. Callahan, The Earth's rotation and the atmospheric angular momentum: Geodesy via meteorology, *EOS, Trans. AGU*, 63, No. 45, 802, 1982.

Eubanks, T.M., J.A. Steppe, J.O. Dickey, and P.S. Callahan, Length of day and the atmospheric angular momentum: The cross validation of Earth rotation and meteorological data, *Remote Sensing: Extending Man's Horizon, 1983 International Geoscience and Remote Sensing Symposium, IEEE Digest, IEEE Catalog No. 83CH1837-4*, 1, 1983.

Eubanks, T.M., J.O. Dickey, and J.A. Steppe, A spectral analysis of the Earth's angular momentum budget: Geophysical implications, *EOS, Trans. AGU*, 64, 18, 1983.

Eubanks, T.M., et al., The 1982-83 El Nino and the Earth rotation, *EOS, Trans. AGU*, 65, 56, 1984.

Eubanks, T.M., et al., The Earth's polar motion and the atmospheric angular momentum, *EOS, Trans. AGU*, 64, 45, 1984.

Eubanks, T.M., J.O. Dickey, and J.A. Steppe, The geophysical significance of systematic errors in the Earth's angular momentum budget, *Proc. XVIII Gen. Assembly of the IUGG/IAG*, 2, 1984.

Eubanks, T.M., J.O. Dickey, and J.A. Steppe, The Southern Oscillation and changes in the length of day, *EOS, Trans. AGU*, 65, 1984.

Eubanks, T.M., J.A. Steppe, and M. Spieth, Submission to the BIH Report for 1983: VLBI Earth orientation results from TEMPO work at JPL, *BIH Annual Report, D53-D58*, 1984.

Eubanks, T.M., J.A. Steppe, and M. Spieth, The accuracy of radio interferometric measurements of Earth rotation, *JPL Telecomm. and Data Acquis. (TDA) Progress Report*, 1984.

Eubanks, T.M., J.A. Steppe, and M. Spieth, Possible detection of tectonic motion using Earth orientation measurements, *EOS, Trans. AGU*, 65, 45, 1984.

Eubanks, T.M., J.A. Steppe, J.O. Dickey, and P. Callahan, A spectral analysis of the Earth's angular momentum budget, *J. Geophys. Res.*, 90, 5385-5404, 1985.

Eubanks, T.M., J.A. Steppe, and J.O. Dickey, The atmospheric excitation of Earth orientation changes during MERIT, *Report on the MERIT-COTES Campaign on Earth Rotation and Reference Systems, Part II: Proc. International Conference on Earth Rotation and the Terrestrial Reference Frame*, I.I. Mueller, ed., Ohio State University, 2, 434-440, 1985.

Eubanks, T.M., J.O. Dickey, and J.A. Steppe, Rapid polar motion during 1984, *EOS, Trans. AGU*, 66, 46, 844, 1985.

Eubanks, T.M., M. Spieth, and J.A. Steppe, Stability of modern Earth orientation measurements, *EOS, Trans. AGU*, 66, 18, 1985.

Eubanks, T.M., M. Spieth, and J.A. Steppe, Earth orientation results from DSN VLBI at JPL, *BIH Annual Report for 1984*, 1985.

Eubanks, T.M., J.A. Steppe, and O.J. Sovers, An analysis and intercomparison of VLBI nutation estimates, *International Conference on Earth Rotation and the Terrestrial Reference Frame*, Ohio State University, 1985.

Eubanks, T.M., J.A. Steppe, and J.O. Dickey, Length of day changes and the Southern Oscillation: 2.6 Year predictions of a Southern Oscillation index, *EOS, Trans. AGU*, 67, 44, 881, 1986.

Eubanks, T.M., J.A. Steppe, and J.O. Dickey, Rapid polar motions and the failure of the oceanic inverted barometer at high frequencies, *EOS, Trans. AGU*, 67, 16, 259, 1986.

Eubanks, T.M., J.A. Steppe, and J.O. Dickey, The El Nino, the Southern Oscillation and the Earth's rotation, *NATO Advanced Research Workshop (co-sponsored by the Council of Europe), Earth Rotation: Solved and Unsolved Problems, NATO Advanced Institute Series C: Mathematical and Physical Sciences*, A. Cazenave, ed., D. Reidel, 187, 1986.

Eubanks, T.M., J.A. Steppe, and J.O. Dickey, Atmospheric excitation of the Chandler and seasonal wobbles, *EOS, Trans. AGU*, 68, 282, 1987.

Eubanks, T.M., J.A. Steppe, and J.O. Dickey, Filtering and prediction of Earth rotation variations using atmospheric angular momentum data, *EOS, Trans, AGU*, 68, 1244, 1987.

Eubanks, T.M., J.O. Dickey, and J.A. Steppe, Length of day changes and the Southern Oscillation: Predictions of a southern oscillation index 2.6 years in advance, *IUGG, International Assoc. of Meteorology and Atmospheric Physics Symposium, Prediction of Transitions in the Climate System on Interannual Timescales, IUGG XIX General Assembly, Vancouver, August 1987, Abstracts*, 3, 828, 1987.

Eubanks, T.M., J.A. Steppe, and J.O. Dickey, Atmospheric excitation of polar motions, *IUGG Interdisciplinary Symposium, Variations in the Earth's Rotation, IUGG XIX General Assembly, Vancouver, August 1987, Abstracts, Vol. 1*, 1987.

Eubanks, T.M., J.A. Steppe, J.O. Dickey, R.D. Rosen, and D.A. Salstein, Causes of rapid motions of the Earth's pole, *Nature*, 334, 115-119, 1988.

Eubanks, T.M., J.A. Steppe, and J.O. Dickey, The atmospheric excitation of rapid polar motion, *Proc. IAU Symposium 128, The Earth's Rotation and Reference Frames for Geodesy and Geodynamics*, A.K. Babcock and G.A. Wilkins, eds, D. Reidel, 1988.

Eubanks, T.M., J.O. Dickey, and J.A. Steppe, The 1982-83 El Nino, The southern oscillation and changes in the length of day, *Tropical Ocean-Atmosphere Newsletter*, 29, 21-23, 1988.

Fishbein, E.F., Topography on the lithospheric-asthenospheric boundary, *Ph.D. Dissertation, University of California*, 1988.

Fleitout, L., and C. Froidevaux, Tectonics and topography for a lithosphere containing density heterogeneities, *Univ. of Paris*, 1983.

Fleitout, L., and C. Froidevaux, Tectonic stresses in the lithosphere, *Laboratoire de Geophysique et Geodynamique Interne*, 1984.

Fiegel, H.F., J.O. Dickey, and J.G. Williams, Earth rotation using lunar laser ranging data, *EOS, Trans. AGU*, 61, 46, 939, 1980.

Fiegel, H.F., J.O. Dickey, and J.G. Williams, Earth rotation by lunar distances: JPL Report, *Project MERIT: Report on the Short Campaign and Grasse Workshop with Observations on Earth-Rotation During 1980 August-October*, G.A. Wilkins and M. Feissel, eds., 100, 1982.

Fiegel, H., J.O. Dickey, and J.G. Williams, Intercomparison of lunar laser ranging and traditional determinations of Earth rotation, *High-Precision Earth Rotation and Earth-Moon Dynamics: Lunar Distances and Related Observations, Proc. IAU Colloquium 63*, O. Calame, ed., D. Reidel, 1982.

- Foster, J.L., D.K. Hall, A.T.C. Chang, B.F. Chao, and W.P. O'Connor, Global snow cover and the Earth's rotation, *IAHS Pub. 166, Large Scale Effects of Seasonal Snow Cover, Proc. IUGG Symposium, Vancouver, 1987.*
- Freedman, A.P., S.L. Marcus, and J.O. Dickey, High-frequency length of day: Detection of an eight-day variation, *EOS, Trans. AGU, 70, 1056, 1989.*
- Freedman, A.P., Determination of Earth orientation using the global positioning system, *TDA Progress Report 42-99, NASA/JPL, November 15, 1989.*
- Galdeano, A., Acquisition of long wavelength magnetic anomalies pre-dates continental drift, *Phys. Earth Planet. Int., 32, 289-292, 1983.*
- Gambis, D., Possibility of detecting the diurnal forced nutation by the study of artificial satellites orbits, *Centre d'Etudes et de Recherches, 1983.*
- Gasperini, P., and R. Sabadini, Lateral variations in mantle viscosity and post-glacial rebound, *Geophys. J. Int., 98, 1989.*
- Gasperini, P., D. A. Yuen, and R. Sabadini, Effects of lateral viscosity variations on postglacial rebound: Implications for recent sea-level trends, *Geophys. Res. Lett., 16, 429-432, 1989.*
- Gordon, R., and C. Cape, Cenozoic latitudinal shift of the Hawaiian Hotspot and its implications for true polar wander, *Earth Planet. Sci. Lett., 81, 1981.*
- Gordon, R., The late Maastrichtian paleomagnetic pole of the Pacific Plate, *Geophys. J. R. Astron. Soc., 70, 1982.*
- Gordon, R., Late Cretaceous apparent polar wander of the Pacific Plate: Evidence for rapid shift of the Pacific hotspots with respect to the spin axis, *Geophys. Res. Lett., 10, 1983.*
- Gross, R.S., and M.L. Smith, A determination of polar motion from the recomputed ILS star observations, *EOS, Trans. AGU, 63, 302, 1982.*
- Gross, R.S., A matched filter for the Chandler Wobble, *EOS, Trans. AGU, 63, 903, 1982.*
- Gross, R.S., A deconvolution filter for the Chandler Wobble, *EOS, Trans. AGU, 64, 675, 1983.*
- Gross, R.S., On the application of a noisy matched filter to the Chandler Wobble, *EOS, Trans. AGU, 64, 206, 1983.*
- Gross, R.S., The Earthquake excitation of the Chandler Wobble During 1977-1983, *EOS, Trans. AGU, 65, 859-860, 1984.*
- Gross, R.S., and B.R. Chao, The observed excitation of the LAGEOS derived Chandler Wobble, *EOS, Trans. AGU, 187, 1984.*

Gross, R., The observed excitation function of the Chandler Wobble, *NASA TM 86123*, NASA/GSFC, 1984.

Gross, R., Signal detection techniques applied to the Chandler Wobble, *J. Geophys. Res.*, 90, B12, 1985.

Gross, R., and B. Chao, Excitation study of the LAGEOS-derived Chandler Wobble, *J. Geophys. Res.*, 90, B11, 1985.

Gross, R.S., The influence of earthquakes on the Chandler Wobble during 1977-1983, *Geophys. J. R. Astron. Soc.*, 85, 161-177, 1986.

Gross, R., The effects of earthquakes on the ERP during 1977-1985, *Proc. IAU Symposium 128, The Earth's Rotation and Reference frames for Geodesy and Geodynamics*, A.K. Babcock and G.A. Wilkins, eds., D. Reidel, 1988.

Gross, R.S., The secular drift of the rotation pole, *Earth Rotation and Coordinate Reference Frames*, G.A. Wilkins, ed., Springer-Verlag, (in press), 1989.

Gross, R.S., The secular drift of the Earth's rotation pole, *EOS, Trans. AGU*, 70, 1055, 1989.

Gross, R.S., A.P. Freedman, J.A. Steppe, and J.O. Dickey, Optimal combination of Earth rotation and polar motion observations via the JPL Kalman filter: Results and implications, *EOS, Trans. AGU*, 70, 301, 1989.

Gross, R.S., and B.F. Chao, The global geodynamic effect of the Macquarie Ridge earthquake, *Geophys. Res. Lett.*, (submitted), 1990.

Gwinn, C.R., T.A. Herring, and I.I. Shapiro, Geodesy by radio interferometry: Studies of the forced nutations of the Earth, 2. Interpretation, *J. Geophys. Res.*, 91, 4755-4765, 1986.

Hager, B.H., Global isostatic geoid anomalies for plate and boundary layer models of the lithosphere, *Earth Planet. Sci. Lett.*, 63, 1983.

Hager, B.H., R.J. O'Connell, and A. Raefsky, Subduction, back-arc spreading and global mantle flow, *Tectonophysics*, 99, 1983.

Hager, B.H., M.A. Richards, and R.J. O'Connell, Mantle convection, surface deformation, mantle viscosity structure and the geoid, *Chapman Conference on Vertical Crustal Motion: Measurement and Modeling*, Harpers Ferry, WV, October 22-26, 1984.

Hager, B.H., and M.A. Richards, The generation of long-wavelength geoid anomalies: Implications for mantle structure and dynamics, *14th International Conference, Mathematical Geophysics*, Loen, Norway, *Terra Cognita*, 4, 247-248, 1984.

Hager, B.H., and M.A. Richards, The source of long-wavelength gravity anomalies, *EOS, Trans. AGU*, 65, 195, 1984.

- Hager, B.H., and M.A. Richards, The source of the Earth's long-wavelength geoid anomalies: Observations and implications, *EOS, Trans. AGU*, 65, 1004, 1984.
- Hager, B.H., Slab dip and length and the dynamics of back-arc opening and closing, *EOS, Trans. AGU*, 64, 1984.
- Hager, B.H., Subducted slabs and the geoid: Constraints on mantle rheology and flow, *J. Geophys. Res.*, 89, 1984.
- Hager, B.H., R.W. Clayton, M.A. Richards, R.P. Coner, A.M. Dziewonski, Lower mantle heterogeneity, dynamic topography and the geoid, *Nature*, 313, 541-545, 1985.
- Hager, B.H., M.A. Richards, and R.J. O'Connell, The source of the Earth's long-wavelength geoid anomalies: Implications for mantle and core dynamics, *NASA Geopotential Research Mission, NASA Conference Pub. 2390*, October 1985.
- Harrison, C., and T. Lindh, Comparison between the hotspot and geomagnetic field reference frames, *Nature*, 300, 1982.
- Herring, T.A., C.R. Gwinn, and I.I. Shapiro, Geodesy by radio interferometry: Corrections to the IAU 1980 nutation series, *Proc. International Conference on Earth Rotation and the Terrestrial Reference Frame, Vol. 1*, I.I. Mueller, ed., Ohio State University, 307-325, 1985.
- Herring, T.A., C.R. Gwinn, and I.I. Shapiro, Geodesy by radio interferometry: Studies of the forced nutations of the Earth, 1. Data analysis, *J. Geophys. Res.*, 91, 4745-4754, 1986; *ibid.*, 91, 14, 165, 1986.
- Herring, T.A., C.R. Gwinn, B.A. Buffett, and I.I. Shapiro, Bound on the amplitude of the Earth's free core-nutation, *Proc. IAU Symposium No. 128, the Earth's Rotation and Reference Frame for Geodesy and Geodynamics*, A.K. Babcock and G.A. Wilkins, eds, 293-299, D. Reidel, 1988.
- Hide, R., et al., Atmospheric angular momentum fluctuations and changes in the length of day, *Nature*, 286, 114-117, 1980.
- Hide, R., and J.O. Dickey, Forecasting and exploiting changes in the Earth's rotation, *Research Activities in Atmospheric and Oceanic Modelling, CAS/JSC Working Group on Numerical Experimentation, World Meteorological Organization/ICSU World Climate Research Programme*, G.J. Boer, ed., 1988.
- Himwich, W.E., and E.J. Harder, Direct estimates of nutation coefficients from VLBI data, *Proc. IAU 128, The Earth's Rotation and Reference Frames for Geodesy and Geodynamics*, A.K. Babcock and G.A. Wilkins, eds, D. Reidel, 1988.
- Hinojosa, J.H., and B.D. Marsh, Effect of the lithosphere on the central Pacific geoid, *EOS, Trans. AGU*, 66, 246, 1985.

Hinojosa, J.H., On the state of isostasy in the central Pacific: Static and dynamic compensation mechanisms, *Ph.D. Thesis, Johns Hopkins University*, 276, 1986.

Hinojosa, J.H., Dynamic compensation in the central Pacific Ocean, *EOS, Trans. AGU*, 68, 1463, 1987.

Hinojosa, J.H., and B.D. Marsh, Dynamic compensation in the central Pacific, *J. Geophys. Res.* (submitted), 1989.

Houseman, G., D. McKenzie, and P. Molnar, Convective instability of a thickened boundary layer and its relevance for the thermal evolution of continental convergent belts, *J. Geophys. Res.*, 86, 1981.

Hsui, A., and M. Toksoz, The evolution of thermal structures beneath a subduction zone, *Tectonophysics*, 60, 1979.

Hsui, A., and M. Toksoz, Back arc spreading: Trench migration, continental pull or induced convection, *Tectonophysics*, 74, 1981.

Hsui, A., B. Marsh, and M. Toksoz, On melting of the subducted oceanic crust beneath island arcs, *Tectonophysics*, 99, 1983.

Humphreys, E., R. Clayton, and B. Hager, A tomographic image of mantle structure beneath southern California, *Geophys. Res. Lett.*, 11, 625-627, 1984.

Ihnen, S., and J. Whitcomb, The Indian Ocean gravity low: Evidence for an isostatically uncompensated depression in the upper mantle, *Geophys. Res. Lett.*, 10, 6, 1983.

Ivins, E.R., New aspects of rotational dynamics within the North American-Pacific ductile shear zone, *Geophysical Monograph Series; Deep Structure and Past Kinematics of Accreted Terrains*, J.W. Hillhouse, ed., AGU, Washington, DC, 50, 179-201, 1989.

Jarvis, G., and W. Peltier, Lateral heterogeneity in the convecting mantle, *J. Geophys. Res.*, 91, B1, 1986.

Jurdy, D.M., True polar wander, *Tectonophysics*, 74, 1981.

Jurdy, D.M., and R.G. Gordon, Global plate motions relative to the hotspots 64 to 56 m.y. B.P., *J. Geophys. Res.*, 89, 1984.

Kanamori, H., J. Given, and T. Lay, Analysis of seismic body waves excited by the Mount St. Helens eruption of May 18, 1980, *J. Geophys. Res.*, 89, 1984.

Kaula, W.M., Problems in understanding vertical movements and Earth rheology, *Earth Rheology, Isotasy, and Eustasy*, N.A. Morner, ed., John Wiley, 577-588, 1980.

Kaula, W.M., Material properties for mantle convection consistent with observed surface fields, *J. Geophys. Res.*, 85, 7031-7044, 1980.

- Kaula, W.M., Minimal upper mantle temperature variations consistent with observed heat flow and plate velocities, *J. Geophys. Res.*, 88, 323-332, 1983.
- Keller, G.R., et al., The role of rifting in the tectonic development of the mid-continent U.S.A., *Tectonophysics*, 94, 391-412, 1983.
- King, G.C.P., R. Stein, and J.B. Rundle, The growth of geologic structures by repeated earthquakes: 1. Conceptual framework, *J. Geophys. Res.*, 93, 13307-13318, 1988.
- King, R.W., B.A. Kolaczek, and I.I. Shapiro, Accuracies of recent observations of the Earth's rotation, *EOS, Trans. AGU*, 65, 187, 1984.
- Koch, M., and D. Yuen, Surface deformation and geoid anomalies over single and double-layered convective systems, *Geophys. Res. Lett.*, 12, 10, 1985.
- Krutikhovskaya, Z., and I. Pashkevich, Long wavelength magnetic anomalies as a source of information about deep crustal structure, *J. Geophys. Res.*, 46, 1979.
- Kubo, Y., and T. Fukushima, A numerical solution for precession and nutation of the rigid Earth, *Report of Hydrographic Researchers*, 22, 1987.
- Lachenbruch, A., J. Sass, and S. Galanis, Heat flow in southernmost California and the origin of the Salton Trough, *J. Geophys. Res.*, 90, B8, 1985.
- Lago, B., and A. Cazenave, State of stress of the oceanic lithosphere in response to loading, *Geophys. J. R. Astron. Soc.*, 64, 785-799, 1981.
- Lambeck, K., Changes in length-of-day and atmospheric circulation, *Nature*, 286, 104-105, 1980.
- Lambeck, K., The Earth's variable rotation: Geophysical causes and consequences, *Cambridge University Press*, 450, 1980.
- Lambeck, K., Flexure of the ocean lithosphere from island uplift, bathymetry and geoid height observations: The Society Islands, *Geophys. J. R. Astron. Soc.*, 67, 91-114, 1981.
- Lambeck, K., and P. Hopgood, The Earth's rotation and atmospheric circulation, from 1963-1973, *Geophys. J. R. Astron. Soc.*, 64, 67-89, 1981.
- Lambeck, K., and R. Coleman, Verification of bathymetric charts from satellite altimetry data in the region of the Cook Islands, New Zealand, *J. Science*, 25, 183-194, 1982.

Lambeck, K., and R. Coleman, A search for seamounts in the southern Cook and Austral region, *Geophys. Res. Lett.*, 9, 389-392, 1982.

Lambeck, K., Hula dancers, Walter Munk and the rotation of the Earth, *Australian Nat. Univ.*, 1983.

Lambeck, K., Satellite geophysics, *Terra Cognita*, 3, 51-59, 1983.

Lambeck, K., and S.M. Nakiboglu, Long-period Love numbers and their frequency dependence due to dispersion effects, *Geophys. Res. Lett.*, 10, 857-860, 1983.

Lambeck, K., C. Penney, S.M. Nakiboglu, and R. Coleman, Subsidence and flexure along the Pratt-Welker Seamount Chain, *J. Geodynamics*, 1, 29-60, 1984.

Lambeck, K., Anomalous satellite motion and mantle viscosity, *Nature*, 309, 584-585, 1984.

Lambeck, K., The Earth's variable rotation: Some geophysical causes, *The Earth's Rotation and Reference Frames for Geodesy and Geodynamics*, A.K. Babcock and G. A. Wilkins, eds., D. Reidel, 1-20, 1988.

Lambeck, K., Geophysical aspects of Earth rotation, *Reference Frames in Geodynamics*, J. Kovalevsky, I.I. Mueller and B. Kolachek, eds., D. Reidel, (in press), 1988.

Langel, R.A., R. Coles, and M. Mayhew, Comparisons of magnetic anomalies of lithospheric origin measured by satellite and airborne magnetometers over western Canada, *Can. J. Earth Sci.*, 17, 1980.

Langley, R.B., R.W. King, and I.I. Shapiro, Earth rotation from lunar laser ranging, *J. Geophys. Res.*, 86, 1981.

Langley, R.B., R.W. King, I.I. Shapiro, R.D. Rosen, and D.A. Salstein, Atmospheric angular momentum and the length of day: A common fluctuation with a period near 50 days, *Nature*, 294, 730-732, 1981.

Langley, R.B., R.W. King, P. Morgan, and I.I. Shapiro, Rotation of the Earth from lunar laser ranging, *IAU Colloq. 63, High-Precision Earth Rotation and Earth-Moon Dynamics: Lunar Distances and Related Observations*, O. Calame, ed., D. Reidel, 1982.

LeMouel, J.E., C. Gire, T. Madden, Motions at core surface in the geostrophic approximation, *Phys. Earth Planet. Int.*, 6, 270-287, 1985.

Loper, D., Structure of the inner core boundary, *Geophys. Astrophys. Fluid Dyn.*, 25, 1983.

Loper, D., and F. Stacey, The dynamical and thermal structure of deep mantle plumes, *Phys. Earth Planet. Int.*, 1983.

- Loper, D., A simple model of whole-mantle convection, *J. Geophys. Res.*, 90, B2, 1985.
- Lowman, P., Crustal evolution in silicate planets: Implications for the origin of continents, *J. Geol.*, 84, 1976.
- Luo, S., Z. Dawei, D.S. Robertson, and W.E. Carter, Short period variations in the length of day: Atmospheric angular momentum and tidal components, *J. Geophys. Res.*, 92, 11657-11661, 1987.
- Marcus, S.L., J.O. Dickey, T.M. Eubanks, and M. Ghil, Intra-seasonal oscillations in Earth rotation: Atmospheric forcing in an 1120-Day experiment with the UCLA general circulation model, *EOS, Trans. AGU*, 69, 326-327, 1988.
- Marcus, S.L., M. Ghil, J.O. Dickey, and T.M. Eubanks, The 30-60 day extratropical oscillation in the UCLA general circulation model, *Proc. 7th Conference on Atmospheric Waves and Stability*, American Meteorological Society, San Francisco, CA, April 10-14, 1989.
- Marcus, S.L., J.O. Dickey, and M. Ghil, Comparison of 30-60 day oscillations in a general circulation model with geodetic and atmospheric data, *EOS, Trans. AGU*, 70, 1016, 1989.
- Marcus, S.L., M. Ghil, J.O. Dickey, and T.M. Eubanks, Origin of the 30-60 Day oscillation in the LOD and atmospheric angular momentum: New findings from the UCLA general circulation model, *General Meeting of the IAG, Edinburgh, Scotland, August 3-12, 1989, Earth Rotation and Coordinate Reference Frames*, G.A. Wilkins, ed., Springer-Verlag, 1989.
- Marsh, B.D., and J. Hinojosa, Seasat geoid anomalies in the Pacific: Two dimensional spectra and removal of plate sources, *EOS, Trans. AGU*, 64, 211, 1983.
- Marsh, B.D., and J.G. Marsh, The Pacific geoid and gravity fields above m, n=12, 12 and lithospheric structure, *J. Geol. Soc. Amer.*, 15, 636, 1983.
- Marsh, B.D., J. Hinojosa, and J.G. Marsh, Lithospheric structure in the Seasat geoid of the central Pacific, *EOS, Trans. AGU*, 65, 185, 1984.
- Marsh, B.D., J.G. Marsh, and R.G. Williamson, On gravity from SST, geoid from Seasat, and plate age and fracture zones in the Pacific, *J. Geophys. Res.*, 89, 6070-6078, 1984.
- Marsh, B.D., On convective style and vigor in sheet-like magma chambers, *J. Petrology*, 30, 479-530, 1989.
- Marsh, B.D., Magma chambers, *Ann. Rev. Earth Planet. Sci.*, 17, 439-474, 1989.
- Marsh, B.D., and G. Brandeis, Transient convection prolonged by solidification, *Geophys. Res. Lett.*, (submitted), 1989.

Marty, J.C., and A. Cazenave, Thermal evolution of the lithosphere beneath fracture zones inferred from geoid anomalies, *Geophys. Res. Lett.*, 15, 593-597, 1988.

McAdoo, D., Geoid anomalies in the vicinity of subduction zones, *J. Geophys. Res.*, 86, 1981.

McAdoo, D., On the compensation of geoid anomalies due to subducting slabs, *J. Geophys. Res.*, 87, 1982.

McAdoo, D., and C. Martin, Seasat observations of lithospheric flexure seaward of trenches, *J. Geophys. Res.*, 89, 5, 1984.

McAdoo, D., and D. Sandwell, Folding of oceanic lithosphere, *J. Geophys. Res.*, 90, B10, 1985.

McCarthy, D.D., F.N. Withington, and A.K. Babcock, Spectral analysis of Earth orientation parameters derived from interferometer observations, *Proc. Ninth International Symposium on Earth Tides*, E. Schweizerbart'she Verlagsbuchhandlung, D-7000, Stuttgart, 1981.

McCarthy, D.D., P.E. Angerhofer, A.K. Babcock, D.R. Florowski, F.J. Josties, W.J. Klepczynski, and D.N. Matsakis, The dedicated use of connected-element interferometry for Earth orientation, *Proc. IAG Symposium No. 5, Geodetic Applications of Radio Interferometry*, W.E. Carter, ed., 52, 1982.

McCarthy, D.D., An intercomparison of connected element interferometer and lunar laser Earth rotation parameters, *IAU Colloq. 63, High-Precision Earth Rotation and Earth-Moon Dynamics: Lunar Distances and Related Observations*, O. Calame, ed., D. Reidel, 1982.

McCarthy, D.D., A.K. Babcock, and D.N. Matsakis, A comparison of CEI, VLBI, BIH, and USNO Earth orientation information, *Proc. International Symposium of Space Techniques for Geodynamics*, Sopron, Hungary, 1984.

McCarthy, D.D. and A.K. Babcock, The U.S. Naval Observatory C.O.R.E. solution during Project MERIT, *Proc. International Conference on Earth Rotation and the Terrestrial Reference Frame*, I.I. Mueller, ed., Ohio State University, 1985.

McCarthy, D.D., and A.K. Babcock, The length of day since 1663, *Phys. Earth Planet. Int.*, 44, 281-292, 1986.

Merriam, J., LAGEOS and UT measurements of long-period Earth tides and mantle Q, *J. Geophys. Res.*, 90, B11, 1985.

Ming, Z., G. Zheng-nian, and S. Guo-xuan, On the influence of turbulence in the core of the Earth upon the annual term in polar motion, *Shanghai Obs.*, 1983.

- Ming, Z., and D. Danan, A new search for the secular polar motion in this century, *Proc. IAU Symposium 128, The Earth's Rotation and Reference Frames for Geodesy and Geodynamics*, A.K. Babcock and G.A. Wilkins, eds, D. Reidel, 1988.
- Molnar, P., and W. Chen, S-P wave travel time residuals and lateral inhomogeneity in the mantle beneath Tibet and the Himalaya, *J. Geophys. Res.*, 89, B8, 1984.
- Molnar, P., and D. Gray, Subduction of continental lithosphere: Some constraints and uncertainties, *Geology*, 7, 1979.
- Monnereau, M., and A. Cazenave, Variation of the apparent compensation depth of hotspot swells with age of plate, *Earth Planet. Sci. Lett.*, (in press), 1988.
- Morabito, D.D., T.M. Eubanks, and J.A. Steppe, Kalman filtering of Earth orientation changes, *Proc. IAU Symposium 128, The Earth's Rotation and Reference Frames for Geodesy and Geodynamics*, A.K. Babcock and G.A. Wilkins, eds, D. Reidel, 1988.
- Morgan, P.J., and R.W. King, Determination of coordinates for the Orroral lunar laser ranging station, *IAU Colloq. 63, High-Precision Earth Rotation and Earth-Moon Dynamics: Lunar Distances and Related Observations*, O. Calame, ed., D. Reidel, 1982.
- Morgan, P.J., R.W. King, and I.I. Shapiro, Length of day and atmospheric angular momentum: A comparison for 1981-1983, *J. Geophys. Res.*, 90, 12, 645-12, 652, 1985.
- Morgan, W., Hotspot tracks and the opening of the Atlantic and Indian Oceans, *The Sea: The Oceanic Lithosphere*, C. Emiliani, ed., 1981.
- Morgan, W., Hotspot tracks and the early rifting of the Atlantic, *Tectonophysics*, 94, 1983.
- Mori, A., B. Hager, and A. Raefsky, The evolution of large-scale temperature variation in a convecting system: Application to the evolution of long-wavelength temperature and geoid anomalies in the Earth, *EOS, Trans. AGU*, 64, 1984.
- Mueller, I.I., B. Rajal, and Y. Zhu, Comparison of polar motion data from the 1980 project MERIT short campaign, *Proc. IAU Colloq. 63 High-Precision Earth Rotation and Earth-Moon Dynamics: Lunar Distances and Related Observations*, O. Calame, ed., D. Reidel, 1982.
- Nakanishi, I., and D. Anderson, Measurements of mantle wave velocities and inversion for lateral heterogeneity and anisotropy; Part I: Analysis of great circle phase velocities, *J. Geophys. Res.*, 88, 1983.

Nakanishi, I., and D. Anderson, Measurements of mantle wave velocities and inversion for lateral heterogeneity and anisotropy; Part II: Analysis by the single-station method, *Geophys. J. R. Astron. Soc.*, 78, 2, 573-618, 1984.

Nakanishi, I., and D. Anderson, Aspherical heterogeneity of the mantle from phase velocities of mantle waves, *Nature*, 307, 117, 1984.

Nam, Y.-S., and S.R. Dickman, Effects of dynamic long-period ocean tides on changes in Earth's rotation rate, *J. Geophys. Res.*, (submitted), 1989.

Nataf, H., B.H. Hager, and R. Scott, Convection experiments in a centrifuge and the generation of plumes in a very viscous fluid, *Annales Geophysicae*, 2, 303-310, 1984.

Nataf, H., I. Nakanishi, and D. Anderson, Anisotropy and shear-velocity heterogeneities in the upper mantle, *Geophys. Res. Lett.*, 11, 2, 1984.

Negi, J.G., et al., Large variation of Curie Depth and lithospheric thickness beneath the Indian subcontinent and a case for magnetothermometry, *Geophys. J. R. Astron. Soc.*, 88, 763-775, 1987.

Negi, J.G., et al., Can depression of the core-mantle interface cause coincident Magsat and geoidal 'lows' of the central Indian Ocean?, *Phys. Earth Planet. Int.*, 45, 68-74, 1987.

Newhall, X.X., J.G. Williams, and J.O. Dickey, Earth rotation (UTOR) from lunar laser ranging, *BIH Annual Report for 1985*, D53-57, 1986.

Newhall, X.X., J.G. Williams, and J.O. Dickey, Differenced data in lunar laser ranging, *Bull. Amer. Astron. Soc.*, 1986.

Newhall, X.X., J.G. Williams, and J.O. Dickey, Station offsets derived from differenced lunar laser ranging data, *EOS, Trans. AGU*, 67, 16, 200, 1986.

Newhall, X.X., J.G. Williams, and J.O. Dickey, Earth rotation (UTOR) from lunar laser ranging, *Reports on the MERIT-COTES Campaign on Earth Rotation and Reference Systems, Part III: Observational Results*, M. Feissel, ed., BIH (Paris), B63-B66, 1986.

Newhall, X.X., J.G. Williams, and J.O. Dickey, Earth rotation (UTOR) from lunar laser ranging, *BIH Annual Report for 1986*, D29-D30, 1987.

Newhall, X.X., J.G. Williams, and J.O. Dickey, Earth rotation from lunar laser ranging, *Proc. IAU Symposium No. 128, The Earth's Rotation and Reference Frames for Geodesy and Geodynamics*, A.K. Babcock and G.A. Wilkins, eds., D. Reidel, 159-164, 1988.

Newhall, X.X., J.G. Williams, and J.O. Dickey, Earth rotation (UTOR) from lunar laser ranging, *BIH Annual Report for 1987*, D47-D48, 1988.

Newhall, X.X., J.G. Williams, and J.O. Dickey, Earth rotation (UTOR) from lunar laser ranging, *IERS Technical Note 2, Annex to the International Earth Rotation Service Annual Report for 1988*, 45-47, 1989.

Newhall, X.X., J.G. Williams, and J.O. Dickey, Earth rotation (UTO-UTC) from lunar laser ranging, *IERS Technical Note, Annex to the International Earth Rotation Service Annual Report for 1989*, (submitted), 1990.

O'Connell, R.J., B.H. Hager, and M.A. Richards, Analytic models of deformation and glow of a viscous, self gravitating mantle, *14th International Conference, Mathematical Geophysics, Loen, Norway, Terra Cognita*, 4, 261, 1984.

O'Connell, R.J., and B.H. Hager, Estimates of driving forces and stresses for lithospheric plates, *EOS, Trans. AGU*, 64, 1984.

Okal, E., and A. Cazenave, A model for the plate tectonics evolution of the east central Pacific based on Seasat investigations, *Earth Planet. Sci. Lett.*, 72, 99-117, 1985.

Parsons, B., and S. Daly, The relationship between surface topography, gravity anomalies, and temperature structure of convection, *J. Geophys. Res.*, 88, 1983.

Peltier, W.R., The thickness of the continental lithosphere, *J. Geophys. Res.*, 89, 11303-11316, 1984.

Peltier, W.R., The LAGEOS constraint on deep mantle viscosity: Results from a new normal mode method for the inversion of viscoelastic relaxation spectra, *J. Geophys. Res.*, 90, B11, 1985.

Poehls, K.A., W.M. Kaula, G. Schubert, and D. Sandwell, Studies of oceanic tectonics based on GEOS-3 satellite altimetry, *NASA Cont. Rept. 156854*, NASA, Wallops Island, VA, 1979.

Quarenì, F., D. Yuen, G. Sewell, and U. Christensen, High Rayleigh number convection with strongly variable viscosity: A comparison between mean field and two-dimensional solutions, *J. Geophys. Res.*, 90, B14, 1985.

Rabinowicz, M., B. Lago, and M. Souriau, Large scale gravity profiles across subduction zones, *Geophys. J. R. Astron. Soc.*, 73, 1983.

Rabinowicz, M., B. Lago, and M. Souriau, Landward flow in the upper mantle: Effects of the heat sink and viscous coupling of the sinking slab, *Earth Planet. Sci. Lett.*, 63, 1983.

Reding, L., and R. Richardson, Ridge push forces: How important as a driving force?, *EOS, Trans. AGU*, 64, 1983.

Ricard, Y., C. Froidevaux, and J. Hermance, Model heat flow and magnetotellurics for the San Andreas and oceanic transform faults, *Annales Geophysicae*, 1, Gauthier-Villars, 1983.

Richards, M.A., and B.H. Hager, Geoid anomalies in a dynamic Earth, *J. Geophys. Res.*, 89, 7, 1984.

Richards, M.A., and B.H. Hager, Long-wavelength geoid anomalies with lateral variations in viscosity, *EOS, Trans. AGU*, 65, 857, 1984.

Richardson, R., Inversion for the driving forces of plate tectonics, *IEEE Geosci. and Remote Sensing Symp. II*, 1983.

Richter, F., S. Daly, and H. Nataf, A parameterized model for the evolution of isotopic heterogeneities in a convecting system, *Earth Planet. Sci. Lett.*, 60, 178, 1982.

Richter, F., H. Nataf, and S. Daly, Heat transfer and horizontally averaged temperature of convection with large viscosity variations, *J. Fluid Mech.*, 129, 173, 1983.

Richter, B., and W. Zurn, Chandler effect and free core nutation as determined from observations with a superconducting gravimeter, *Proc. IAU Symposium 128, The Earth's Rotation and Reference Frame for Geodesy and Geodynamics*, A.K. Babcock and G.A. Wilkins, eds., D. Reidel, 1988.

Robertson, D.S., W.E. Carter, B.E. Corey, W.D. Cotton, C.C. Counselman III, I.I. Shapiro, J.J. Wittels, H.F. Hinteregger, C.A. Knight, A.E.E. Rogers, A.R. Whitney, J.W. Ryan, T.A. Clark, R.J. Coates, C. Ma, and J.M. Moran, Recent results of radio interferometric determinations of a transcontinental baseline, polar motion, and Earth rotation, *Time and the Earth's Rotation*, D.D. McCarthy and J.D.H. Pilkington, eds., D. Reidel, 217-224, 1979.

Robertson, D.S., T.A. Clark, R.J. Coates, C. Ma, J.W. Ryan, B.E. Corey, C.C. Counselman III, R.W. King, I.I. Shapiro, H.F. Hinteregger, C.A. Knight, A.E.E. Rogers, A.R. Whitney, J.C. Pigg, and B.R. Schupler, Polar motion and UT1: Comparison of VLBI, lunar laser, satellite laser, satellite Doppler and conventional astrometric determinations, *Radio Interferometry Techniques for Geodesy*, NASA Conference Pub. 2115, 33-44, 1980.

Robertson, D.S., and W.E. Carter, Characterizing the Doppler polar motion time-series by comparing with Mark III VLBI observations, *Proc. Third International Geodetic Symposium on Satellite Doppler Positioning*, Las Cruces, New Mexico, 39-48, 1982.

Robertson, D.S., and W.E. Carter, Earth rotation information derived from MERIT and POLARIS VLBI observations, *High Precision Earth Rotation and Earth-Moon Dynamics*, O. Calame, ed., D. Reidel, 97-122, 1982.

- Robertson, D.S., W.E. Carter, R.J. Eanes, B.E. Schutz, B.D. Tapley, R.W. King, R.B. Langley, P.J. Morgan, and I.I. Shapiro, Comparison of Earth rotation as inferred from radio interferometry, laser ranging, and astrometric observations, *Nature*, 302, 509-511, 1983.
- Robertson, D.S., and W.E. Carter, Earth orientation determinations from VLBI observations, *Proc. International Conference on Earth Rotation and the Terrestrial Reference Frame, Part II, Vol. 1*, Ohio State University, 296-306, 1985.
- Robertson, D.S., W.E. Carter, B.D. Tapley, B.E. Schutz, and R.J. Eanes, Polar motion measurements: Sub-decimeter accuracy verified by intercomparison, *Science*, 229, 1259-1261, 1985.
- Robertson, D.S., W.E. Carter, J. Campbell, and H. Schuh, Daily UT1 determinations from IRIS very long baseline interferometry, *Nature*, 316, 424-427, 1985.
- Robertson, D.S., W.E. Carter, and J.M. Wahr, Possible detection of the Earth's free-core nutation, *Geophys. Res. Lett.*, 13, 949-952, 1986.
- Robertson, D.S., W.E. Carter, and J.M. Wahr, Correction to Possible detection of the Earth's free-core nutation, *Geophys. Res. Lett.*, 13, 1487, 1986.
- Robertson, D.S., W.E. Carter, and F.W. Fallon, Earth orientation from the IRIS project, *The impact of VLBI on Astrophysics and Geophysics*, M.J. Reid and J.M. Moran, eds., D. Reidel, 391-400, 1988.
- Robertson, D. S., Very long baseline interferometry, *Encyclopedia of Geophysics*, (in press), 1988.
- Roecker, S., Velocity structure of the Pamir-Hindu Kush Region: Possible evidence of subducted crust, *J. Geophys. Res.*, 87, 1982.
- Rosen, R.D., and D.A. Salstein, Variations in atmospheric angular momentum on global and regional scales and the length of day, *J. Geophys. Res.*, 88, 5451-5470, 1983.
- Rosen, R.D., D.A. Salstein, T.M. Eubanks, J.O. Dickey, and J.A. Steppe, An El Nino signal in atmospheric angular momentum and Earth rotation, *Science*, 225, 411-414, 1984.
- Rosen, R.D., and D.A. Salstein, Contribution of stratospheric winds to annual and semiannual fluctuations in atmospheric angular momentum and the length of day, *J. Geophys. Res.*, 90, 8033-8041, 1985.
- Rosen, R.D., D.A. Salstein, A.J. Miller, and K. Arpe, Accuracy of atmospheric angular momentum estimates from operational analyses, *Monthly. Weather. Rev.*, 115, 1627-1639, 1987.

Royden, L., and G. Karner, Flexure of lithosphere beneath Apennine and Carpathian foredeep basins: Evidence for an insufficient topographic load, *AAPG Bull.*, 68, 6, 1984.

Royden, L., and G. Karner, Flexure of the continental lithosphere beneath Apennine and Carpathian foredeep basins, *Nature*, 309, 1984.

Rubincam, D., Postglacial rebound observed by LAGEOS and the effective viscosity of the lower mantle, *J. Geophys. Res.*, 89, B2, 1984.

Ruff, L., and H. Kanamori, Seismic coupling and uncoupling at subduction zones, *Tectonophysics*, 99, 1983.

Ruff, L., and A. Cazenave, Geoid anomalies over the Macquarie Ridge Complex indicate an unexpected subducted slab, *EOS, Trans. AGU*, 64, 1983.

Ruff, L., and A. Cazenave, Geoid anomalies over the Macquarie Ridge Complex indicate an unexpected subducted slab, *Physics Earth Planet. Int.*, 38, 59-69, 1985.

Runcorn, S.K., G.A. Wilkins, E. Groten, H. Lenhardt, J. Campbell, R. Hide, B.F. Chao, A. Souriau, J. Hinderer, H. Legros, J.L. Le Mouel, and M. Feissel, The excitation of the Chandler Wobble, *Survey in Geophysics*, 9, 419-449, 1988.

Rundle, J.B., Static elastic-gravitational deformation of a layered half-space by point couple stresses, *J. Geophys. Res.*, 85, 5355-5363, 1980.

Rundle, J.B., Numerical evaluation of static elastic-gravitational deformation in a layered half-space by point couple-sources, *Sandia Tech. Rept. N. SAND80-2048J*, 1980.

Rundle, J.B., and W. Thatcher, Speculations on the nature of the Palmdale uplift, *Bull. Seis. Soc. Amer.*, 70, 1869-1886, 1980.

Rundle, J.B., and M. McNutt, Southern California uplift--is it or isn't it?, *EOS, Trans. AGU*, 62, 97-98, 1981.

Rundle, J.B., Vertical displacements from a rectangular thrust fault in layered elastic-gravitational media, *J. Phys. Earth*, 29, 173-186, 1981.

Rundle, J.B., Viscoelastic-gravitational deformation by a rectangular thrust fault in a layered Earth, *J. Geophys. Res.*, 87, 7787-7796, 1982.

Rundle, J.B., and A. T. Smith, Comment on Interpretation of postseismic deformation with a viscoelastic relaxation model, by J. Wahr and M. Wyss, *J. Geophys. Res.*, 87, 1079-1080, 1982.

Rundle, J.B., Some solutions for static and pseudo-static deformation in layered, nonisothermal media, *J. Phys. Earth*, 30, 421-440, 1983.

- Rundle, J.B., H. Kanamori, and K.C. McNally, An inhomogeneous fault model for gaps, asperities, barriers, and seismicity migration, *J. Geophys. Res.*, 89, 10219-10231, 1984.
- Rundle, J.B., and H. Kanamori, Applications of an inhomogeneous stress (patch) model to complex subduction zone earthquakes: A discrete interaction matrix approach, *J. Geophys. Res.*, 92, 2606-2616, 1987.
- Rundle, J.B., A physical model for earthquakes: 1. Fluctuations and interactions, *J. Geophys. Res.*, 93, 6237-6254, 1988.
- Rundle, J.B., A physical model for earthquakes: 2. Application to southern California, *J. Geophys. Res.*, 93, 6255-6274, 1988.
- Rundle, J.B., A physical model for earthquakes: 3. Thermodynamical approach and its relation to nonclassical theories of nucleation, *J. Geophys. Res.*, 94, 2839-2855, 1989.
- Rundle, J.B., Derivation of the complete Gutenberg-Richter magnitude-frequency relation using the principle of scale invariance, *J. Geophys. Res.*, 94, 12337-12342, 1989.
- Ryan, J.W., T.A. Clark, R.J. Coates, C. Ma, W.T. Wildes, C.R. Gwinn, T.A. Herring, I.I. Shapiro, B.E. Corey, C.C. Counselman, H.F. Hinteregger, A.E.E. Rogers, A.R. Whitney, C.A. Knight, N.R. Vandenberg, J.C. Pigg, B.R. Schupler, and B.O. Ronnang, Geodesy by radio interferometry: Determinations of baseline vector, Earth rotation, and solid Earth tide parameters with the Mark I very long baseline radio interferometry system, *J. Geophys. Res.*, 91, 1935-1946, 1986.
- Sabadini, R., D. Yuen, and E. Boschi, The effects of postseismic motions on the moment of inertia of a stratified viscoelastic Earth with an asthenosphere, *Geophys. J. R. Astron. Soc.*, 79, 727-745, 1984.
- Sabadini, R., D. Yuen, and E. Boschi, A comparison of the complete and truncated versions of the polar wander equations, *J. Geophys. Res.*, 89, B9, 7609-7620, 1984.
- Sabadini, R., D. Yuen, and P. Gasperini, The effects of transient rheology on the interpretation of lower mantle viscosity, *Geophys. Res. Lett.*, 12, 1985.
- Sabadini, R., D. Yuen, and R. Widmer, Constraints on short-term mantle rheology from the J_2 observation and the dispersion of 18.6y tidal Love number, *Phys. Earth Planet. Int.*, 38, 1985.
- Sabadini, R., and G. Spada, Ground motion and stress accumulation driven by density anomalies in a viscoelastic lithosphere: Some results for the Apennines, *Geophys. J.*, 95, 463-480, 1988.
- Sabadini, R., and P. Gasperini, Glacial isostasy and the interplay of upper and lower mantle lateral viscosity heterogeneities, *Geophys. Res. Lett.*, 16, 429-432, 1989.

Salstein, D.A., and R.D. Rosen, Earth rotation data as a proxy index of global wind fluctuations, *Amer. Meteor. Soc. Conf. on Climate Variations*, Los Angeles, 1985.

Sandwell, D.T., and K.A. Poehls, A compensation mechanism for the central Pacific, *J. Geophys. Res.*, 85, B7, 3751-3758, 1980.

Sandwell, D.T., and G. Schubert, Geoid height versus age for symmetric spreading ridges, *J. Geophys. Res.*, 85, B12, 7235-7241, 1980.

Sandwell, D.T., and G. Schubert, Lithospheric flexure at fracture zones, *J. Geophys. Res.*, 87, B6, 4657-4667, 1982.

Sandwell, D.T., and G. Schubert, Geoid height-age relation from Seasat altimeter profiles across the Mendocino Fracture Zone, *J. Geophys. Res.*, 87, B5, 3949-3958, 1982.

Sandwell, D.T., Thermal isostasy: Response of a moving lithosphere to a distributed heat source, *J. Geophys. Res.*, 87, B2, 1001-1014, 1982.

Sandwell, D.T., Thermomechanical evolution of oceanic fracture zones, *J. Geophys. Res.*, 89, B13, 11401-11413, 1984.

Sasao, T., and J.M. Wahr, An excitation mechanism for the free "core nutation", *Geophys. J. R. Astron. Soc.*, 64, 729-746, 1981.

Sawyer, D., Brittle failure in the upper mantle during extension of continental lithosphere, *J. Geophys. Res.*, 90, B4, 1985.

Scott, D., D. Stevenson, and B.H. Hager, Melt migration using Darcy's Law generalized to include matrix deformation, *EOS, Trans. AGU*, 64, 1984.

Schubert, G., and Z. Garfunkel, Mantle upwelling in the Dead Sea and Salton Trough-Gulf of California leaky transforms, *Annales Geophysicae*, 2, 1984.

Schubert, G., and C. Anderson, Finite element calculations of very high Rayleigh number thermal convection, *Geophys. J. R. Astron. Soc.*, 80, 3, 575-602, 1985.

Slade, M., G. Lyzenga, and A. Raefsky, Constraints on mantle rheology from post seismic Chandler Wobble excitation, *EOS, Trans. AGU*, 65, 1003, 1984.

Slade, M., G. Lyzenga, and A. Raefsky, Variations in Earth's polar motion, universal time, and gravity field from great earthquakes in subduction zones, *EOS, Trans. AGU*, 66, 229, 1985.

Smith, D., et al. Polar motion and length of day from LAGEOS observations, *ISSTG Meeting Trans.*, Sopron, Hungary, July 1984.

Souriau, M, Loading of a partly viscous continental crust: Implications for isostasy, *EOS, Trans. AGU*, 64, 1983.

Sovers, O., et al., Nutation amplitudes from DSN intercontinental VLBI data, *EOS, Trans. AGU*, 65, 1984.

Sovers, O., et al., Radio interferometric determination of intercontinental baselines and Earth orientation utilizing Deep Space Network antennas: 1971 to 1980, *J. Geophys. Res.*, 89, 7597-7607, 1984.

Spence, W., and R.S. Gross, A tomographic glimpse of the upper mantle source of magmas of the Jemez Lineament, New Mexico, *J. Geophys. Res.*, (submitted), 1989.

Spieth, M., T. Eubanks, and J. Steppe, The accuracy of the JPL TEMPO Earth orientation measurements, *EOS, Trans. AGU*, 64, 45, 1983.

Spieth, M., T. Eubanks, and J. Steppe, Intercomparison of independent measurements of Earth orientation and rotation, *EOS, Trans. AGU*, 65, 16, 1984.

Spohn, T., and G. Schubert, Convective thinning of the lithosphere: A mechanism for rifting and mid-plate volcanism on Earth, Venus, and Mars, *Tectonophysics*, 94, 1983.

Stefanick, M., and D.M. Jurdy, The distribution of hotspots, *J. Geophys. Res.*, 89, 1984.

Stein, R., G.C.P. King, and J.B. Rundle, The growth of geological structures by repeated earthquakes: 2. Field examples of continental dip-slip faults, *J. Geophys. Res.*, 93, 13319-13331, 1988.

Steppe, J., T. Eubanks, and M. Spieth, Systematic error in "short" baseline VLBI estimates of the Earth orientation, *EOS, Trans. AGU*, 65, 45, 1984.

Steppe, J.A., T.M. Eubanks, and J.O. Dickey, The Southern Oscillation, variations in zonal winds, and the duration of the day, *EOS, Trans. AGU*, 67, 16, 155, 1986.

Susao, T., and J.M. Wahr, An excitation mechanism for the free core nutation, *Geophys. J. R. Astron. Soc.*, 64, 729-746, 1981.

Tanimoto, T., and D. Anderson, Mapping convection in the mantle, *Matrix Typography*, 1983.

Tanimoto, T., A simple derivation of the formula to calculate synthetic long-period seismograms in a heterogeneous Earth by normal mode summation, *Calif. Inst. of Tech.*, 1984.

Tanimoto, T., Waveform inversion of mantle Love waves: The Born seismogram approach, *Geophys. J. R. Astron. Soc.*, 78, 3, 641-660, 1984.

- Tapley, B.D., H. Miao-Fu, and R. Eanes, Earth rotation parameters deduced from Starlette laser ranging, *Scientia Sinica (Series A)*, XXV, 10, 1982.
- Tapley, B.D., Polar motion and Earth rotation, *Rev. Geophys. and Space Phys.*, 21, 3, 1983.
- Tapley, B.D., R.J. Eanes, and B.E. Schutz, UT/CSR analysis of Earth rotation from LAGEOS data, *Reports on the MERIT-COTES Campaign on Earth Rotation and Reference Systems, Part II, Proc. International Conference on Earth Rotation and the Terrestrial Frame*, I.I. Mueller, ed., Ohio State University, 1, 111-126, 1985.
- Thatcher, W., and J. B. Rundle, A viscoelastic model for periodically recurring earthquakes in subduction zones, *J. Geophys. Res.*, 89, 7631-7640, 1984.
- Trupin, A.S., and J.M. Wahr, Stack of global tide gauge sea level data, *Variations in Earth Rotation, AGU Monograph Series*, D.D. McCarthy, ed., (in press).
- Turcotte, D., and R. Harris, Relationship between the oceanic geoid and the structure of the oceanic lithosphere, *Marine Geophys. Res.*, 6, 177-190, 1984.
- Van Schmus, W., and M. Bickford, Proterozoic chronology and evolution of the midcontinent region, *North America, Precambrian Plate Tectonics*, Elsevier, 1981.
- Wagner, C.A. and D.T. Sandwell, The Gravsat signal over tectonic features, *J. Geophys. Res.*, 89, 4419-4426, 1984.
- Wahr, J.M., T. Sasao, and M.L. Smith, Effect of the fluid core on changes in the length of day due to long period tides, *Geophys. J. R. Astron. Soc.*, 64, 635-650, 1981.
- Wahr, J.M., A normal mode expansion for the forced response of a rotating Earth, *Geophys. J. R. Astron. Soc.*, 64, 651-676, 1981.
- Wahr, J.M., Body tides on an elliptical, rotating, elastic and oceanless Earth, *Geophys. J. R. Astron. Soc.*, 64, 677-704, 1981.
- Wahr, J.M., The forced nutations of an elliptical, rotating, elastic and oceanless Earth, *Geophys. J. R. Astron. Soc.*, 64, 705-728, 1981.
- Wahr, J.M., and T. Sasao, Adiurnal resonance in the ocean tide and in the Earth's load response due to the resonant free "core nutation", *Geophys. J. R. Astron. Soc.*, 64, 747-766, 1981.
- Wahr, J.M., The effect of the atmosphere and oceans on the Earth's wobble: 1. Theory, *Geophys. J. R. Astron. Soc.*, 70, 349-372, 1982.

Wahr, J.M., Computing tides, nutations and tidally induced variations in the Earth's rotation rate for a rotating, elliptical Earth, *Geodesy and Global Geodynamics*, H. Moritz and H. Sunkel, eds., 327-380, 1983.

Wahr, J.M., and D.R. Larden, An analysis of lunar laser ranging data for the Earth's free core nutation, *Proc. 9th International Symposium on Earth Tides*, August 1981, New York, 1983.

Wahr, J.M., and T. Sasao, A nearly diurnal resonance in the ocean load tide, *Proc. 9th International Symposium on Earth Tides*, August 1981, New York, 1983.

Wahr, J.M., The effects of the atmosphere and oceans on the Earth's wobble and on the seasonal variations in the length of day - 2. Results, *Geophys. J. R. Astron. Soc.*, 74, 451-487, 1983.

Wahr, J.M., Normal modes of the coupled Earth-ocean system, *J. Geophys. Res.*, 89, 7621-7630, 1984.

Wahr, J.M., and A.H. Oort, Friction-and mountain-torque estimates from global, atmospheric data, *J. Atmos. Sci.*, 41, 190-204, 1984.

Wahr, J.M., Deformation induced by polar motion, *J. Geophys. Res.*, 90, 9363-9368, 1985.

Wahr, J.M., Polar motion-induced gravity, *Proc. International Conference on Earth Rotation and the Terrestrial Reference Frame*, July 31-August 2, 1985, I.I. Mueller, ed., Columbus, Ohio, 736-741, 1985.

Wahr, J.M., Reply to S.R. Dickman, *J. Geophys. Res.*, 90, 11557, 1985.

Wahr, J.M., The Earth's rotation rate, *American Scientist*, 73, 41-46, 1985.

Wahr, J.M., Geophysical aspects of polar motion, variations in the length of day, and the lunisolar nutations, *Space Geodesy and Geodynamics*, A. Anderson and A. Cazenave, eds., Academic press, 281-314, 1986.

Wahr, J.M., and Z. Bergen, The effects of mantle anelasticity on nutations, Earth tides, and tidal variations in rotation rate, *Geophys. J. R. Astron. Soc.*, 87, 633-688, 1986.

Wahr, J.M., The Earth's rotation, *La Recherche* (in French; also, translated into Spanish for *Mundo Cientifico*, and appearing in *India in English in the World Scientist*), 17, 1174-1182, 1986.

Wahr, J.M., The Earth's C_{21} and S_{21} gravity coefficients and the rotation of the core, *Geophys. J. R. Astron. Soc.*, 88, 265-276, 1987.

Wahr, J.M., The shape of the core-mantle boundary and the rotation of the Earth, *IAG: General Theory and Methodology*, K. P. Schwarz, ed., 173-177, 1987.

Wahr, J.M., The theory of the Earth's orientation, with some new results for nutation, *The Impact of VLBI on Astrophysics and Geophysics*, M.J. Reid and J. Moran, eds., 1381-1390, 1988.

Wahr, J.M., The Earth's Rotation, *Ann. Rev. Earth Planet. Sci.*, 16, 231-249, 1988.

Wahr, J.M., Changes in the length of day and atmospheric angular momentum, *Physics Today*, 42, S-46, 1989.

Wahr, J.M., Some effects of the atmosphere on the Earth's rotation and on crustal deformation, *Interactions of the Solid Planet with the Atmosphere and Climate*, G. Visconti, ed., Editrice Galileo Galilei, 1989.

Wahr, J.M., and D. de Vries, The possibility of lateral structure inside the core and its implications for certain geodetic observations, *Geophys. J. Int.*, 99, 511-520, 1989.

Wahr, J. M., and D. de Vries, The Earth's forced nutations: Geophysical implications, *Variations in Earth Rotation*, AGU Monograph Series, D.D. McCarthy, ed., 1989.

Wahr, J.M., Correction and update to: "The Earth's C_{21} and S_{21} gravity coefficients and the rotation of the core", *Geophys. J. Int.*, 1989.

Ward, S., A note on lithospheric bending calculations, *Geophys. J. R. Astron. Soc.* 78, 241-253, 1984.

Ward, S., Small scale mantle flow and induced lithospheric stress near island arcs, *Geophys. J. R. Astron. Soc.*, 81, 409-428, 1985.

Whaler, K., Does the whole of the Earth's core convect? *Nature*, 287, 1980.

Williams, J., and W. Melbourne, Comments on the effects of adopting new precession and equinox corrections, *High-Precision Earth Rotation and Earth-Moon Dynamics: Lunar Distances and Related Observations*, Proc. IAU Colloquium 63, O. Calame, ed., D. Reidel, 1982.

Williams, J.G., X.X. Newhall, and J.O. Dickey, the coordinate frame of the lunar laser network, *Report on the MERIT-COTES Campaign on Earth Rotation and Reference Systems, Part II: Proc. International Conference on Earth Rotation and the Terrestrial Reference Frame*, I.I. Mueller, ed., Ohio State University, 2, 590-600, 1985.

Wilson, C., Discrete polar motion equations, *Geophys. J. R. Astron. Soc.*, 80, 551-554, 1985.

Wilson, C.R., J. Kuehne, and Li Zhian, Computation of water storage contributions to polar motion, *Proc. IAU Symposium 128, The Earth's Rotation and Reference Frames for Geodesy and Geodynamics*, A.K. Babcock and G.A. Wilkins, eds., D. Reidel, 1988.

Yanick, R., F. Luce, and C. Froidevaux, Geoid heights and lithospheric stresses for a dynamic Earth, *Univ. of Paris*, 1983.

Yoder, C.F., J.G. Williams, and M. Parke, Tidal variations in Earth rotation, *J. Geophys. Res.*, 86, 1981.

Yoder, C.F., J.G. Williams, M. Parke, and J.O. Dickey, Short-period variations in Earth rotation, *Annales Geophysicae*, 37, 1981.

Yoder, C.F., et al., Secular variation of Earth's gravitational harmonic J_2 from LAGEOS and the nontidal acceleration of Earth's rotation, *Nature*, 303, 5920, 1983.

Yoder, C.F., and E. R. Ivins, On the ellipticity of the core-mantle boundary from Earth nutations and gravity, *Proc. IAU Symposium 128, Earth's Rotation and Reference Frames for Geodesy and Geodynamics*, A.K. Babcock and G.A. Wilkins, eds., D. Reidel, 317-322, 1988.

Yoder, C. F., and E. R. Ivins, Improved analytical nutation model, *The Impact of VLBI on Astrophysics and Geophysics, I.A.U. Symposium 129*, M.J. Reid and J.M. Moran, eds., 379-380, 1988.

Yuen, D., R. Sabadini, and E. Boschi, The dynamical equations of polar wander, and the global characteristics of the lithosphere as extracted from rotational data, *Phys. Earth Planet. Int.*, 33, 1983.

Yuen, D., and R. Sabadini, Secular rotational motions and the mechanical structure of a dynamical viscoelastic Earth, *Phys. Earth Planet. Int.*, 36, 1984.

Yuen, D., and R. Sabadini, Viscosity stratification of the lower mantle as inferred by the J_2 observation, *Annales Geophysicae*, 3, 1985.

Zhang, J., and B. Hager, A critical assessment of viscous models of trench topography and subduction zone flow, *EOS, Trans. AGU*, 64, 1984.

Zhu, S., Prediction of Earth rotation and polar motion, *Dept. Geodetic Science and Surveying Report 320*, Ohio State University, 1981.

Zhu, S., Comments on "Frequency modulation of the Chandlerian component of polar motion" by W.E. Carter, *J. Geophys. Res.*, 87, 1982.

Zhu, S., and I.I. Mueller, The effect of corrections in precession, nutation, and equinox, *Bull. Geodesique*, 57, 1983.

3. Geopotential Fields

a. Gravity Field and Geoid

Albouy, Y., and R. Godivier, Cartes gravimetriques de la Republique Centrafricaine, *ORSTOM*, 1981.

Angevine, C., and D. Turcotte, Correlation of geoid and depth anomalies over the Agulhas Plateau, *Tectonophysics*, 100, 43-52, 1983.

Benvenuti, M., and M. Caputo, Pattern recognition of gravity anomaly-seismicity relationship, *Atti Accad. Naz. Lincei*, 52, 6, 1982.

Bernard, J., et al., First Seasat altimeter data analysis on the western Mediterranean sea, *J. Geophys. Res.*, 88, 1983.

Bose, S., and G. Thobe, Gravity field recovery by Fourier analysis of satellite-to-satellite range rate, *Applied Science Analytics*, 1984.

Bowin, C., Depth of principal mass anomalies contributing to the Earth's geoidal undulations and gravity anomalies, *Marine Geodesy*, 7, 61-100, 1983.

Bowin, C., G. Thompson, and J. Schilling, Residual geoid anomalies in Atlantic Ocean Basin: Relationship to mantle plumes, *J. Geophys. Res.*, 89, B12, 1984.

Brown, R., Ocean tide measurement by Seasat altimeter data, *Oceans 82 Conference Record*, *Marine Technology Society*, 1982.

Brown, R., et al., Roughness of the marine geoid from Seasat altimetry, *J. Geophys. Res.*, 88, C3, 1983.

Brown, R., M_2 ocean tide at Cobb Seamount from Seasat altimeter data, *J. Geophys. Res.*, 88, 1983.

Brown R., Toward a more dynamical geoid, *Proc. Ninth International Symposium on Earth Tides*, 1983.

Buck, W., and E. Parmentier, Convection beneath young oceanic lithosphere: Implications for thermal structure and gravity, *J. Geophys. Res.*, 91, B2, 1986.

Cazenave, A., B. Lago, K. Dominh, and K. Lambeck, On the response of the ocean lithosphere to seamount loads from GEOS-3 satellite radar altimetry, *Geophys. J. R. Astron. Soc.*, 63, 233-252, 1980.

Cazenave, A., and S. Daillet, Lunar tidal acceleration from Earth satellite orbit analyses, *J. Geophys. Res.*, 86, 1659-1663, 1981.

- Cazenave, A., B. Lago, and K. Dominh, Geoid anomalies over the northeast Pacific fracture zones from satellite altimeter data, *Geophys. J. R. Astron. Soc.*, 69, 15-31, 1982.
- Cazenave, A., B. Lago, and K. Dominh, Thermal parameters of the oceanic lithosphere estimated from geoid height data, *J. Geophys. Res.*, 88, 1005-1118, 1983.
- Cazenave, A., and K. Dominh, Geoid anomalies above the Louisville Ridge (South Pacific), *J. Geophys. Res.*, 89, 11171-11179, 1984.
- Cazenave, A., Thermal cooling of the oceanic lithosphere: Possible evidence for two distinct trends, *Nature*, 310, 401-403, 1984.
- Cazenave, A., Thermal cooling of the oceanic lithosphere: New constraints from geoid height data, *Earth Planet. Sci. Lett.*, 70, 395-407, 1984.
- Cazenave, A., K. Dominh, C. Allegre, and J. Marsh, Global relationship between oceanic geoid and topography, *J. Geophys. Res.*, 91, 11439-11450, 1986.
- Cazenave, A., C. Rosemberg-Borot, and M. Rabinowicz, Geoid lows at deep sea trenches, *J. Geophys. Res.*, 91, 1989-2005, 1986.
- Cazenave, A., and E. A. Okal, Use of satellite altimetry in studies of the oceanic lithosphere, *Space Geodesy. and Geodynamics.*, A.J. Anderson and A. Cazenave, eds., Academic Press, London, 1986.
- Cazenave, A., M. Monnereau, and D. Gibert, Seasat gravity undulations in the central Indian Ocean, *Phys. Earth Planet. Int.*, 48, 130-141, 1987.
- Cazenave, A., and K. Dominh, Global relationship between oceanic geoid and sea floor depth: New results, *Geophys. Res. Lett.*, 14, 1-5, 1987.
- Cazenave, A., K. Dominh, M. Rabinowicz, and G. Ceuleneer, Geoid and depth anomalies over ocean swells and troughs: Evidence for an increasing trend of the geoid to depth ratio with age of plate, *J. Geophys. Res.*, 93, 8064-8077, 1988.
- Ceuleneer, G., M. Rabinowicz, M. Monnereau, A. Cazenave, and C. Rosemberg-Borot, Viscosity and depth extent of the sublithospheric low-viscosity zone: constraints from geoid and depth over oceanic swells, *Earth Planet. Sci. Lett.*, 89, 84-102, 1988.
- Chapman, M., and M. Talwani, Geoid anomalies over deep sea trenches, *Geophys. J. R. Astron. Soc.*, 68, 1982.
- Chase, C.G., and M. McNutt, The geoid: Effect of compensated topography and uncompensated oceanic trenches, *Geophys. Res. Lett.*, 9, 28-32, 1982.

Chase, C.G., and D. Sprowl, The modern geoid and ancient plate boundaries, *Earth Planet. Sci. Lett.*, 62, 314-320, 1983.

Chase, C.G., The geological significance of the geoid, *Ann. Rev. Earth Planet Sci.*, 13, 97-118, 1985.

Chao, B.F., W.P. O'Connor, A.T.C. Chang, D.K. Hall, and J.L. Foster, Snow-load effect on the Earth's rotation and gravitational field: 1979-1985, *J. Geophys. Res.*, 92, 9415-9422, 1987.

Chao, B.F., and R.S. Gross, Changes in the Earth's rotation and low-degree gravitational field induced by earthquakes, *Geophys. J. R. Astron. Soc.*, 91, 569-596, 1987.

Chao, B.F., and W.P. O'Connor, Effect of a uniform sea level change on the Earth's rotation and gravitational field, *J. Geophys. Res.*, 93, 191-193, 1988.

Chao, B.F., and W.P. O'Connor, Global surface water-induced seasonal variations in the Earth's rotation and gravitational field, *J. Geophys. Res.*, 94, 263-270, 1988.

Colombo, O., Global geopotential modeling from satellite-to-satellite tracking, *Dept. Geodetic Science and Surveying, Report 317*, Ohio State University, 1981.

Cruz, J., Improved global prediction of 300 nautical mile mean free air anomalies, *Dept. of Geodetic Science and Surveying, Report 331*, Ohio State University, 1982.

Despotakis, V., The development of the June 1986 $1^{\circ} \times 1^{\circ}$ and the August 1986 $30' \times 30'$ terrestrial mean free-air anomaly data bases, *Dept. of Geodetic Science and Surveying*, Ohio State University, 1986.

Despotakis, V., Geoid undulation computations at laser tracking stations, *Dept. of Geodetic Science and Surveying, Report 383*, Ohio State University, 1987.

Engelis, T., R.H. Rapp, and C.C. Tscherning, The precise computation of geoid undulation differences with comparison to results obtained from the global positioning system, *Geophys. Res. Lett.*, 1, 9, 821-824, 1984.

Engelis, T., R.H. Rapp, and Y. Bock, Measuring orthometric height differences with GPS and gravity data, *Manuscripta Geodaetica*, 10, 187-194, 1985.

Geri, G., I. Marson, A. Rossi, and B. Toro, Consideration about gravity and elevation changes observed in the Travale geothermal field, *Bull. d'Information Bureau Gravimetrique International*, 53, Universita Pisa, 1983.

Goad, C., Earth tides, *Rev. Geophys. Space Phys.*, 21, 3, 544-546, 1983.

Goad, C., C. Tscherning, and M. Chin, Gravity empirical covariance values for the continental United States, *J. Geophys. Res.*, 89, B9, 7962-7968, 1984.

Hager, B.H., The geoid and geodynamics, *Nature*, 299, 1982.

Hager, B.H., Global isostatic geoid anomalies for plate and boundary layer models of the lithosphere, *Earth Planet. Sci. Lett.*, 63, 1983.

Hager, B.H., Subducted slabs and the geoid: Constraints on mantle rheology and flow, *J. Geophys. Res.*, 89, 1984.

Hager, B.H., and M.A. Richards, The generation of long-wavelength geoid anomalies: Implications for mantle structure and dynamics, *14th International Conference, Mathematical Geophysics, Loen, Norway, Terra Cognita*, 4, 247-248, 1984.

Hager, B.H., and M.A. Richards, The source of long-wavelength gravity anomalies, *EOS, Trans. AGU*, 65, 195, 1984.

Hager, B.H., and M.A. Richards, The source of the Earth's long-wavelength geoid anomalies: Observations and implications, *EOS, Trans. AGU*, 65, 1004, 1984.

Hager, B.H., M.A. Richards, and R.J. O'Connell, Mantle convection, surface deformation, mantle viscosity structure and the geoid, *Chapman Conference on Vertical Crustal Motion: Measurement and Modeling*, Harpers Ferry, WV, October 22-26, 1984.

Hager, B.H., R.W. Clayton, M.A. Richards, R.P. Coner, A.M. Dziewonski, Lower mantle heterogeneity, dynamic topography and the geoid, *Nature*, 313, 1985.

Hager, B.H., M.A. Richards, and R.J. O'Connell, The source of the Earth's long-wavelength geoid anomalies: Implications for mantle and core dynamics, *NASA Geopotential Research Mission, NASA Conference Publication 2390*, October 1985.

Hajela, D., A simulation study to test the prediction of $1^0 \times 1^0$ mean gravity anomalies using least squares collocation from the Gravsat mission, *Dept. Geodetic Science and Surveying, Report 316*, Ohio State University, 1981.

Haxby, W.F., and J.L. LaBrecque, Gravity anomalies from Seasat altimetry in ocean margin drilling program, *Regional Atlas 13, South Atlantic Ocean and Adjacent Antarctic Continental Margin*, J. LaBrecque, ed., Marine Science International, Woods Hole, 1986.

Herring, T.A., et al., Determination of tidal parameters from VLBI observations, *Proc. Ninth Internat. Symposium on Earth Tides*, New York, 1981.

Herring, T.A., et al., Determination of tidal parameters from VLBI observations, *E. Schweizerbart'sche Verlagsbuchhandlung*, 1983.

Ihnen, S., and J. Whitcomb, The Indian Ocean gravity low: Evidence for an isostatically uncompensated depression in the upper mantle, *Geophys. Res. Ltrs.*, 10, 6, 1983.

Jekeli, C., Alternative methods to smooth the Earth's gravity field, *Dept. Geodetic Science and Surveying, Report 327*, Ohio State University, 1981.

Jones, G., A technique for computing geoid height anomalies over two-dimensional Earth models, *Geophys. J. R. Astron. Soc.*, 69, 2, 329-338, 1982.

Kaula, W.M., The next development in satellite determination of the Earth's gravity field, *Proc. USA-Hungarian Workshop on Dynamics, Dynamical Astronomy*, B.J. Balasz and V. Szebehely, eds., Eotvos University, Budapest, 127-134, 1982.

Kaula, W.M., Inference of variations in the gravity field from satellite-to-satellite range-data, *J. Geophys. Res.*, 88, 8345-8350, 1983.

Kaula, W.M., Satellite measurements of the Earth's gravity field, *Methods of Experimental Physics, 24B: Geophysics*, C.G. Sammis and T. Henyey, eds., Academic Press, 163-187, 1987.

Klokocnik, J., and J. Kostelecky, On orbit determination with lumped coefficients, *Observ. Artif. Satell.*, 23, Praha, 1984.

Klolocnik, J., Further comparison of Earth gravity models by means of lumped coefficients, *Bull. Astron. Inst. Cs.*, 36, 1985.

Klosko, S., J. Marsh, F. Lerch, and R. Williamson, Gravity model improvement for Seasat, *J. Geophys. Res.*, 87, C5, 1982.

Koch, M., and D. Yuen, Surface deformation and geoid anomalies over single and double-layered convective systems, *Geophys. Res. Lett.*, 12, 10, 1985.

Lambeck, K., and R. Coleman, The Earth's shape and gravity field: A report of progress from 1958 to 1982, *Geophys. J. R. Astron. Soc.*, 74, 25-54, 1983.

Lambeck, K., Anomalous satellite motion and mantle viscosity, *Nature*, 309, 584-585, 1984.

Lambeck, K., and R. Coleman, Reply to comments by Lerch, et al., On the Earth's shape and gravity field: A report of progress from 1958 to 1982, *Geophys. J. R. Astron. Soc.*, 86, 665-668, 1986.

Lerch, F.J., Verification of the accuracy of GEM-L2 in response to criticism by Lambeck and Coleman, *NASA TM 86123*, NASA/GSFC, 1984.

- Lerch, F.J., S.M. Klosko, G.P. Patel, and C.R. Wagner, A gravity model for crustal dynamics (GEM-L2), *J. Geophys. Res.*, 90, B11, 9301-9311, 1985.
- Lerch, F.J., S.M. Klosko, and G.B. Patel, A refined gravity model from LAGEOS, *J. Geophys. Res.*, 90, B11, 1985.
- Lerch, F.J., S.M. Klosko, C.A. Wagner, and G.P. Patel, On the accuracy of recent Goddard gravity models, *J. Geophys. Res.*, 90, B11, 9316-9334, 1985.
- Lerch, F.J., Error spectrum of Goddard satellite models for the gravity field, *NASA TM 86223*, NASA/GSFC, 1985.
- Lerch, F.J., S.M. Klosko, and C.A. Wagner, Comments on Lambeck and Coleman: The Earth's shape and gravity field: A report of progress from 1958 to 1982, *Geophys. J. R. Astron. Soc.*, 86, 651-664, 1986.
- Lerch, F.J., et al., An improved error assessment for the GEM-T1 gravitational model, *NASA TM 100713*, NASA/GSFC, November 1988.
- Liu, C., D. Sandwell, and J. Curray, The negative gravity field over the 85°E Ridge, *J. Geophys. Res.*, 87, 1982.
- Lyon-Caen, H., and P. Molnar, Gravity anomalies and the structure of western Tibet and the southern Tarim Basin, *Geophys. Res. Lett.* 11, 12, 1984.
- Mainville, A., and R.H. Rapp, Detection of regional bias in 1°X1° mean terrestrial gravity anomalies, *Bull. d'Information, Bureau Gravimetrique International*, 57, 1985.
- Marsh, B.D., and J. Hinojosa, Seasat geoid anomalies in the Pacific: Two dimensional spectra and removal of plate sources, *EOS, Trans. AGU*, 64, 211, 1983.
- Marsh, B.D., and J.G. Marsh, The Pacific geoid and gravity fields above m, n = 12, 12 and lithospheric structure, *Geol. Soc. Amer.*, 15, 636, 1983.
- Marsh, B.D., J. Hinojosa, and J.G. Marsh, Lithospheric structure in the Seasat geoid of the central Pacific, *EOS, Trans. AGU*, 65, 185, 1984.
- Marsh, B.D., J.G. Marsh, and R.G. Williamson, On gravity from SST, geoid from Seasat, and plate age and fracture zones in the Pacific, *J. Geophys. Res.*, 89, 6070-6078, 1984.
- Marsh, J.G., B.D. Marsh, R.G. Williamson, and W. Wells, The gravity field in the central Pacific from satellite-to-satellite tracking, *J. Geophys. Res.*, 86, 1981.
- Marsh, J.G., G.R. Cheney, T. Martin, and J. McCarthy, Computation of a precise mean sea surface in the eastern North Pacific using Seasat altimetry. *EOS, Trans. AGU*, 63, 9, 1982.

Marsh, J.G., F.J. Lerch, and R.G. Williamson, Estimation of geodynamic and geodetic parameters from Starlette laser ranging data, *Proc. Third International Symposium on the Use of Artificial Satellites for Geodesy and Geodynamics*, Ermioni, Greece, September 1982, National Technical University, Athens, Greece, 1984.

Marsh, J.G., Global mean sea surface based upon Seasat altimeter data, *NASA TM 86123*, NASA/GSFC, 1984.

Marsh, J.G., R. Cheney, J. McCarthy, and T. Martin, Regional mean sea surfaces based on GEOS-3 and Seasat altimeter data, *Marine Geodesy*, 8, 1-4, Crane, Russak and Co., 1984.

Marsh, J.G., Global mean sea surface based upon a combination of the GEOS-3 and Seasat altimeter data, *Geodynamics Branch Annual Report, TM 86223*, NASA/GSFC, 1985.

Marsh, J.G., et al., A new gravitational model for the Earth from satellite tracking data: GEM-T1, *J. Geophys. Res.*, 93, B6, 6169-6215, 1988.

Martinec, Z. and K. Pec, Spherical harmonic coefficients of the external equipotential surface inferred from Stokes' constants, *Proc. Int. Symp.*, Charles Univ., 1983.

Marty, J.C., and A. Cazenave, Thermal evolution of the lithosphere beneath fracture zones inferred from geoid anomalies, *Geophys. Res. Lett.*, 15, 593-597, 1988.

Mazzega, P., The M_2 ocean tide recovered from Seasat altimetry in the Indian Ocean, *Nature*, 302, 1983.

McAdoo, D.C., Geoid anomalies in the vicinity of subduction zones, *J. Geophys. Res.*, 86, 1981.

McAdoo, D.C., On the compensation of geoid anomalies due to subducting slabs, *J. Geophys. Res.*, 87, 1982.

Menghua, W., Z. Wei, and M. Li, Gravity changes before and after the Tangshan Earthquake of July 28, 1976, and possible interpretation, *J. Geophys. Res.*, 90, B7, 1985.

Merriam, J., LAGEOS and UT measurements of long-period Earth tides and mantle Q, *J. Geophys. Res.*, 90, B11, 1985.

Mori, A., B. Hager, and A. Raefsky, The evolution of large-scale temperature variation in a convecting system: Application to the evolution of long-wavelength temperature and geoid anomalies in the Earth, *EOS, Trans. AGU*, 64, 1984.

Parsons, B., and S. Daly, The relationship between surface topography, gravity anomalies, and temperature structure of convection, *J. Geophys. Res.*, 88, 1983.

- Parsons, B., and A.P. Freedman, Intermediate-wavelength depth and geoid anomalies of the south Atlantic Ocean, *EOS, Trans. AGU*, 68, 1497, 1987.
- Pec, K., and Z. Martinec, Expansion of geoid heights into a spherical harmonic series, *Studia Geoph. et Geod.*, 26, 1982.
- Pec, K. and Z. Martinec, Expansion of geoid heights over a triaxial Earth's ellipsoid into a spherical harmonic series, *Studia Geoph. et Geod.*, 27, 1983.
- Peltier, W.R., The LAGEOS constraint on deep mantle viscosity: Results from a new normal mode method for the inversion of viscoelastic relaxation spectra, *J. Geophys. Res.*, 90, B11, 1985.
- Platzman, G., The role of Earth tides in the balance of tidal energy, *J. Geophys. Res.*, 90, B2, 1985.
- Poehls, K.A., W.M. Kaula, G. Schubert, and D. Sandwell, Studies of oceanic tectonics based on GEOS-3 satellite altimetry, *NASA Cont. Rept. 156854*, NASA, Wallops Island, VA, 37, 1979.
- Rabinowicz, M., B. Lago, and M. Souriau, Large scale gravity profiles across subduction zones, *Geophys. J. R. Astron. Soc.*, 73, 1983.
- Rapp, R.H., Ellipsoidal corrections for geoid undulation computations using gravity anomalies in a cap, *J. Geophys. Res.*, 86, 10843-10848, 1981.
- Rapp, R.H., Aspects of geoid definition and determination, *Proc. Gen. Meeting, IAG*, Tokyo, Japan, 1982.
- Rapp, R.H., Degree variances of the Earth's potential, topography, and its isostatic compensation, *Bull. Geodesique*, 56, 84-94, 1982.
- Rapp, R.H., Geoid undulation computations for Doppler positioning requirements, *Proc. Annual Meeting, American Congress of Surveying and Mapping*, 1983.
- Rapp, R.H., The development of the January 1983 $1^0 \times 1^0$ mean free-air anomaly data tape, *Dept. of Geodetic Science and Surveying*, Ohio State University, 1983.
- Rapp, R.H., and C. Wichiencharoen, A comparison of satellite Doppler and gravimetric geoid undulations considering terrain-corrected gravity data, *J. Geophys. Res.*, 89, 1105-1111, 1984.
- Rapp, R.H., The determination of high degree potential coefficient expansions from the combination of satellite and terrestrial gravity information, *Dept. of Geodetic Science and Surveying, Report 361*, Ohio State University, 1984.
- Rapp, R.H., The gravity field of the Earth and prospects for improvement of its determination, *Space Geodesy and Geodynamics*, A.J. Anderson and A. Cazenave, eds., Academic Press, 1986.

- Rapp, R.H., Spherical harmonic expansions of the Earth's gravitational potential to degree 360 using 30' mean anomalies, *Dept. of Geodetic Science and Surveying, Report 376*, Ohio State University, 1986.
- Rapp, R.H., An estimate of equatorial gravity from terrestrial and satellite data, *Geophys. Res. Lett.*, 14, 730-732, July 1987.
- Rapp, R.H., Terrestrial gravity data and comparisons with satellite data, *Proc. of an ESA-NASA Workshop on a Joint Solid Earth Programme*, Matera, Italy, ESA SP-1094, Oct. 1987.
- Rapp, R.H., Gravitational potential coefficient models - developments and comparisons, *IUGG/IAG General Assembly*, Vancouver, 1987.
- Rapp, R.H., Combination of satellite altimetric, and terrestrial gravity data, *Lecture Notes in Earth Sciences, Theory of Satellite Geodesy and Gravity Field Determination*, Springer-Verlag, 1989.
- Rapp, R.H., The decay of the spectra of the gravitational potential of the Earth, *Geophys. J.*, (in press), 1990.
- Reigber, C., G. Balmino, and B. Moynot, The GRIM-3 Earth gravity field model, *Manuscripta Geodaetica*, 4, 1983.
- Reigber, C., An improved GRIM-3 Earth gravity model (GRIM-3B), *Proc. IAG Symposium C, XVIIIth, IUGG Gen. Assembly*, 1983.
- Reigber, C., et al., GRIM gravity model improvement using LAGEOS (GRIM3-LI), *J. Geophys. Res.*, 90, B11, 1985.
- Reinhardt, V., Determining the gravity potential from low-low satellite tracking data utilizing a complex spherical harmonic expansion of the potential, *Bendix Field Engineering Corp.*, 1984.
- Richards, M.A., and B.H. Hager, Long-wavelength geoid anomalies and mantle convection, *EOS, Trans. AGU*, 65, 272, 1984.
- Richards, M.A., and B.H. Hager, Geoid anomalies in a dynamic Earth, *J. Geophys. Res.*, 89, 7, 1984.
- Richards, M.A., and B.H. Hager, Long-wavelength geoid anomalies with lateral variations in viscosity, *EOS, Trans. AGU*, 65, 857, 1984.
- Robbins, J., Least squares collocation applied to local gravimetric solutions from satellite gravity gradiometry data, *Dept. of Geodetic Science and Surveying, Report 368*, Ohio State University, 1985.

- Rowlands, D., The adjustment of Seasat altimeter data on a global basis for geoid and sea surface height determinations, Dept. Geodetic Science and Surveying, Report 325, Ohio State Univ., 1981.
- Rubincam, D.P., Information theory lateral density distribution for Earth inferred from global gravity field, NASA TM 83825, NASA/GSFC, 1981.
- Rubincam, D.P., LAGEOS orbit and solar eclipses, NASA TM 86123, NASA/GSFC, 1984.
- Rubincam, D.P., LAGEOS orbit and the albedo problem, NASA TM 86123, NASA/GSFC, 1984.
- Rubincam, D.P., Postglacial rebound observed by LAGEOS and the effective viscosity of the lower mantle, *J. Geophys. Res.*, 89, B2, 1984.
- Rubincam, D.P., B.F. Chao, K.H. Schatten, and W.W. Sager, Non-Newtonian gravity or gravity anomalies?, *EOS, Trans. AGU*, 69, 50, 1636, 1988.
- Rubincam, D.P., B.F. Chao, and K.H. Schatten, Application of internal gravitational field equations to geophysical measurement of G , *J. Geophys. Res.*, 94, 7563-7566, 1989.
- Ruff, L., and A. Cazenave, Geoid anomalies over the Macquarie Ridge Complex indicate an unexpected subducted slab, *EOS, Trans. AGU*, 64, 1983.
- Ruff, L., and A. Cazenave, Geoid anomalies Over the Macquarie Ridge Complex indicate an unexpected subducted slab, *Phys. Earth Planet. Int.*, 38, 59-69, 1985.
- Rummel, R., R.H. Rapp, H. Sunkel, and C.C. Tscherning, Comparisons of global topographic/isostatic models to the Earth's observed gravity field, Dept. of Geodetic Science and Surveying, Report 388, Ohio State University, 1988.
- Rundle, J.B., Deformation, gravity, and potential changes due to volcanic loading of the crust, *J. Geophys. Res.*, 87, 10724-10744, 1982.
- Ryan, J.W., T.A. Clark, R.J. Coates, C. Ma, W.T. Wildes, C.R. Gwinn, T.A. Herring, I.I. Shapiro, B.E. Corey, C.C. Counselman, H.F. Hinteregger, A.E.E. Rogers, A.R. Whitney, C.A. Knight, N.R. Vandenberg, J.C. Pigg, B.R. Schupler, and B.O. Ronnang, Geodesy by radio interferometry: Determinations of baseline vector, Earth rotation, and solid Earth tide parameters with the Mark I very long baseline radio interferometry system, *J. Geophys. Res.*, 91, 1935-1946, 1986.
- Sabadini, R., D. Yuen, and R. Widmer, Constraints on short-term mantle rheology from the J_2 observation and the dispersion of 18.6y tidal Love number, *Phys. Earth Planet. Int.*, 38, 1985.

Sanchez, B., An objective analysis technique for extrapolating tidal fields, *NASA TM 86123*, NASA/GSFC, 1984.

Sanchez, B., D. Rao, and P. Wolfson, Objective analysis for tides in a closed basin, *Marine Geodesy*, 9, 1, 1985.

Sandwell, D.T., and G. Schubert, Geoid height versus age for symmetric spreading ridges, *J. Geophys. Res.*, 85, B12, 7235-7241, 1980.

Sandwell, D.T., and K.A. Poehls, A compensation mechanism for the central Pacific, *J. Geophys. Res.*, 85, B7, 3751-3758, 1980.

Sandwell, D.T., and G. Schubert, Geoid height-age relation from Seasat altimeter profiles across the Mendocino Fracture Zone, *J. Geophys. Res.*, 87, B5, 3949-3958, 1982.

Sandwell, D.T., A detailed view of the south Pacific geoid from satellite altimetry, *J. Geophys. Res.*, 89, 1089-1104, 1984.

Savage, J., Local gravity anomalies produced by dislocation sources, *J. Geophys. Res.*, 89, 1945-1952, 1984.

Slade, M., G. Lyzenga, and A. Raefsky, Variations in Earth's polar motion, universal time, and gravity field from great earthquakes in subduction zones, *EOS, Trans. AGU*, 66, 229, 1985.

Souriau, A., Geoid anomalies over Gorringer Ridge, north Atlantic Ocean, *Earth Planet. Sci. Lett.*, 68, 101-114, 1984.

Thobe, G.L., and S. Bose, Estimation of geopotential from satellite-to-satellite range-rate data: Numerical results, *Applied. Science. Analytics*, Canoga Park, 1987.

Tinti, S., A. Dall'Oglio, and S. Zerbini, Tidal correction evaluation for the determination of the geoid in the Adriatic sea, *Proc. International Symposium on the definition of the geoid*, Florence, May 26-30, vol. 1, 157-196, 1986. (Also in *Bolletino di Geodesia e Scienze Affini*, Anno XLVI, N. 1, 45-68, 1987).

Tscherning, C., R.H. Rapp, and C.C. Goad, A comparison of methods for computing gravimetric quantities from high degree spherical harmonic expansions, *Manuscripta Geodaetica*, 8, 249-272, 1983.

Turcotte, D., and R. Harris, Relationship between the oceanic geoid and the structure of the oceanic lithosphere, *Marine Geophys. Res.*, 6, 177-190, 1984.

Von Frese, R.R.B., D.N. Ravat, W.J. Hinze, and C.A. McGue, Improved inversion of geopotential field anomalies for lithospheric investigations, *Geophysics*, 53, 375-385, 1988.

Wagner, C.A., and S.M. Klosko, Gravitational harmonics from shallow resonant orbits, *Celest. Mech.* 16, 143-163, 1977.

- Wagner, C.A., and F.J. Lerch, The accuracy of geopotential models, *Planet. Space Sci.* 26, 1081-1140, 1978.
- Wagner, C.A., The geoid spectrum from altimetry, *J. Geophys. Res.*, 84, B8, 3861-3871, 1979.
- Wagner, C.A., and O.L. Colombo, Gravitational spectra from direct measurements, *J. Geophys. Res.*, 84, 4699-4712, 1979.
- Wagner, C.A., F.J. Lerch, S.M. Klosko, and R.E. Laubscher, Gravity model improvement using GEOS-3, GEM-9 and 10, *J. Geophys. Res.*, 84, 3897-3916, 1979.
- Wagner, C.A., F.J. Lerch, B.H. Putney, and S.M. Klosko, Goddard Earth models for oceanographic applications: GEM-10b and 10c, *Marine Geodesy*, 5, 145-187, 1981.
- Wagner, C.A., and S.M. Klosko, Spherical harmonic representation of the gravity field from dynamic satellite data, *Planet. and Space Sci.*, 30, 1, 5-28, 1982.
- Wagner, C.A., Direct determination of gravitational harmonics from low-low Gravsat data, *J. Geophys. Res.*, 88, B12, 10309-10321, 1983.
- Wagner, C.A., The accuracy of the low-degree geopotential: Implications for ocean dynamics, *J. Geophys. Res.*, 88, B6, 5083-5090, 1983.
- Wagner, C.A., and D.T. Sandwell, The Gravsat signal over tectonic features, *J. Geophys. Res.*, 89, 4419-4426, 1984.
- Wagner, C.A., Radial variations of a satellite orbit due to gravitational errors: Implications for satellite altimetry, *J. Geophys. Res.*, 90, B4, 3027-3036, 1985.
- Wagner, C.A., Accuracy estimate of geoid and ocean topography recovered jointly from satellite altimetry, *J. Geophys. Res.*, 91, B1, 453-461, 1986.
- Wagner, C.A., and D.C. McAdoo, Time variations in the Earth's gravity field detectable with Geopotential Research Mission intersatellite tracking, *J. Geophys. Res.*, 91, B8, 8373-8386, 1986.
- Wagner, C.A., Geopotential orbit variations: Applications to error analysis, *J. Geophys. Res.*, 92, B8, 8136-8146, 1987.
- Wagner, C.A., Improved gravitational recovery from a Geopotential Research Mission Satellite pair flying en echelon, *J. Geophys. Res.*, 92, B8, 8147-8155, 1987.
- Wagner, C.A., The accuracy of a Goddard TOPEX gravity model as seen by independent resonant data, *Planet. and Space Sci.* 35, 8, 997-1008, 1987.

Wahr, J.M., Polar motion-induced gravity, *Proc. International Conference on Earth Rotation and the Terrestrial Reference Frame*, July 31-August 2, 1985, I.I. Mueller, ed., Columbus, Ohio, 736-741, 1985.

Wahr, J.M., The Earth's C_{21} and S_{21} gravity coefficients and the rotation of the core, *Geophys. J. R. Astron. Soc.*, 88, 265-276, 1987.

Wahr, J.M., Earth tides, *Encyclopedia of Geophysics*, D.E. James, ed., Van Nostrand, (in press).

Wakker, K., and B. Ambrosius, Accurate orbit determinations from laser ranging observations of LAGEOS, Starlette, and GEOS-3. *ESA SP-160*, 1981.

Wakker, K., B. Ambrosius, and T. van der Ploeg, Preliminary results of Seasat orbit determinations from laser ranging and European Doppler observations, *Memorandum M-411*, Delft University of Technology, 1981.

Wakker, K., and B. Ambrosius, ERS-1 orbit determination from laser TRANET and PRARE tracking data, *Memorandum M-464*, Delft Univ. of Tech., 1983.

Wakker, K., B. Ambrosius, and H. Piersma, Analysis of POPSAT gravity model errors, *Final Report, ESTEC Contract 5512/83/NL/MS*, Delft Univ. of Tech., 1983.

Wakker, K., and B. Ambrosius, Orbit determination of LAGEOS and Starlette and the position estimation of the European laser tracking stations at Kootwijk, Wettzell, Grasse, and Metsahovi, *Memorandum M-455*, Delft Univ. of Tech., 1983.

Wakker, K., B. Ambrosius, and L. Aardoom, Precise Orbit Determination for ERS-1, *ESA Contract Report, Contract 5227/82/D/IM/(SC)*, Delft Univ. of Tech., 1983.

Wakker, K., B. Ambrosius, and T. van der Ploeg, Seasat orbit determination from laser range observations, *Satellite Microwave Remote Sensing*, Delft Univ. of Tech., 1983.

Wichiencharoen, C., The indirect effects on the computation of geoid undulations, *Dept. of Geodetic Science and Surveying, Report 336*, Ohio State University, 1982.

Wichiencharoen, C., A comparison of gravimetric undulations computed by the modified Molodensky truncation method and the method of least squares spectral combination by optimal integral kernals, *Bull. Geodesique*, 58, 494-509, 1984.

Wicheincharoen, C., Recovery of 1^0 mean anomalies in a local region from a low-low satellite-to-satellite tracking mission, *Dept. of Geodetic Science and Surveying, Report 363*, Ohio State University, 1985.

Williams, J.G., X.X. Newhall, and J.O. Dickey, GM/Earth from lunar laser ranging (LLR), *EOS, Trans. AGU*, 68, 281, 1987.

Williamson, R.G., and J.G. Marsh, Starlette geodynamics: The Earth's tidal response, *J. Geophys. Res.*, 90, B11, 1985.

Wu, S.C., and J.T. Wu, Refinement of Earth's gravity field with TOPEX GPS measurements, *Chapman Conference on Progress in Determining the Earth's Gravity Field*, Ft. Lauderdale, FL, September 1988.

Wu, S.C., J.T. Wu, and W.I. Bertiger, An Efficient Technique for gravity recovery using a low Earth satellite, *Proc. Fifth International Geodetic Symposium on Satellite Positioning*, Las Cruces, NM, March 1989.

Yanick, R., F. Luce, and C. Froidevaux, Geoid heights and lithospheric stresses for a dynamic Earth, *Univ. of Paris*, 1983.

Yuen, D., and R. Sabadini, Viscosity stratification of the lower mantle as inferred by the J_2 observation, *Annales Geophysicae*, 3, 1985.

Yoder, C.F., et al., Secular variation of Earth's gravitational harmonic J_2 from LAGEOS and the nontidal acceleration of Earth's rotation, *Nature*, 303, 5920, 1983.

Yoder, C.F., and E.R. Ivins, On the ellipticity of the core-mantle boundary from Earth nutations and gravity, *Earth's Rotation and Reference Frames for Geodesy and Geodynamics*, I.A.U. Symposium #128, A.K. Babcock and G.A. Wilkins, eds., D. Reidel, 317-322, 1988.

b. Magnetic Field

Achache, J., A. Abtout, and J.L. LeMouel, The downward continuation of Magsat crustal anomaly field over southeast Asia, *J. Geophys. Res.*, 92, 11, 586-596, 1987.

Agarwal, A.K., et al., On utility of space-borne vector magnetic measurements in crustal studies, *Phys. Earth Planet. Int.*, 41, 260-268, 1986.

Allenby, R.J., and C.C. Schnetzler, U.S. crustal structure, *Tectonophysics*, 93, 13-31, 1983.

Allredge, L.R., and E.R. Benton, Fourier power spectra of the geomagnetic field for circular paths on the Earth's surface, *J. Geomag. Geoelectr.*, 38, 807-821, 1986.

Allredge, L.R., and E.R. Benton, Alternate forms of the associated Legendre functions for use in geomagnetic modeling, *J. Geomag. Geoelectr.*, 38, 599-609, 1986.

Arkani-Hamed, J., et al., Delineation of Canadian sedimentary basins from Magsat data, *Earth Planet. Sci. Lett.*, 70, 148-156, 1984.

Arkani-Hamed, J., et al., Comparison of Magsat and low-level aeromagnetic data over the Canadian Shield: Implications for GRM, *Can. J. Earth Sci.*, 22, 1241-1247, 1985.

Arkani-Hamed, J., W. Urquhart, and D.W. Strangway, Scalar magnetic anomalies of Canada and northern United States derived from Magsat data, *J. Geophys. Res.*, 90, B3, 2599-2608, 1985.

Arkani-Hamed, J., and D.W. Strangway, Intermediate-scale magnetic anomalies of the Earth, *Geophysics*, 50, 2817-2830, 1985.

Arkani-Hamed, J., and D.W. Strangway, An interpretation of magnetic signatures of aulacogens and cratons in Africa and South America, *Tectonophysics*, 113, 257-269, 1985.

Arkani-Hamed, J., and D.W. Strangway, Lateral variations of apparent magnetic susceptibility of lithosphere deduced from Magsat data, *J. Geophys. Res.*, 90, 2655-2664, 1985.

Arkani-Hamed, J., and D.W. Strangway, Magnetic susceptibility anomalies of lithosphere beneath Eastern Europe and the Middle East, *Geophysics*, 51, 1711-1724, 1986.

Arkani-Hamed, J., and D.W. Strangway, Band-limited global scalar magnetic anomaly map of the Earth derived from Magsat data, *J. Geophys. Res.*, 91, 8193-8203, 1986.

Arkani-Hamed, J., and D.W. Strangway, Effective magnetic susceptibility of the oceanic upper-mantle derived from Magsat data, *Geophys. Res. Lett.*, 13, 999-1002, 1986.

Arkani-Hamed, J., and D.W. Strangway, An interpretation of magnetic signatures of subduction zones detected by Magsat, *Tectonophysics*, 133, 45-56, 1987.

Arur, M., P. Bains, and J. Lal, Anomaly map of Z component of Indian subcontinent from magnetic satellite data, *Proc. Indian Acad. Sci., Earth Planet. Sci.*, 94, 111-115, 1985.

Backus, G., Kinematics of geomagnetic secular variation in a perfectly conducting core, *Philos. Trans. R. Soc., A*, 263, 1968.

Backus, G., The electric field produced in the mantle by the dynamo in the core, *PEPI*, 28, 1982.

Backus, G., Applications of mantle filter theory to the magnetic jerk of 1969, *Geophys. J. R. Astron. Soc.*, 74, 1983.

Backus, G., and S. Hough, Some models of the geomagnetic field in western Europe from 1960 to 1980, *PEPI*, 1985.

Backus, G., Keeping phases of Gauss coefficients, *EOS, Trans. AGU*, 67, 920, 1986.

- Backus, G., R. H. Estes, D. Chinn, and R. A. Langel, Comparing the jerk with other global models of the geomagnetic field from 1960 to 1978, *J. Geophys. Res.*, 92, 3615-3622, 1987.
- Backus, G., Bayesian inference in geomagnetism, *Geophys. J.*, 92, 125-142, 1988.
- Backus, G., The field lines of an axisymmetric magnetic field, *Geophys. J.*, 93, 413-418, 1988.
- Barraclough, D.R., A comparison of satellite and observatory estimates of geomagnetic secular variation, *J. Geophys. Res.*, 90, B3, 2523-2526, 1985.
- Ben'kova, N.P., T. Bondar, G.I. Kolomiytseva, and T. Cherevko, Representation of the main geomagnetic field and its secular variations by Magsat model, *Geomagn. and Aeron.*, 23, 94-98, 1983.
- Ben'kova, N.P., and G.I. Kolomiytseva, Comparison of three satellite models of the main geomagnetic field, *Geomagn. and Aeron.*, 25, 294-295, 1985.
- Bentley, C., Investigation of Antarctic crust and upper mantle using Magsat and other geophysical data, *Tenth Quarterly Progress Report*, 1982.
- Bentley, C., Magsat magnetic anomalies over Antarctica and the surrounding oceans, *Geophys. Res. Lett.*, 9, 1982.
- Benton, E.R., On fluid circulation around null-flux curves at Earth's core-mantle boundary, *Geophys. Astrophys. Fluid Dynamics*, 11, 323-327, 1979.
- Benton, E.R., Vorticity dynamics in spin-up from rest, *Phys. Fluids*, 22, 1250-1251, 1979.
- Benton, E.R., Kinematic dynamo action with helical symmetry in an unbounded fluid conductor. Part 1. Formulation and survey of low order cases, *Geophys. Astrophys. Fluid Dynamics*, 12, 313-344, 1979.
- Benton, E.R., Kinematic dynamo action with helical symmetry in an unbounded fluid conductor; Part 2: Further development of an explicit solution for the prototype case of Lortz, *Geophys. Astrophys. Fluid Dynamics*, 12, 345-358, 1979.
- Benton, E.R., L.A. Muth, and M. Stix, Magnetic contour maps at the core mantle boundary, *J. Geomag. and Geoelectr.*, 31, 615-626, 1979.
- Benton, E.R., and L.A. Muth, On the strength of electric currents and zonal magnetic fields at the top of Earth's core: Methodology and preliminary estimates, *Phys. Earth Planet. Int.*, 20, 127-133, 1979.

- Benton, E.R., A simple method for determining the vertical growth rate of vertical motion at the top of Earth's outer core, *Phys. Earth Planet. Int.*, 24, 242-244, 1981.
- Benton, E.R., Inviscid, frozen-flux velocity components at the top of Earth's core from magnetic observations at Earth's surface; Part 1: A new methodology, *Geophys. Astrophys. Fluid Dynamics*, 18, 157-174, 1981.
- Benton, E.R., Investigation of geomagnetic field forecasting and fluid dynamics of the core, *Quarterly Reports 8 and 9*, 1982.
- Benton, E.R., R.H. Estes, R.A. Langel, and L.A. Muth, Sensitivity of selected geomagnetic properties to truncation level of spherical harmonic expansions, *Geophys. Res. Lett.*, 9, 41, 254-257, 1982.
- Benton, E.R., and M.C. Coulter, Frozen-flux upper limits to the magnitudes of geomagnetic Gauss coefficients, based on Magsat observations, *Geophys. Res. Lett.*, 9, 41, 262-264, 1982.
- Benton, E.R., and K.A. Whaler, Rapid diffusion of the poloidal geomagnetic field through the weakly conducting mantle: A perturbation solution, *Geophys. J. R. Astron. Soc.* 75, 77-100, 1983.
- Benton, E.R., Geomagnetism of Earth's core, *Rev. Geophys. Space Phys.*, 21, 627-633, 1983.
- Benton, E.R., Report for IAGA transactions covering the XVIII General Assembly of the IUGG, Hamburg, August 1983, IAGA Session 12, Origin of Main Fields and Secular Changes of the Earth and Planets, *Phys. Earth Planet. Int.*, 36, VII-X, 1984.
- Benton, E.R., On the coupling of fluid dynamics and electromagnetism at the top of the Earth's core, *Geophys. Astrophys. Fluid Dynamics*, 33, 315-330, 1985.
- Benton, E.R., and B.C. Kohl, Geomagnetic main field analysis at the core-mantle boundary: Spherical harmonics compared with harmonic splines, *Geophys. Res. Lett.*, 13, 1533-1536, 1986.
- Benton, E.R., R.H. Estes, and R.A. Langel, Geomagnetic field modeling incorporating constraints from frozen-flux electromagnetism, *Phys. Earth Planet. Int.*, 48, 241-264, 1987.
- Benton, E.R., and L.R. Allredge, On the interpretation of the geomagnetic energy spectrum, *Phys. Earth Planet. Int.*, 48, 265-278, 1987.
- Benton, E.R., and C.V. Voorhies, Testing candidate geomagnetic field models via magnetic flux conservation at the core-mantle boundary, *Phys. Earth Planet. Int.*, 48, 350-357, 1987.
- Bhattacharyya, B., Reduction and treatment of magnetic anomalies of crustal origin in satellite data, *J. Geophys. Res.*, 82, 1977.

- Black, R.A., Geophysical processing and interpretation of Magsat satellite magnetic anomaly data over the U.S. midcontinent, *Master of Science Thesis, Dept. of Geology, University of Iowa*, 1-116, 1981.
- Bloxham, J., and D. Gubbins, Geomagnetic field analysis-IV: Testing the frozen-flux hypothesis, *Geophys. J. R. Astron. Soc.*, **84**, 139-152, 1986.
- Brammer, R., R. Sailor, and A. Lazarewicz, Magsat investigation of lithospheric magnetic anomalies in the eastern Indian Ocean, *IAGA Bull.*, **45**, 1981.
- Cain, J.C., Main field and secular variation, *Rev. Geophys. and Space Physics*, **17**, 273-277, 1979.
- Cain, J.C., J. Frayser, L. Muth, and D. Schmitz, The use of Magsat data to determine secular variation, *J. Geophys. Res.*, **88**, B7, 5903-5910, 1983.
- Cain, J.C., D.R. Schmitz, and L. Muth, Small-scale features in the Earth's magnetic field observed by Magsat, *J. Geophys. Res.*, **89**, B2, 1070-1076, 1984.
- Cain, J.C., D.R. Schmitz, and C. Kluth, Eccentric geomagnetic dipole drift, *Phys. Earth and Planet. Int.*, **39**, 237-242, 1985.
- Cain, J.C., and C. Kluth, An evaluation of the 1985-1990 secular variation candidates, *Phys. Earth and Planet. Int.*, **48**, 362-378, 1985.
- Cain, J.C., Z. Wang, and D.R. Schmitz, A simple monitor of the geomagnetic field, *EOS, Trans. AGU*, **66**, 861, 1985.
- Cain, J.C., The Earth as a Magnet, Chapter. 5, *The Solar Wind and the Earth*, S.I. Akasofu and Y. Kamide, eds., 57-69, Terra Scientific Publishing Co, Tokyo, 1987.
- Cain, J.C., Geomagnetic Analysis, *Van Nostrand Encyclopedia of Geophysics*, D.E. James, ed., 517-522, 1989.
- Cain, J.C., Z. Wang, D.R. Schmitz, and J. Meyer, The geomagnetic spectrum for 1980 and core-crustal separation, *Geophys. J.*, **97**, 443-447, 1989.
- Cain, J.C., Z. Wang, C. Kluth, and D.R. Schmitz, Derivation of a geomagnetic model to $n=63$, *Geophys. J.*, **97**, 431-441, 1989.
- Cain, J.C., B. Holter, and D. Sandee, Numerical experiments in geomagnetic modelling, *J. Geomag. Geoelectr.*, (submitted), 1989.
- Cain, J.C., Geomagnetism, Entry for the McGraw-Hill *Encyclopedia of Science and Technology*, 1990 edition.
- Carle, H.M., and C.G.A. Harrison, A problem in representing the core magnetic field of the Earth using spherical harmonics, *Geophys. Res. Lett.*, **9**, 4, 265-268, 1982.

Carmichael, R.S., Use of Magsat anomaly data for crustal structure and mineral resources in the U.S. midcontinent, *Quarterly Progress Reports, NASA Contract NAS5-26425*, 1981.

Carmichael, R.S., and R.A. Black, An analysis and use of Magsat magnetic data for interpretation of crustal structure and character in the U.S. mid-continent, *Phys. Earth Planet. Int.*, 44, 333-347, 1986.

Clark, S., H.V. Frey, and H. Thomas, Satellite magnetic anomalies over subduction zones: The Aleutian Arc anomaly, *Geophys. Res. Lett.*, 12, 41-44 1985.

Cohen, Y., et al., Magnetic measurements aboard a stratospheric balloon, *Phys. Earth Planet. Int.*, 44, 348-357, 1986.

Coles, R.L., G. Haines, G. Jansen van Beek, A. Nandi, and J. Walker, Magnetic anomaly maps from 40°N to 83°N derived from Magsat satellite data, *Geophys. Res. Lett.*, 9, 4, 281-284, 1982.

Coles, R.L., Magsat scalar magnetic anomalies at northern high latitude, *J. Geophys. Res.*, 90, 2576-2582, 1985.

Coles, R.L., P.T. Taylor, Magnetic anomalies, Chapter 8, *The Geology of the Arctic Ocean Region, Vol. L: The Arctic Ocean Region, Geol. Soc. Am.*, (in press), 1989.

Constable, C.G., and R. L. Parker, Statistics of the geomagnetic secular variation for the past 5 MY, *J. Geophys. Res.*, 93, 11569-11582. 1988.

Constable, C.G., A simple statistical model for geomagnetic reversals, *J. Geophys. Res.*, (submitted), 1989.

Counil, J.L., Contribution du geomagnetisme a l'Etude des heterogeneites laterales de la croûte et du manteau superieur, A l'Universite de Paris VII Thesis, at a l'Institut de Physique du Globe de Paris, 1-244, 1987.

Counil, J. L., and J. Achache, Magnetization gaps associated with tearing in the central America subduction zone, *Geophys. Res. Lett.*, 14, 1115-1118, 1987.

Didwall, E., The electrical conductivity of the Earth's upper mantle as estimated from satellite measured magnetic field variations, Ph.D. Dissertation, John Hopkins University, 1981.

Dooley, J.C., and P.M. McGregor, Correlative geophysical data in the Australian region for use in the Magsat project, *Bull. Aust. Soc. Explor. Geophys.*, 13, 63-67, 1982.

Frey, H.V., Magsat scalar anomalies and major tectonic boundaries in Asia, *Geophys. Res. Lett.*, 9, 41, 299-302, 1982.

Frey, H.V., Magsat scalar anomaly distribution: The global perspective, *Geophys. Res. Lett.*, 9, 41, 277-280, 1982.

- Frey, H.V., Magsat and POGO magnetic anomalies over the Lord Howe Rise: Evidence against a simple continental crustal structure, *J. Geophys. Res.*, 90, 2631-2639, 1985.
- Fujita, S., and M. Kawamura, Regional magnetic anomaly around the Japanese Islands revealed in marine data, *J. Geomagn. Geoelectr.*, 36, 483-486, 1984.
- Fukushima, N., Summary of the results of Magsat investigations in Japan, *J. Geomag. Geoelectr.*, 36, 395-416, 1984.
- Fukushima, N., Outline of the activity of the Japanese Magsat team, *J. Geomag. Geoelectr.*, 36, 383-394, 1984.
- Galdeano, A., Acquisition of long wavelength magnetic anomalies pre-dates continental drift, *Phys. Earth Planet. Int.*, 32, 289-292, 1983.
- Galliher, S.C., and M.A. Mayhew, On the possibility of detecting large-scale crustal remnant magnetization with Magsat vector magnetic anomaly data, *Geophys. Res. Lett.*, 9, 41, 325-328, 1982.
- Ghidella, M.E., C.A. Raymond, and J.L. LaBrecque, Verification of crustal sources for satellite elevation magnetic anomalies in west Antarctica and the Weddell Sea and their regional tectonic implications, *5th Symposium on Antarctic Geology*, M.R.A. Thompson, ed., Cambridge, (in press).
- Gibbs, B., and R.H. Estes, Geomagnetic modeling by optimal recursive filtering, *BTS Inc., Final Report 81-147, NAS5-26250*, April 1982.
- Gibbs, B., and R.H. Estes, Geomagnetic field modeling errors and optimization of recursive estimation - Phase 1, *Final Report, BTS Inc., Final Report 1061*, Sept. 1984.
- Godivier, R., Bangui Anomaly Progress Report, 1981.
- Golovkov, V.P., and G.I. Kolomiytseva, The international analytical field and its secular trend for the 1980-1990 period, *Geomagn. and Aeron.*, 26, 439-441, 1986.
- Goyal, H.K., R.R.B. von Frese, W.J. Hinze, and D.N. Ravat, Statistical prediction of satellite magnetic anomalies, *J. Geophys.*, 1989.
- Gubbins, D., Geomagnetic field analysis: I Stochastic inversion, *Geophys. J. R. Astron. Soc.*, 73, 641-652, 1983.
- Gubbins, D., Geomagnetic field analysis: II Secular variation consistent with a perfectly conducting core, *Geophys. J. R. Astron. Soc.*, 77, 753-766, 1984.
- Gubbins, D., and J. Bloxham, Geomagnetic field analysis: III Magnetic fields on the core-mantle boundary, *Geophys. J. R. Astron. Soc.*, 80, 31, 695-713, 1985.

- Hahn, A., et al., A Model of magnetic sources within the Earth's crust compatible with the field measured by the satellite Magsat, *Geol. J.*, 75, 125-156, 1984.
- Haines, G.V., Spherical cap harmonic analysis, *J. Geophys. Res.*, 90, B3, 2583-2592, 1985.
- Haines, G.V., Magsat vertical field anomalies above 40⁰N from spherical cap harmonic analysis, *J. Geophys. Res.*, 90, B3, 2593-2598, 1985.
- Hall, D., I. Noble, and T. Millar, Crustal structure of the Churchill-Superior boundary zone between 80⁰N and 98⁰W longitude from Magsat anomaly maps and stacked passes, *J. Geophys. Res.*, 90, B3, 2621-2630, 1985.
- Harrison, C.G.A., and H.M. Carle, Intermediate wave length magnetic anomalies over ocean basins, *J. Geophys. Res.*, 86, 11585-11599, 1981.
- Harrison, C.G.A., and H.M. Carle, Modelling the core magnetic field of the Earth, *Phil. Trans. R. Soc.*, A306, 179-191, 1982.
- Harrison, C.G.A., Magnetic anomalies, *Rev. Geophys. Space Phys.*, 21, 634-643, 1983.
- Harrison, C.G.A., H.M. Carle, and K.L. Hayling, Interpretation of satellite elevation magnetic anomalies, *J. Geophys. Res.*, 91, 3633-3650, 1986.
- Harrison, C.G.A., The Crustal Field, *Geomagnetism, Volume 1*, J.A. Jacobs, ed., Academic Press, 513-610, 1987.
- Harrison, C.G.A., The source of marine magnetic anomalies, *Marine Geophysics: A Navy Symposium*, E.N. Shor and C.L. Ebrahimi, eds., Marine Physical Laboratory, Report No. MPL-V-42/87, Scripps Institution of Oceanography, 52-60, 1987.
- Harrison, C.G.A., and Q. Huang, Longitudinal drift of the Earth's magnetic field at the core-mantle boundary, *Geophys. J. R. Astron. Soc.*, (submitted), 1988.
- Hastings, D.A., A look at the preliminary Magsat anomaly map, emphasizing Africa, *Proc. Sixth Conference of African Geology*, Nairobi, 1982.
- Hastings, D.A., An interpretation of the preliminary total-field Magsat anomaly map, *Proc. Fifth Latin American Geological Congress*, 1982.
- Hastings, D.A., Preliminary correlations of Magsat anomalies with tectonic features in Africa, *Geophys. Res. Lett.*, 9, 4, 1982.
- Hastings, D.A., An updated Bouguer anomaly map of south-central west Africa, *Technicolor Govt. Services, Inc.*, 1982.

- Hayling, K.L., and C.G.A. Harrison, Magnetization modeling in the north and equatorial Atlantic Ocean using Magsat data, *J. Geophys. Res.*, 91, 12423-12443, 1986.
- Hermance, J.F., Model simulations of possible electromagnetic induction effect at Magsat altitude, *Geophys. Res. Lett.*, 9, 373-376, 1982.
- Hermance, J.F., Are there electromagnetic induction effects in Magsat data? Some model simulations, *Geophys. Res. Lett.*, 9, 41, 1982.
- Hermance, J.F., and M. Rossen, Global induction studies using Magsat data, *IUGG Gen. Assembly*, 1983.
- Hermance, J.F., Global and regional electromagnetic induction effects in Magsat satellite data, *Brown Univ.*, 1984.
- Hide, R., How to locate the electrically conducting fluid core of a planet from external magnetic observations, *Nature*, 271, 1978.
- Hinze, W.J., R.R.B. von Frese, M.B. Longacre, L.W. Braile, E.G. Lidiak, and G.R. Keller, Regional magnetic and gravity anomalies of South America, *Geophys. Res. Lett.*, 9, 314-417, 1982.
- Jenson, D.C., and J.C. Cain, An interim geomagnetic field, *J. Geophys. Res.*, 67, 3568-3569, 1962, (also in 'Contemporary Classics in Physical, Chemical and Earth Sciences,' A Thackray, comp., iSi Press, Philadelphia, 1986).
- Johnson, B.D., Viscous remanent magnetization model for the Broken Ridge satellite magnetic anomaly, *J. Geophys. Res.*, 90, 2640-2646, 1985.
- Kawasaki, K., J.C. Cain, and R.D. Peters, Dipole axially symmetric, external field components of the geomagnetic field, *J. Geomag. Geoelectr.*, 40, 1085-1102, 1988.
- Krutikhovskaya, Z., and I. Pashkevich, Long wavelength magnetic anomalies as a source of information about deep crustal structure, *J. Geophys. Res.*, 46, 1979.
- Kuhn, G.J., and H. Zaaiman, Long wavelength magnetic anomaly map for southern Africa from Magsat, *Trans. Geol. Soc. S. Afr.*, 89, 9-16, 1986.
- LaBrecque, J.L., and S.C. Cande, Observations of seamount anomalies in Magsat and sea surface magnetic data, *The Origin and Evolution of Seamounts*, 8, 1982.
- LaBrecque, J.L., S.C. Cande, and R.D. Jarrard, The intermediate wave length magnetic anomaly field of the north Pacific and possible source distribution, *J. Geophys. Res.* 90, 2549-2564, 1985.

LaBrecque, J.L., and S.C. Cande, Intermediate wavelength magnetic anomalies over the central Pacific, *J. Geophys. Res.*, 89, 11, 124-134, 1984..

LaBrecque, J.L., and C.A. Raymond, Seafloor spreading anomalies in the Magsat Field of the north Atlantic, *J. Geophys. Res.*, 90, 2565-2575, 1985.

Langel, R.A., Near-Earth satellite magnetic field measurements: A prelude to Magsat, *EOS, Trans. AGU*, 60, 667-668, 1979.

Langel, R.A., Magsat scientific investigations, *APL Technical Digest, Johns Hopkins Univ.*, 1, 214-227, 1980.

Langel, R.A., R.Coles, and M. Mayhew, Comparisons of magnetic anomalies of lithospheric origin measured by satellite and airborne magnetometers over western Canada, *Can. J. Earth Sci.*, 17, 1980.

Langel, R.A., R.H. Estes, G. Mead, and E. Lancaster, Initial geomagnetic field model from Magsat vector data, *Geophys. Res. Lett.*, 7, 793-796, 1980.

Langel, R.A., J. Berbert, T. Jennings, and R. Horner, Magsat data processing: A report for investigators, *NASA TM 82160*, NASA/GSFC, 1981.

Langel, R.A., J. Phillips, and R. Horner, Initial scalar magnetic anomaly map from Magsat, *Geophys. Res. Lett.*, 9, 4, 269-271, 1982.

Langel, R.A., R.H. Estes, and G. Mead, Some new methods in geomagnetic field modeling applied to the 1960-1980 Epoch, *J. Geomagn. Geoelectr.*, 34, 327-349, 1982.

Langel, R.A., and L. Thorning, A satellite magnetic anomaly map of Greenland, *Geophys. J. R. Astron. Soc.*, 71, 3, 599-612, 1982.

Langel, R.A., and L. Thorning, Satellite magnetic field over the Naros Strait Region, *Nares Strait: A Central Conflict in Plate Tectonics Studies of the Arctic*, P.R. Dowes and J.W. Ken, eds., *Medd. Gronland Geosci.*, 1982.

Langel, R.A., and R.H. Estes, A geomagnetic field spectrum, *Geophys. Res. Lett.*, 9, 250-253, 1982.

Langel, R.A., The magnetic Earth as seen from Magsat, initial results, *Geophys. Res. Lett.*, 9, 4, 239-242, 1982.

Langel, R.A., Magsat data availability, *The IMS Source Book*, C.T. Russell and D.J. Southwood, eds., AGU, Wash., DC., 109-111, 1982.

Langel, R.A., Results from the Magsat mission, *APL Technical Digest, Johns Hopkins Univ.*, 3, 307-323, 1982.

- Langel, R.A., C.C. Schnetzler, J. Phillips, and R. Horner, Initial vector magnetic anomaly map from Magsat, *Geophys. Res. Lett.*, 9, 4, 273-276, 1982.
- Langel, R.A., et al., Reduction of satellite magnetic anomaly data, *J. Geophys. Res.*, 54, 207-212, 1984.
- Langel, R.A., Introduction to the special issue: A perspective on Magsat results, *J. Geophys. Res.*, 90, B3, 2441-2444, 1985.
- Langel, R.A., and R.H. Estes, The near-Earth magnetic field at 1980 determined From Magsat data, *J. Geophys. Res.*, 90, B3, 2495-2510, 1985.
- Langel, R.A., D.J. Kerridge, D.R. Barraclough, and S.R.C. Malin, Geomagnetic temporal change: 1903-1982, A spline representation, *J. Geomag. Geoelectr.*, 38, 573-597, 1986.
- Langel, R.A., and R.H. Estes, Derivation of proposed international geomagnetic reference field models for 1945, 1950, 1955, 1960, *Phys. Earth Planet. Int.*, 8, 293-305, 1987.
- Langel, R.A., Satellite magnetic measurements, *Encyclopedia of Solid Earth Geophysics*, D.E. James, ed., 977-989, Van Nostrand, Reinhold, 1989.
- Lidiak, E.G., and W.J. Hinze, Relation between drill-hole basement lithology and magnetic and gravity anomalies in the east-central midcontinent: *Society of Exploration Geophysicists Technical Program, Abstracts and Biographies*, 258-260, 1982.
- Lidiak, E.G., D.W. Yuan, W.J. Hinze, M.B. Longacre, and G.R. Keller, Correlation of tectonic provinces of South America and the Caribbean with Magsat anomalies, *10th Caribbean Geological Conference*, Aug. 1983, Cartagena, Colombia, 1983.
- Longacre, M.B., Satellite magnetic investigation of South America, *M.Sc., Thesis, Purdue University*, 1981.
- Longacre, M.B., W.J. Hinze, and R.R.B. von Frese, A satellite magnetic model of northeastern South American aulacogens, *Geophys. Res. Lett.*, 9, 4, 318-321, 1982.
- Lotter, C.J., Stable inversions of Magsat data over the geomagnetic equator by means of ridge regression, *J. Geophys.*, 61, 77-81, 1987.
- Lowes, F.J., Perpendicular error effect in the DGRF model proposals, *Phys. Earth Planet. Int.*, 37, 25-34, 1985.
- Lowes, F.J., and J.E. Martin, Optimum use of satellite intensity and vector Data in modeling the main geomagnetic field, *Department of Geophys. and Planet. Phys., Univ. of Newcastle, upon Tyne*, 1986.

Lugovenko, V.N., et al., Correlation connection between the anomalous magnetic and gravitational fields for regions with different types of the Earth's crust, preprint, Academy of Sciences, the USSR, 1986.

Mayhew, M.A., Inversion of satellite magnetic anomaly data, *J. Geophys. Res.*, 45, 1980.

Mayhew, M.A., B. Johnson, and R.A. Langel, An equivalent source model of the satellite-altitude magnetic anomaly field over Australia, *Earth Planet. Sci. Lett.*, 51, 1980.

Mayhew, M.A., et al., Satellite and surface geophysical expression of anomalous crustal structure in Kentucky and Tennessee, *Earth Planet. Sci. Lett.*, 58, 395-405, 1982.

Mayhew, M.A., An equivalent layer magnetization model for the United States derived from satellite altitude magnetic anomalies, *J. Geophys. Res.*, 87, 1982.

Mayhew, M.A., Application of satellite magnetic anomaly data to Curie Isotherm mapping, *J. Geophys. Res.*, 87, 1982.

Mayhew, M.A., and S.C. Galliher, An equivalent layer magnetization model for the United States derived from Magsat data, *Geophys. Res. Lett.*, 9, 4, 311-313, 1982.

Mayhew, M.A., and R.H. Estes, Equivalent source modeling of the core magnetic field using Magsat data, *J. Geomagn. Geoelectr.*, 35, 119-130, 1983.

Mayhew, M.A., Magsat anomaly field inversion for the U.S., *Earth Planet. Sci. Lett.*, 71, 290-296, 1984.

Mayhew, M.A., Curie isotherm surfaces inferred from high-altitude magnetic anomaly data, *J. Geophys. Res.*, 90, B3, 1985.

Mayhew, M.A., B. Johnson, and P. Wasilewski, A review of problems and progress in studies of satellite magnetic anomalies, *J. Geophys. Res.*, 90, B3, 2511-2522, 1985.

Mayhew, M.A., R.H. Estes, and D. Myers, Magnetization models for the source of the Kentucky Anomaly observed by Magsat, *Earth Planet. Sci. Lett.*, 74, 117-129, 1985.

Mayhew, M.A., Curie isotherm surfaces inferred from high-altitude magnetic anomaly data, *J. Geophys. Res.*, 90, 2647-2654, 1985.

Mayhew, M. A., and J.L. LaBrecque, Crustal geological studies with Magsat and surface magnetic data, *Rev. Geophys.*, 25, 5, 971-981, 1987.

McLeod, M.G., Crustal geomagnetic field: Two-dimensional intermediate-wavelength spatial power spectra, *Phys. Earth Planet. Int.*, 31, 1983.

- McLeod, M.G., Optimal processing of satellite derived magnetic anomaly data, *Phys. Earth Planet. Int.*, 31, 1983.
- McLeod, M.G., On the geomagnetic jerk of 1969, *J. Geophys. Res.*, 90, B6, 1985.
- Meyer, J., et al., Investigations of the internal geomagnetic field by means of a global model of the Earth's crust, *J. Geophys.*, 52, 71-84, 1983.
- Meyer, J., J. Hufen, M. Siebert, and A. Hahn, On the identification of Magsat anomaly charts as crustal part of the internal field, *J. Geophys. Res.*, 90, B3, 1985.
- Mishra, D.C., and M. Venkatraydu, Magsat scalar anomaly map of India and a part of Indian Ocean-magnetic crust and tectonic correlation, *Geophys. Res. Lett.*, 12, 781-784, 1985.
- Morner, N., The lithospheric geomagnetic field: Origin and dynamics of long-wavelength anomalies, *Phys. Earth Planet. Int.*, 44, 366-372, 1986.
- Muth, L.A., and E.R. Benton, On the frozen flux velocity field at the surface of Earth's core necessary to account for the poloidal main magnetic field and its secular variation, *Phys. Earth and Planet. Int.*, 24, 245-252, 1981.
- Nakagawa, I., and T. Yukutake, Spatial properties of the geomagnetic field in the area surrounding Japan, *J. Geomagn. Geoelectr.*, 36, 443-454, 1984.
- Nakagawa, I., and T. Yukutake, Rectangular harmonic analyses of geomagnetic anomalies derived from Magsat data over the area of the Japanese Islands, *J. Geomagn. Geoelectr.*, 37, 957-977, 1985.
- Nakagawa, I., T. Yukutake, and N. Fukushima, Extraction of magnetic anomalies of crustal origin from Magsat data over the area of the Japanese Islands, *J. Geophys. Res.*, 90, B3, 2608-2616, 1985.
- Nakatsuka, N., and Y. Ono, Geomagnetic anomalies over the Japanese islands region derived from Magsat data, *J. Geomagn. Geoelectr.*, 36, 455-462, 1984.
- Negi, J.G., P. Agarwal, and N. Thakur, Vertical component Magsat anomalies and Indian tectonic boundaries, *Proc. Indian Acad. Sci. (Earth Planet. Sci.)*, 94, 35-41, 1985.
- Negi, J.G., et al., Crustal magnetisation-model of the Indian subcontinent through inversion of satellite data, *Tectonophysics*, 122, 123-133, 1986.
- Negi, J.G., et al., Prominent Magsat anomalies over India, *Tectonophysics*, 122, 345-356, 1986.

Negi, J.G., et al., Large variation of Curie depth and lithospheric thickness beneath the Indian subcontinent and a case for magnetothermometry, *Geophys. J. R. Astron. Soc.*, 88, 763-775, 1987.

Negi, J.G., et al., Can depression of the core-mantle interface cause coincident Magsat and geoidal "lows" of the central Indian Ocean?, *Phys. Earth Planet. Int.*, 45, 68-74, 1987.

Newitt, L., E. Dawson, R. Coles, and A. Nandi, Magnetic charts of Canada derived from Magsat data, *Geophys. Res. Lett.*, 9, 4, 246-249, 1982.

Noble, I.A., Magsat anomalies and crustal structure of the Churchill-Superior Boundary Zone, *M.Sc. Thesis, Univ. of Manitoba, Winnipeg*, 1983.

Nolte, H.J., and M. Siebert, An analytical approach to the magnetic field of the Earth's crust, *J. Geophys. Res.* 61, 69-76, 1987.

Oliver, R., Satellite magnetic anomalies of Africa and Europe, *Geophysics*, 48, 1983.

Oliver, R., W.J. Hinze, and R.R.B. von Frese, Reduced to pole long-wavelength magnetic anomalies of Africa and Europe, *EOS, Trans. AGU*, 64, 1983.

Parrott, M.H., Interpretation of Magsat anomalies over South America, *M.Sc. Thesis, Purdue Univ.*, 1-95, 1985.

Peddie, N.W., International geomagnetic reference field: The third generation, *J. Geomagn. Geoelectr.*, 34, 309-326, 1982.

Peddie, N.W., and E.B. Fabiano, A proposed international Geomagnetic Reference Field for 1965-1985, *J. Geomagn. Geoelectr.*, 34, 357-364, 1982.

Peddie, N.W., and A.K. Zunde, An assessment of the near-surface accuracy of the IGRF 1980 model of the main geomagnetic field, *Phys. Earth Planet. Int.*, 37, 1-4, 1985.

Phillips, R.J., and C.R. Brown, The satellite magnetic anomaly of Ahaggar: Evidence for African plate motion, *Geophys. Res. Lett.*, 12, 697-700, 1985.

Potemra, T.A., et al., The geomagnetic field and its measurement: Introduction and magnetic field satellite glossary, *APL Technical Digest, Johns Hopkins Univ.*, 1, 162-170, 1980.

Rajaram, M., and B.P. Singh, Spherical Earth modelling of the scalar magnetic anomaly over the Indian region, *Geophys. Res. Lett.*, 13, 961-964, 1986.

Rajbanshi, K., et al., Comparison of Magsat anomalies over Indian region with POGO and ground data, *Indian Inst. of Geomagnetism*, 1983.

Rajbanshi, K., et al., Isolating the components of crustal origin in satellite magnetic measurements, *Indian Inst. of Geomagnetism*, 1983.

Rao, K.N.N., et al., Fortran IV subroutines for the inversion of Magsat data using an algorithm of one-dimensional arrays, *Computers and Geosciences*, 11, 79-83, 1985.

Raymond, C.A., and J.L. LaBrecque, Magnetization of the oceanic crust: Thermo remanent magnetization or chemical remanent magnetization?, *J. Geophys. Res.*, 92, 8077-8088, 1987.

Rastogi, R., Fifth progress report on Magsat for geomagnetic studies over Indian Region, *Indian Inst. of Geomagnetism*, 1983.

Rastogi, R., Sixth progress report on Magsat for geomagnetic studies over Indian Region, *Indian Inst. of Geomagnetism*, 1984.

Regan, R.D., J.C. Cain, and W. Davis, A global magnetic anomaly map, *J. Geophys. Res.*, 30, 1975.

Regan, R.D., et al., A closer examination of the reduction of satellite magnetometer data for geological studies, *J. Geophys. Res.*, 86, 9567-9573, 1981.

Regan, R.D., and B.D. Marsh, The Bangui Magnetic Anomaly: Its geological origin, *J. Geophys. Res.*, 87, B2, 1982.

Renbarger, K.S., A crustal structure study of South America, *M.Sc. Thesis, Purdue University*, 1984.

Ridgway, J.R., Preparation and interpretation of a revised Magsat satellite magnetic anomaly map over South America, *M.Sc. Thesis, Purdue University*, 1984.

Ridgway, J.R., and W.J. Hinze, Magsat scalar anomaly map of South America, *Geophysics*, 51, 1472-1479, 1986.

Ritzwoller, M.H., and C.R. Bentley, Magsat magnetic anomalies over Antarctica and the surrounding oceans, *Geophys. Res. Lett.*, 9, 4, 285-288, 1982.

Ritzwoller, M.H., and C.R. Bentley, Magnetic anomalies over Antarctica measured from Magsat: Antarctic Earth science, *Proc. Fourth International Symposium on Antarctic Earth Sciences*, R.L. Oliver, P.R. James, and J.B. Jago, eds., Australian Academy of Science, 504-507, 1983.

Ruder, M.E., Interpretation and modeling of regional crustal structure of the southeastern United States, *M. Sc. Thesis, Pennsylvania State University*, 1986.

Ruder, M.E., and S.S. Alexander, Magsat equivalent source anomalies over the southeastern U.S.: Implications for crustal magnetization, *Earth Planet. Sci. Lett.*, 78, 33-43, 1986.

Sailor, R.V., A. Lazarewicz, and R. Brammer, Spatial resolution and repeatability of Magsat crustal anomaly data over the Indian Ocean, *Geophys. Res. Lett.*, 9, 4, 289-292, 1982.

Schlinger, C.M., Magnetization of lower crust and interpretation of regional magnetic anomalies: Example from Lofoten and Vesteralen, Norway, *J. Geophys. Res.*, 90, 11484-11504, 1985.

Schmitz, D.R., F.B. Frayser, and J.C. Cain, Application of dipole modeling to magnetic anomalies, *Geophys. Res. Lett.*, 9, 4, 307-310, 1982.

Schmitz, D.R., and J.C. Cain, Geomagnetic spherical harmonic analyses: I. Techniques, *J. Geophys. Res.*, 88, 1222-1228, 1983.

Schmitz, D.R., J. Meyer, and J.C. Cain, Modeling the Earth's geomagnetic field to high degree and order, *Geophys. J.*, 97, 421-430, 1989.

Schnetzler, C.C., An estimation of continental crust magnetization and susceptibility from Magsat data for the conterminous U.S., *J. Geophys. Res.*, 90, 2617-2620, 1985.

Schnetzler, C.C., and R.J. Allenby, Estimation of lower crust magnetization from satellite derived anomaly field, *Tectonophysics*, 93, 33-45, 1983.

Schnetzler, C.C., Satellite elevation magnetic anomaly contrasts over continent-ocean boundaries, *EOS, Trans. AGU*, 65, 1984.

Schnetzler, C.C., P.T. Taylor, and R.A. Langel, Mapping magnetized geologic structures from space: The effect of orbital and body parameters, *NASA TM 86134*, NASA/GSFC, 1984.

Schnetzler, C.C., P.T. Taylor, R.A. Langel, W. Hinze, and J. Phillips, Comparison between the recent U.S. composite magnetic anomaly map and Magsat anomaly data, *J. Geophys. Res.*, 90, B3, 2543-2548, 1985.

Sexton, J., W.J. Hinze, R.R.B. von Fresè, and L. Braile, Long wavelength aeromagnetic anomaly map of the conterminous U.S.A., *Geology*, 10, 364-369, 1982.

Shibuya, K., and K. Kaminuma, Aeromagnetic survey around the Japanese Antarctic stations, *J. Geomagn. Geoelectr.*, 36, 487-492, 1984.

Shure, L., R.L. Parker, and G. Backus, Harmonic splines for geomagnetic modeling, *Phys. Earth Planet. Int.*, 28, 1982.

Shure, L., and R.L. Parker, A preliminary harmonic spline model from Magsat data, *J. Geophys. Res.*, 90, 11505-11512, 1985.

Silva, J.B.C., Reduction to the pole as an inverse problem and its application to low-latitude anomalies, *Geophysics*, 51, 369-382, 1986.

- Singh, B.P., Mapping the Earth's magnetic field, *Science Today*, 39-42, 1981.
- Singh, B.P., et al., On utility of space-borne vector measurements in crustal studies, *Phys. Earth Planet. Int.*, 1983.
- Singh, B.P., et al., On the nature of residual trend in Magsat passes after removal of core and external components, *Annales Geophysicae*, 4, 653-658, 1986.
- Slud, E., and P. Smith, Regression models of the geomagnetic anomaly field, *Contract Report to GSFC*, March 1982.
- Srinivasan, S., et al., Analysis of data from overlapping passes over Indian Region, *Indian Inst. of Geomagnetism*, 1983.
- Starich, P.J., The south-central United States magnetic anomaly, *M.Sc. Thesis, Purdue University*, 1-76, 1984.
- Stassinopoulos, E.G., et al., Temporal variations in the Siple Station conjugate area, *J. Geophys. Res.*, 89, 5655-5659, 1984.
- Stern, D., R.A. Langel, and G. Mead, Backus Effect observed by Magsat, *Geophys. Res. Lett.*, 7, 941-944, 1980.
- Szeto, A.M.K., and W.H. Cannon, On the separation of core and crustal contributions to the geomagnetic field, *Geophys. J. R. Astron. Soc.*, 82, 319-329, 1985.
- Tanaka, M., et al., Magnetic anomalies in and around Japan based on aeromagnetic surveys., *J. Geomagn. Geoelectr.*, 36, 463-470, 1984.
- Taylor, P.T., A. Schanzle, T. Jones, R.A. Langel, and W. Kahn, Influence of gravity field uncertainties on the results from POGO and Magsat geomagnetic surveys, *Geophys. Res. Lett.*, 8, 12, 46-48, 1981.
- Taylor, P.T., Magnetic data over the Arctic from aircraft and satellite, *Cold Regions Science and Technology*, 7, 35-40, 1983.
- Taylor, P.T., Nature of the Canada Basin--implications from satellite derived magnetic anomaly data, *J. Alaska Geological Society*, 2, 1-8, 1983.
- Taylor, P.T., and J.J. Frawley, Magsat anomaly data over the Kursk Region, USSR, *Phys. Earth Planet. Int.*, 45, 255-265, 1987.
- Thomas, H.H., Petrologic model of the northern Mississippi embayment based on satellite magnetic and ground-based geophysical data, *Earth. Planet Sci. Lett.*, 70, 115-120, 1984.
- Thomas, H.H., A model of ocean basin crustal magnetization appropriate for satellite elevation anomalies, *J. Geophys. Res.*, 92, 11609-11613, 1987.

- Toft, P.B., and S.E. Haggerty, A remanent and induced magnetization model of Magsat vector anomalies over the West African Craton, *Geophys. Res. Lett.*, 13, 341-344, 1986.
- Ueda, Y., et al., A regional magnetic field model around Japan at the epoch 1980.0 and its comparison with world magnetic field models MGST (4/81) & IGRF 1980, *J. Geomagn. Geoelectr.*, 36, 471-482, 1984.
- von Frese, R.R.B., W.J. Hinze, and L. Braile, Spherical Earth gravity and magnetic anomaly analysis by equivalent point source inversion, *Earth Planet. Sci. Lett.*, 53, 1981.
- von Frese, R.R.B., W.J. Hinze, J. Sexton, and L. Braile, Regional magnetic models of the Mississippi Embayment, *EOS, Trans. AGU*, 62, 1981.
- von Frese, R.R.B., and W.J. Hinze, Regional north American gravity and magnetic anomaly correlations, *Geophys. J. R. Astron. Soc.*, 69, 745-761, 1982.
- von Frese, R.R.B., W.J. Hinze, J. Sexton, and L. Braile, Verification of the crustal component in satellite magnetic data, *Geophys. Res. Lett.*, 9, 4, 293-295, 1982.
- von Frese, R.R.B., Long-wavelength magnetic and gravity anomaly correlations of Africa and Europe, *IAGA Bulletin*, 47, 1983.
- von Frese, R.R.B., Regional anomalies of the Mississippi River Aulacogen, *Geophysics*, 48, 1983.
- von Frese, R.R.B., Regional geophysical analysis of Mississippi Embayment crustal structure, 112th Ann. Mtng. of the Soc. of Mining Engineers, *Technical Prog. and Abstracts*, 1983.
- Von Frese, R.R.B., et al., Regional magnetic anomaly constraints on continental breakup, *Geology*, 14, 68-71, 1986.
- Voorhies, C.V., and E.R. Benton, Pole strength of the Earth from Magsat and magnetic determination of the core radius, *Geophys. Res. Lett.*, 9, 4, 258-261, 1982.
- Voorhies, C.V., Magnetic location of Earth's core-mantle boundary and estimates of the adjacent fluid motion, *Ph.D. Thesis, University of Colorado*, 1-347, 1984.
- Voorhies, C.V., and G. Backus, Steady flows at the top of the core from geomagnetic field models: The steady motions theorem., *Geophys. and Astrophys. Fluid Dynamics*, 32, 1985.
- Wallis, D., J. Burrows, T. Hughes, and M. Wilson, Eccentric dipole coordinates for Magsat data presentation and analysis of external current effects, *Geophys. Res. Lett.*, 9, 4, 353-356, 1982.
- Wasilewski, P.J., H.H. Thomas, and M.A. Mayhew, The Moho as a magnetic boundary, *Geophys. Res. Lett.*, 6, 541-544, 1979

Wasilewski, P.J., and M.A. Mayhew, Crustal xenolith magnetic properties and long wavelength anomaly source requirements, *Geophys. Res. Lett.* 9, 1982.

Wasilewski, P., J., and D.M. Fountain, The Ivera Zone as a model for the distribution of magnetization in the continental crust, *Geophys. Res. Lett.*, 9, 333-336, 1982.

Wellman, P., et al., Australian long wavelength magnetic anomalies, *BMR Journal of Australian Geology and Geophysics*, 9, 297-302, 1984.

Won, I.J., and K.H. Son, A preliminary comparison of the Magsat data and aeromagnetic data in the continental U.S., *Geophys. Res. Lett.*, 9, 296-298, 1982.

Yanagisawa, M., Derivation of crustal magnetic anomalies from Magsat, *D.Sc. Thesis, Univ. of Tokyo, Tokyo*, 1983.

Yanagisawa, M., and M. Kono, Magnetic anomaly maps obtained by means of the mean ionospheric field correction, *J. Geomagn. Geoelectr.*, 36, 417-442, 1984.

Yanagisawa, M., and M. Kono, Mean ionospheric field correction of Magsat data, *J. Geophys. Res.*, 90, 2527-2536, 1985.

Yuan, D.W., E.G. Lidiak, M.B. Longacre, and G.R. Keller, Relation of Magsat anomalies to the main tectonic provinces of South America, *Society of Exploration Geophysicists Technical Program Abstracts and Biographies*, 274-276, 1983.

Yukutake, T., and J.C. Cain, Solar cycle variations of the first-degree spherical harmonic components of the geomagnetic field, *J. Geomag. Geoelectr.*, 31, 509-544, 1979.

Yukutake, T., and J.C. Cain, Solar cycle variations in the annual mean values of the geomagnetic components of observatory data, *J. Geomag. Geoelectr.*, 39, 19-46, 1986.

Zaaiman, H., and G.J. Kuhn, The application of the ring current correction model to Magsat passes, *J. Geophys. Res.*, 91, 8034-8038, 1986.

4. Technical

Aardoom, L. and P. Wilson, A modular transportable laser ranging system-MTLRS. *CSTG Bulletin*, 5, Delft Univ. of Tech., 1983.

Acuna, M.H., et al., The Magsat vector magnetometer a precision fluxgate magnetometer for the measurement of the geomagnetic field, *NASA TM 79656, NASA/GSFC*, 1978.

Acuna, M.H., The Magsat precision vector magnetometer, *APL Technical Digest*, Johns Hopkins Univ., 1, 210-213, 1980.

- Alasia, F., L. Cannizzo, G. Gerutti, and I. Marson, Absolute gravity acceleration measurements: Experiences with a transportable gravimeter, *Metrologia*, 18, Springer-Verlag, 1982.
- Alfonso, G., et al., Status on the neutral and charge drag effects of LAGEOS, *Congres Erminoni*, 1982.
- Alfonso, G., et al., Reassessment of the charge and neutral drag of LAGEOS and its geophysical implications, *J. Geophys. Res.*, 90, B11, 1985.
- Anselmo, L., P. Farinella, A. Milani, and A.M. Nobili, Effects of the Earth-reflected sunlight on the orbit of the LAGEOS satellite, *J. Astron. Astrophys.*, 117, 3-8, 1983.
- Archinal, B., and I.I Mueller, A comparison of geodetic Doppler satellite receivers, *Proc. Third International Geodetic Symposium on Satellite Doppler Positioning*, 1982.
- Balmino, G., et al., Proposal for a satellite gravity gradiometer experiment for the geosciences, *European Space Agency*, September 1985.
- Beavan, J., K. Hurst, R. Bilham, and L. Shengold, A densely-spaced array of sea-level monitors for the detection of vertical crustal deformation in the Shumagin Seismic Gap, Alaska, *J. Geophys. Res.*, 91, B9, 9067-9080, 1986.
- Beckman, B., A water vapor radiometer error model, *IEEE Trans. Geosci. and Remote Sensing*, GE-23, 1985.
- Bertiger, W.I., S.M. Lichten, and E.C. Katsigris, A demonstration of sub-meter GPS orbit determination and high precision user positioning, *IEEE Trans. Aerospace and Electronic Sys.* 4, 16-25, 1989.
- Blewitt, G., S. Lichten, P. Kroger, M. Kornreich, U. Linguister, L. Skrumeda, and W. Bertiger, Accuracy and long-term stability of GPS baseline estimates, *EOS, Trans. AGU*, 69, 44, 1988.
- Blewitt, G., Carrier phase ambiguity resolution for the global positioning system applied to geodetic baselines up to 2000 km, *J. Geophys. Res.*, 1989.
- Blewitt, G., Smart receiver algorithms, *4th Annual Workshop on GPS Geodesy at JPL*, April 1989.
- Blewitt, G., An automatic editing algorithm for GPS data, *Geophys. Res. Lett.*, (in press), 1990.
- Bock, Y., On the time delay weight matrix in VLBI geodetic parameter estimation, *Dept. of Geodetic Sci. and Surveying Report 348*, Ohio State University., 1983.

- Brunner, F., ed., *Geodetic Aspects of Electromagnetic Wave Propagation Through the Atmosphere*, Springer Verlag (Berlin), 1984.
- Chan, H.A., M.V. Moody, H.J. Paik, and J.W. Parke, Development of three-axis superconducting gravity gradiometer, *Proc. 17th International Conference on Low Temperature Physics*, V. Echern, A. Schmid, W. Weber, and J. Wuhl, eds., Kahlsruhe, W. Germany, August, 1984, Elsevier, 1984.
- Chan, H.A., M.V. Moody, H.J. Paik, and J.W. Parke, Superconducting techniques for gravity survey and inertial navigation, *IEEE Trans., Magnetics, MAG-21*, 411, 1985.
- Chan, H.A., and H.J. Paik, Superconducting gravity gradiometer for sensitive gravity measurements: I. Theory, *Phys. Rev., D35*, 3551, 1987.
- Chan, H.A., M.V. Moody, and H.J. Paik, Superconducting gravity gradiometer for sensitive gravity measurements: II. Experiment, *Phys. Rev., D35*, 3572, 1987.
- Cohen, S.C., J.D. Degnan, J.L. Bufton, J.B. Gavin, and J.B. Abshire, The geoscience laser altimetry/ranging system, *IEEE Trans. Geosci. and Remote Sensing, GE-25*, 581-592, 1987.
- Counselman, C., and S. Gourvitch, Miniature interferometer terminals for Earth surveying: Ambiguity and multipath with global positioning system, *IEEE Trans. Geosci. and Remote Sensing, GE-19*, 1981.
- Counselman, C., et al., Accuracy of baseline determinations by MITES assessed by comparison with tape, theodolite, and geodimeter measurements. *EOS, Trans. AGU*, 62, 17, 1981.
- Counselman, C., et al., Accuracy of relative positioning by interferometry with GPS: double-blind test results, *Proc. Third Int. Symposium on Satellite Doppler Positioning*, 1982.
- Davis, J.L., T.A. Herring, I.I. Shapiro, A.E.E. Rogers, and G. Elgered, Geodesy by radio interferometry: Effects of atmospheric modeling errors on estimates of baseline length, *Radio Science*, 20, 1593-1607, 1985.
- Degnan, J., W. Kahn, and T. Englar, Centimeter precision airborne laser ranging systems, *J. Surveying Engineering*, 109, 1983.
- Dixon, T.H., S.K. Wolf, Some tests of wet tropospheric calibration for the CASA Uno global positioning system experiment, *Geophys. Res. Lett.*, (submitted), 1989.
- Ekkebus, E., Problems in attaining accurate state estimates from an extended Kalman Filter: Processing laser range-only observations from a single tracking station, *Technical Thesis, Delft University of Technology, Dept. Aerospace Engineering*, 1981.

Elgered, G., Water vapor radiometry with applications to radio interferometry and meteorology. *Technical Report, 137, Chalmers Univ. of Tech.*, 1983.

Elgered, G. and P. Lundh, A dual channel water vapor radiometer system, *Research Report, 145, Chalmers Univ. of Tech.*, 1983.

Elgered, G., J.L. Davis, T.A. Herring, and I.I. Shapiro, Methods of correction for the "wet" atmosphere in estimating baseline lengths from VLBI, *Proceedings of IAU Symposium No. 129, The Impact of VLBI on Astrophysics and Geophysics*, M. Reid and J. M. Moran, eds., D. Reidel, 543-544, 1988.

Faller, J.E., E. Fischbach, Y. Fujii, K. Kuroda, H.J. Paik, and C.C. Speake, Precision experiments in search for the fifth force, *IEEE Trans. Instr. Measur.*, 38, 180, 1989.

Farrell, W., and J. Wang, State space design of a digitally controlled gravity meter. *Final Technical Report, S-Cubed*, November, 1983.

Farthing, W.H., The Magsat scalar magnetometer, *APL Technical Digest, Johns Hopkins Univ.*, 1, 205-209, 1980.

Fountain, G.H., et al., The Magsat attitude determination system, *APL Technical Digest, Johns Hopkins Univ.*, 1, 194-200, 1980.

Fuligni, F., and M. Grosso, Research relative to the development of cryogenic microwave cavity gradiometer for orbital use, *Semiannual Report on NASA Grant NAG5-338, Harvard - Smithsonian Cntr. for Astrophys.*, 1983.

Galuppi, R.G., and F.F. Mobley, Conceptual design for the magnetic field explorer (MFEx) Satellite, *Johns Hopkins*, 1984.

Gambis, D., Compression of LAGEOS laser data, *Centre d'Etudes et de Recherches*, 1983.

Goad, C.C., M.L. Sims, and L.E. Young, A comparison of four precise global positioning system geodetic receivers, *IEEE Trans. Geosci. and Remote Sensing, GE-23*, 1985.

Grossi, M., Limitations imposed by ionospheric turbulence on satellite-to-satellite Doppler measurement accuracy, *Geophys. Res. Lett.*, 9, 1982.

Gullahorn, G.E., Investigation of dynamic noise affecting geodynamics information in a tethered subsatellite, *Semiannual Report on NASA Grant NAG5-325, Harvard-Smithsonian Cntr. for Astrophys.*, 1984.

Gullahorn, G.E., F. Fuligni, and M.D. Grossi, Gravity gradiometry from the tethered satellite system, *IEEE Trans. Geosci. and Remote Sensing, GE-23*, 1985.

Hauck, H., The Program ORBDOP (Extended GEODOP), *Institut fur Angewandte Geodasie*, 1983.

- Heffernan, K.J., et al., The Magsat attitude control system, *APL Technical Digest, Johns Hopkins Univ.*, 1, 188-193, 1980.
- Herring, T., I. Shapiro, N. Bartel, B. Corey, and A. Rogers, Geodesy by radio interferometry: Ionospheric effects, *EOS, Trans. AGU*, 62, 17, 1981.
- Hurst, K.J., and J. Beavan, Improved sea level monitors for measuring vertical crustal motion in the Shumagin Seismic Gap, Alaska, *Geophys. Res. Lett.*, 14, 1234-1237, 1987.
- Janssen, M.A., A new instrument for the determination of radio path delay due to atmospheric water vapor, *IEEE Trans. Geosci. and Remote Sensing*, GE-23, 1985.
- Kahn, W.D., F.O. von Bun, D.E. Smith, T.S. Englar, and E.P. Gibbs, Performance analysis of the spaceborne laser ranging system, *Bull. Geodesique*, 54, 165-180, 1980.
- Kahn, W.D., J. Degnan, and T. Englar, The airborne laser ranging system: Its capabilities and applications, *Bull. Geodesique*, 57, 1983.
- Kahn, W.D., Accuracy of mapping the Earth's gravity field fine structure with a spaceborne gravity gradiometer mission, *NASA TM 86123, NASA/GSFC*, 1984.
- Katsigris, E.C., T.H. Dixon, D.M. Tralli, and S.M. Lichten, Modeling wet tropospheric path delays for GPS baseline estimation, *Chapman Conference on GPS Measurements for Geodynamics*, Ft. Lauderdale, FL, September 1988.
- Kolenkiewicz, R., Results of laser ranging collocations during 1983, *NASA TM 86123, NASA/GSFC*, 1984.
- Lancaster, E., T. Jennings, M. Morrissey, and R. Langel, Magsat vector magnetometer calibration using Magsat geomagnetic field measurements, *NASA TM 82046, NASA/GSFC*, 1980.
- Lanyi, G., Tropospheric calibration in radio interferometry, *Proc. of the Int. Symp. on Space Tech. for Geodyn.*, Jet Prop. Lab., 1984.
- Latimer, J., D. Hills, S. Vrtilik, A. Chaiken, D. Arnold, and M. Pearlman, An evaluation and upgrading of the SAO prediction technique, *Proc. Fourth International Workshop on Laser Ranging Instrumentation*, 1981.
- Latimer, J., J. Thorp, D. Hanlon, and G. Gullahorn, A review of network data handling procedures, *Proc. Fourth International Workshop on Laser Ranging Instrumentation*, 1981.
- Lichten, S.M., W.I. Bertiger, and E.C. Katsigris, Sub-meter GPS orbit determination and high precision user positioning: A demonstration, *AIAA/AAS Astrodynamics Conference*, paper 88-4211, Minneapolis, Minn., 8-16, August 1988.

Lichten, S.M., and W.I. Bertiger, A comparison of techniques for relative positioning with high accuracy GPS orbits, *Chapman Conference on GPS Measurements for Geodynamics*, Ft. Lauderdale, FL, September 1988.

Lichten, S.M., Estimation and filtering for high-precision GPS positioning applications, *Symposium on Factorized Estimation Applications*, 27th IEEE Conference on Decision and Control, Austin, TX, December 6-7, 1988.

Lichten, S.M., W.I. Bertiger, and U.J. Lindqwister, The effect of fiducial network strategy on high-accuracy GPS orbit and baseline determination, *Fifth International Geodetic Symposium on Satellite Positioning*, Las Cruces, NM, March 1989.

Lichten, S.M., High accuracy global positioning system orbit determination: Progress and prospects, *Proc. IAG General Meeting*, Edinburgh, August 3-12, 1989.

Lindqwister, U., G. Blewitt, and W. Bertiger, Future of GPS network processing, *EOS, Trans. AGU*, 69, 44, 1988.

Lindqwister, U., G. Blewitt, and T. Yunck, Continuously operating GPS networks (Co-Op Nets), *EOS, Trans. AGU*, 1989.

Lindqwister, U., G. Blewitt, and T. Yunck, GPS continuously operating array, *4th Annual Workshop on GPS Geodesy at JPL*, April 1989.

Lindqwister, U.J., S.M. Lichten, and G. Blewitt, Precise regional baseline estimations using a priori orbital information, *Geophys. Res. Lett.*, (in press), 1990.

Malla, R.P., and S.C. Wu, Deriving a unique reference frame for GPS measurements, *IEEE Position Location and Navigation Symposium (PLANS 88)*, Orlando, FL, December 1988.

Malla, R.P., and S.C. Wu, Establishing a geocentric reference frame for satellite positioning, *Proc. Fifth International Geodetic Symposium on Satellite Positioning*, Las Cruces, NM, March 1989.

Martin, C., M. Torrence, and C. Misner, Relativistic effects on an Earth-orbiting satellite in the barycenter coordinate system, *J. Geophys. Res.*, 90, B11, 1985.

Mashhoon, B., H.J. Paik, and C.M. Will, Detection of the gravitomagnetic field using an orbiting superconducting gravity gradiometer: I. Theoretical Principles, *Phys. Rev.*, D39, 2825, 1989.

Masters, E., A. Stolz, and B. Hirsch, A method of filtering and compressing LAGEOS range data, *Bull. Geodesique*, 57, 1983.

- Mignard, F., Action de l'atmosphère neutre et ionisée sur le mouvement d'un satellite - application à LAGEOS, *Annales Geophysicae*, 37, 1981.
- Mobley, F.F., L. Eckard, G. Fountain, and G. Ousley, Magsat: A new satellite to survey the Earth's magnetic field, *IEEE Trans. on Magnetics*, 16, 758-760, 1980.
- Mobley, F.F., Magsat performance highlights, *APL Technical Digest, Johns Hopkins Univ.*, 1, 175-178, 1980.
- Moody, M.V., H.A. Chan, and H.J. Paik, Preliminary tests of a newly developed superconducting gravity gradiometer, *IEEE Trans. Magnetic*, MAG-19, 461, 1983.
- Moody, M.V., H.A. Chan, and H.J. Paik, Superconducting gravity gradiometer for terrestrial and space applications, *J. Appl. Phys.* 60, 4308, 1986.
- Mooers, C., et al., The potential of satellite-based radar altimeters, *EOS, Trans. AGU*, 65, 10, 1984.
- Moon, W., and R. Tang, On hydrodynamic correction of Seasat altimeter data, *Marine Geodesy*, 9, 291-334, 1985.
- Noomen, R., Aerodynamic drag and geomagnetic perturbations: Their modeling and effect on spacecraft dynamics, *Technical Thesis, Dept. of Aerospace Eng., Delft Univ. of Tech.*, 1983.
- Ousley, G.W., Overview of the Magsat program, *APL Technical Digest, Johns Hopkins Univ.*, 1, 171-174, 1980.
- Paik, H.J., Superconducting tensor gravity gradiometer with SQUID readout, *Proc. SQUID Applications to Geophysics Workshop*, Los Alamos, New Mexico, 1980.
- Paik, H.J., Superconducting tensor gravity gradiometer for satellite geodesy and inertial navigation, *J. Astron. Sci.*, 29, 1, 1981.
- Paik, H.J., Superconducting tensor gravity gradiometer, *Bull. Geodesique.*, 55, 370, 1981.
- Paik, H.J., Superconducting tensor gravity gradiometer, *Proc. Symposium on Inertial Technology for Surveying and Geodesy*, Banff, Canada, 1981.
- Paik, H.J., A spaceborne superconducting gravity gradiometer for mapping the Earth's gravity field, *Digest of the 1981 International Geoscience and Remote Sensing Symposium*, Washington, DC, 1981.
- Paik, H.J., Development of a sensitive superconducting gravity gradiometer for geological and navigational applications, *NASA Contractor Report 4011*, 1986.

Paik, H.J., Tests of general relativity in Earth orbit using a superconducting gravity gradiometer, *Adv. Space Res.*, 9, 41, 1989.

Pearlman, M.R., N.W. Lanham, J.M. Thorp, and J. Wohn, SAO calibration techniques, *Proc. Fourth International Workshop on Laser Ranging Instrumentation*, 1981.

Pearlman, M.R., N.W. Lanham, J. Wohn, and J.M. Thorp, Current status and upgrading of the SAO laser ranging systems, *Proc. Fourth International Workshop on Laser Ranging Instrumentation*, 1981.

Puell, H. and P. Wilson, Aufbau und funktionsweise des Nd:Yag-lasers im modularen transportablen laserentfernungsmesssystem, *Institut fur Angewandte Geodasie*, 1983.

Putney, B., Geodyn systems development, *NASA TM 86123*, NASA/GSFC, 1984.

Reinhart, E., Global positioning systems - present status of technology and future trends, *Institut fur Angewandte Geodasie*, 1983.

Resch, G.M., Water vapor - the wet blanket of microwave interferometry, *Atmospheric Water Vapor*, Deepak, Wilkerson, and Ruhnke, eds., Academic Press, New York, 1980.

Resch, G.M., Another look at the optimum frequencies for a water vapor radiometer, *TDA Prog. Rep.*, 42-76, *NASA TDA Tech. Development*, 1983.

Resch, G.M., Inversion algorithms for water vapor radiometers operating at 20.7 and 31.4 GHz, *TDA Prog. Rep.*, 42-76, *NASA TDA Tech. Development*, 1983.

Resch, G.M., Water vapor radiometry in geodetic applications, *TDA Prog. Rep.*, *NASA TDA Tech. Development*, 1983.

Resch, G.M., D. Hogg, and P. Napier, Radiometric correction of atmospheric pathlength fluctuations in interferometric experiments, *Radio Science*, 19, 1, 1984.

Royden, H., R. Miller, and R. Buennagel, Comparison of NAVSTAR satellite L-band ionospheric calibrations with Faraday-Rotation measurements, *Radio Science*, May-June, 1984.

Rubincam, D.P., and N. Weiss, The orbit of LAGEOS and solar eclipses, *J. Geophys. Res.*, 90, B11, 1985.

Saburi, Y., et al., Development of K-3 VLBI System in RRL for US-Japan joint experiment, *Fifth Ann. NASA Geodynamic Program Conference and Crustal Dynamics Project Review*, NASA HQ., 1982.

Saburi, Y., et al., The first US-Japan VLBI test observation by use of K-3 System at the Radio Research Laboratories, *J. Radio Research Lab.*, 31, 132, 1984.

- Schenkel, F.W., and R.J. Heins, The Magsat three axis arcsecond precision attitude transfer system, *J. British Interplant. Soc.*, 34, 539-546, 1981.
- Scherneck, H.-G., Crustal loading affecting VLBI sites, *Proc. IAG Symposium: The Role of Gravimetry in Geodynamics*, IUGG Gen. Assembly, Hamburg, 1984.
- Scherneck, H.-G., Tidal gravimetry: Physical models and numerical methods for the reduction of environmental and instrumental problems in applications to Earth and ocean tide measurements, *Ph.D. Thesis, Uppsala University*, 1986.
- Shelus, P.J., MLRS: A lunar/artificial satellite laser ranging facility at the McDonald Observatory, *IEEE Trans. Geosci. and Remote Sensing*, GE-23, 1985.
- Shuster, M.D., et al., In-flight estimation of spacecraft attitude sensor accuracies and alignments, *J. Guidance, Control, and Dynamics*, 5, 339-343, 1982.
- Smola, J.F., The Magsat magnetometer boom system, *APL Technical Digest, Johns Hopkins Univ.*, 1, 201-204, 1980.
- Soltau, G., GPS-Macrometer test at the geodetic observatory at Wettzell, FRG, *Institut fur Angewandte Geodasie*, 1983.
- Soltau, G., Terrestrial supplementary geodetic survey at the stations of a global geodetic network, *Institut fur Angewandte Geodasie*, 1983.
- Souriau, A., and M. Souriau, A filtering procedure of great circle data, *Annales. Geophysicae*, 1, 1983.
- Souriau, A., and M. Souriau, Test of tectonic models by great circle data, *Geophys. J. R. Astron. Soc.*, 73, 1983.
- Sovers, O., et al., Ocean tidal loading in intercontinental VLBI baseline measurements, *EOS, Trans. AGU*, 64, 1983.
- Spiess, F., et al., Seafloor referenced positioning: Needs and opportunities, *Panel on Ocean Bottom Positioning of the National Research Council's Committee on Geodesy*, 54, National Academy Press, 1983.
- Spiess, F., and D. Boegeman, An acoustic transponder for precision measurement of sea floor strain, *EOS, Trans. AGU*, 65, 45, 1984.
- Spiess, F., Analysis of a possible sea floor strain measurement system, *Marine Geodesy*, 9, 385-398, 1985.
- Spiess, F., Sub-oceanic geodetic measurements, *IEEE Trans. Geosci. and Remote Sensing*, GE-23, 1985.

Tang, G., Studies of extragalactic radio source structure and its effects on geodetic VLBI measurement, *Ph.D. Thesis, Chalmers University of Technology*, 1988.

Tossman, B.E., et al., Magsat attitude control system design and performance, *Proc. AIAA Guidance and Control Conference*, Danvers, MA, August 11-13, 95-104, 1980.

Tralli, D.M., and S.M. Lichten, Stochastic estimation of tropospheric path delays in global positioning system measurements, *Bull. Geodesique*, (submitted), 1989.

Truehaft, R., et al., Empirical troposphere modeling from DSN intercontinental VLBI data, *EOS, Trans. AGU*, 65, 1984.

Van Dam, T.M., and J.M. Wahr, Deformation of the Earth's surface due to atmospheric loading: Effects on gravity and baseline measurements, *J. Geophys. Res.*, 92, 1281-1286, 1987.

Van Dam, T.M., and J.M. Wahr, A comparison of NMC and FNOC sea level pressure values, *Proc. of 1987 Altimeter Algorithm Conference*, D. Chelton, ed., 1988.

van Hulzen, J., Kalman filter satellite orbit determination using single-station laser ranging observations, *Technical Thesis, Delft University of Technology, Dept. Aerospace Engineering*, 1981.

Vermaat, E., and B. van Gelder, On the eccentricity of MTLRS, *Report of the Dept. of Geodesy, Mathematical and Physical Geodesy*, 83.4, *Delft Univ. of Tech.*, 1984.

Vermeer, M., Kalman Filter orbit determination for geodetic satellite laser ranging: A theoretical inquiry, *Thesis, Delft Univ. of Tech., Dept. Aerospace Engineering*, 1981.

Wakker, K., B. Ambrosius, and J. van Hulzen, Kalman filter orbit improvement from Kootwijk laser range observations, *Adv. Space Res.*, 1, 1981.

Wakker, K., and B. Ambrosius, Kalman filter satellite orbit improvement using laser range measurements from a single tracking station, *Adv. in Theory and Tech. of Applications of Nonlinear Filters and Kalman Filters (AGARD)*, 1982.

Wasch, J., Choix d'un modele de rayonnement k'albedo terrestre, Calcul Pratique de son effet sur la Trajectoire D'un Satellite, *Congres Ermioni*, 1982.

Webster, W.J., P.T. Taylor, C.C. Schnetzler, and R.A. Langel, The magnetic field of the Earth: Performance considerations for space-based observing systems, *IEEE Trans. Geosci. and Remote Sensing*, GE-23, 1985.

Wilson, P., A modular transportable laser ranging system, *CSTG Bull.*, 5, *Institut fur Angewandte Geodasie*, 1983.

Wu, S.C., W.G. Melbourne, and T. P. Yunck, Impact of tracking network variation on GPS determination, *AIAA Aerospace Sciences Meeting*, Reno, NV, January 1988.

Wu, S.C., and R.P. Malla, Determination of a geocentric coordinate frame for GPS measurements, *AIAA/AAS Astrodynamics Conference*, 88-4210, Minneapolis, Minn., August 1988.

Wyatt, F., K. Beckstrom, and J. Berger, Optical anchor - A geophysical strainmeter, *Bull. Seis. Soc. Am.*, 72, 1707, 1982.

Young, L., D. Spitzmesser, and L. Buennagel, SERIES, A novel use of GPS satellites for positioning, *Proc. IAG/IUGG Symposium on Point Positioning in Marine Geodesy*, 1983.

5. General

Anderson, A.J., and A. Cazenave, eds., *Space Geodesy and Geodynamics*, Academic Press, London, 1986.

Anderson, D.L., Hotspots, polar wander, Mesozoic convection, and the geoid, *Nature*, 297, 1982.

Anderson, D.L., The Earth as a planet: Paradigms and paradoxes, *Science*, 223, 1983.

Anderson, D.L., Surface wave tomography, *Calif. Inst. of Tech.*, 1984.

Araki, T., T. Iyemori, S. Tsunomura, T. Kamei, and H. Maeda, Detection of an ionospheric current for the preliminary impulse of the geomagnetic sudden commencement, *Geophys. Res. Lett.*, 9, 4, 341-346, 1982.

Araki, T., et al., Polar cap vertical currents associated with northward interplanetary magnetic field, *Geophys. Res. Lett.*, 11, 23-26, 1984.

Araki, T., et al., Sudden commencements observed by Magsat above the ionosphere, *J. Geomag. Geoelectr.*, 36, 507-520, 1984.

Araki, T., Recent research of geomagnetic sudden commencements, Prospect and Retrospect in Studies of Geomagnetic Field Disturbances, *Geophys. Res. Lab.*, Univ. of Tokyo, 117-125, 1985.

Backus, G., Isotropic probability measures in infinite dimensional spaces, *Proc. Nat. Acad. Sci.*, 84, 8755-8757, 1987.

Backus, G., Comparing hard and soft prior bounds in geophysical inverse problems, *Geophys. J.*, 94, 249-261, 1988.

Barfield, J.N., et al., Three-dimensional observations of Birkeland Currents, *J. Geophys. Res.*, 91, 4393-4404, 1986.

Bender, P.L., et al., The lunar laser ranging experiment, *Science*, 182, 229-238, 1973.

Bender, P.L., Establishment of terrestrial reference frames by new observational techniques, *Reference Coordinate Systems for Earth Dynamics*, E.M. Gaposchkin and B. Kolaczek, eds., D. Reidel, 1981.

Benton, E.R., Magnetic probing of planetary interiors, *Phys. Earth Planet. Int.*, 20, 111-118, 1979.

Bertiger, W.I., and C.L. Thornton, GPS-based system for satellite tracking and geodesy, *Navigation: Journal of the Institute of Navigation*, 36, Spring 1988-89.

Bilham, R., J. Beavan, K. Evans, and K. Hurst, Crustal deformation metrology at Lamont-Doherty Geological Observatory, *Earthquake Prediction Res.*, 3, 391-411, 1985.

Bilham, R., R. Yeats, and S. Zerbini, Space geodesy and the global forecast of earthquakes, *EOS, Trans. AGU*, 70, 5, 65, 1989.

Blewitt, G., W.G. Melbourne, W.I. Bertiger, T.H. Dixon, P.M. Kroger, S.M. Lichten, T.K. Meehan, R.E. Neilan, L.L. Skrumeda, C.L. Thornton, S.C. Wu, and L.E. Young, GPS geodesy with centimeter accuracy, *Lecture Notes in Earth Sciences*, 19, *GPS Techniques Applied to Geodesy and Surveying*, E. Groten and R. Strauss, eds., Springer-Verlag, 1988.

Blewitt, G., T. Yunck, S. Lichten, W. Bertiger, and S. Wu, GPS geodesy: A status report, *International Workshop on High Precision Navigation*, Stuttgart, 1988.

Buennagel, L., D. Spitzmesser, and L. Young, One nano-second time synchronization using SERIES and GPS, *Proc. Fourteenth Ann. Precise Time and Time Interval Application and Planning Meeting*, JPL, December 1982.

Burrows, J.R., et al., A study of high latitude Current systems during quiet geomagnetic conditions using Magsat data, *Magnetospheric Currents*, T. Potemra, ed., AGU, Wash. DC, 28, 104-114, 1984.

Bythrow, P.F., and T.A. Potemra, The relationship of total Birkeland Currents to the merging electric field, *Geophys. Res. Lett.*, 10, 573-576, 1983.

Bythrow, P.F., et al., Variation of the auroral Birkeland Current pattern associated with the north-south component of the IMF, *Magnetospheric Currents*, T. Potemra, ed., AGU, Wash. D.C., 28, 131-136, 1984.

Caputo, M., The reddening of the spectra of the parameters and the energy of earthquakes, *Earthquake Prediction Res.*, 1, 1982.

Caputo, M., and G. Faito, Statistical analysis of the tsunamis of the Italian coasts, *J. Geophys. Res.*, 87, 1982.

Carter, W.E., D.S. Robertson, and M.D. Abell, An improved polar motion and Earth rotation monitoring service using radio interferometry, *Time and the Earth's Rotation*, D.D. McCarthy and J.D.H. Pilkington, eds., D. Reidel, 191-198, 1979.

Carter, W.E., J.F. Dracup, L.D. Hothem, D.S. Robertson, and W.E. Strange, NGS activities to support development of radio interferometric surveying techniques, *Radio Interferometry Techniques for Geodesy*, NASA Conference Publication 2115, 9-22, 1980.

Carter, W.E., and D.S. Robertson, Geodynamic measurements from the HRAS-Westford POLARIS interferometer, *Proc. IAG General Meeting, Tokyo, Japan*, 1982.

Carter, W.E., D.S. Robertson, and J. MacKay, Geodetic radio interferometric surveying: Applications and results, *J. Geophys. Res.*, 90, B6, 1985.

Carter, W.E., and D.S. Robertson, A modern Earth orientation monitoring service: Functions, goals and methods of observation, *Proc. International Conference on Earth Rotation and the Terrestrial Reference Frame, Part II, Vol. 2*, Ohio State University, 536-550, 1985.

Carter, W.E., D.S. Robertson, T.E. Pyle, and J. Diamante, The application of geodetic radio interferometric surveying to the monitoring of sea level, *Geophys. J. R. Astron. Soc.*, 87, 3-13, 1986.

Clark, T.A., C.C. Counselman III, P.G. Ford, L.B. Hanson, H. F. Hinteregger, W.J. Klepczynski, C.A. Knight, D.S. Robertson, A.E.E. Rogers, J.W. Ryan, I.I. Shapiro, and A.R. Whitney, Synchronization of clocks by very-long-baseline interferometry, *IEEE Trans. Instrumentation and Measurement*, IM-28, 184-187, 1979.

Chan, H.A., and H.J. Paik, A true Laplacian detector for null test of the inverse square law of gravitation, *Proc. 9th International Conference on General Relativity and Gravitation*, Jena, East Germany, 1980.

Chan, H.A., M.V. Moody, and H.J. Paik, Null test of the gravitational inverse square law, *Phys. Rev. Lett.* 49, 1745, 1982.

Chan, H.A., and H.J. Paik, Experimental test of a spatial variation of the Newtonian gravitational constant at large distances, *Precision Measurement and Fundamental Constants II*, B.N. Taylor and W.D. Phillips, eds., Natl. Bur. Stand. (U.S.) Spec. Publ. 617, 601, 1984.

Chao, B.F., On the maximum entropy/autoregressive modeling of time series, *NASA TM 86057*, NASA/GSFC, 1984.

Chao, B.F., On the use of maximum entropy/autoregressive spectrum in harmonic analysis of time series, *NASA TM-86057*, NASA/GSFC, 1984.

Chao, B.F., As the world turns, *EOS, Trans. AGU*, 46, 766-770, 1985.

Chao, B.F., Feynman's dining hall dynamics, *Phys. Today*, 42, 2, 15, 1989.

Chao, B.F., and R.S. Gross, The global geodynamic effect of the Macquarie Ridge earthquake, *EOS, Trans. AGU*, 70, 1197, 1989.

Christodoulidis, D.C., and D.E. Smith, The role of satellite laser ranging through the 1990's, *NASA TM 95104*, NASA/GSFC, 1984.

Coates, R.J., H.V. Frey, G.D. Mead, and J.M. Bosworth, Space Age Geodesy: The NASA crustal dynamics project, *IEEE Trans. Geosci. and Remote Sensing*, GE-23, 4, 360-367, 1985.

Cohen, S., and D. Smith, LAGEOS scientific results: Introduction, *J. Geophys. Res.*, 90, B11, 1985.

Dickey, J.O., J.G. Williams, and C.F. Yoder, Results from lunar laser ranging analysis, *EOS, Trans. AGU*, 61, 46, 939, 1980.

Dickey, J.O., and J.G. Williams, Geodynamical applications of lunar laser ranging, *EOS, Trans. AGU*, 63, 18, 301, 1982.

Dickey, J.O., Activity report of IUGG/IAG Special Study Group 5-98, Atmospheric excitation of the Earth's rotation, *CSTG Bulletin 7*, I.I. Mueller, ed., Dept. of Geodetic Science and Surveying, Ohio State University, 164, 1984.

Dickey, J.O., J.G. Williams, and X.X. Newhall, Fifteen years of lunar laser ranging: Accomplishments and future challenges, *Proc. Fifth Int. Workshop on Laser Rang. Inst.*, Royal Greenwich Observatory, Sept. 1984, J. Geignebef, ed., 1, 1985.

Dickey, J.O., Activities and goals of the IUGG/IAU Special Study Group 5-98, *Proc. International Symposium of Space Techniques for Geodynamics*, Sopron, Hungary, July 9-13, 1984, 1985.

Dickey, J.O., An overview of the IUGG/IAG Special Study Group 5-98, Atmospheric excitation of the Earth's rotation, 66, 250, 1985.

Dickey, J.O., P.B. Esposito, J.F. Lestrade, R.P. Linfield, W.G. Melbourne, XX Newhall, A.E. Niell, R.A. Preston, E.M. Standish, J.G. Williams, D.O. Muhleman, G.L. Berge, and D.J. Rudy, Coordinate systems: Interconnections, unification and implications, *EOS, Trans. AGU*, 67, 16, 259, 1986.

Dickey, J.O., P.B. Esposito, J.F. Lestrade, R.P. Linfield, W.G. Melbourne, XX Newhall, A.E. Niell, R.A. Preston, E.M. Standish, J.G. Williams, D.O. Muhleman, G.L. Berge, and D.J. Rudy,

- Reference frame studies at JPL/Caltech, *Highlights of Astronomy*, J.P. Swings, ed., 7, 1986.
- Dickey, J.O., J.L. Fanelow, W.G. Melbourne, X.X. Newhall, E.M. Standish, and J.G. Williams, Reference frames: Determinations and connections, *Proc. IAU Symposium No. 128, The Earth's Rotation and Reference Frames for Geodesy and Geodynamics*, A.K. Babcock and G.A. Wilkins, eds., D. Reidel, 41-48, 1988.
- Dickey, J.O., Impact of space geodesy on geophysics, Invited Union Lecture, *EOS, Trans. AGU*, 69, 301, 1988.
- Dickey, J.O., X.X. Newhall, and J.G. Williams, Investigating relativity using lunar laser ranging: Geodetic precession and the Nordvedt effect, *Symposium No. 15, Relativistic Gravitation, XXVII COSPAR - ESPOO, Advances in Space Research*, (in press), 1989.
- Dickey, J.O., and J.G. Williams, Lunar laser ranging: Results and future roles, *Reports on the MERIT-COTES Campaign on Earth Rotation and Reference Systems, Part 1. Proc. Third MERIT Workshop and the Joint MERIT-COTES Working Group Meetings*, G.A. Wilkins, ed., Royal Greenwich Observatory, (in press), 1989.
- Dickman, S.R., and D.J. Steinberg, New aspects of the equilibrium pole tide, *Geophys. J. R. Astron. Soc.*, 86, 515-529, 1986.
- Dickman, S.R., and J.R. Preisig, Another look at North Sea pole tide dynamics, *Geophys. J. R. Astron. Soc.*, 87, 295-304, 1987.
- Dickman, S.R., The self-consistent dynamic pole tide in non-global oceans, *Geophys. J.*, 94, 519-543, 1988.
- Dickman, S.R., A complete spherical harmonic approach to luni-solar tides, *Geophys. J.*, 99, 457-468, 1988.
- Dickman, S.R., Theoretical investigation of the oceanic inverted barometer response, *J. Geophys. Res.*, 93, 14941-14946, 1988.
- Dickman, S.R., The pole tide in deep oceans, *Variations in Earth Rotation (AGU Monograph)*, D.D. McCarthy, ed., (in press).
- Dickman, S.R., Experiments in tidal mass conservation (Research Note), *Geophys. J.*, (in press), 1990.
- Engebretson, M.J., et al., On the relationship between morning sector irregular magnetic pulsations and field aligned currents, *J. Geophys. Res.*, 89, 1602-1612, 1984.
- Eubanks, T.M., J.A. Steppe, and J.O. Dickey, Climatology through geodesy: Connections between length of day changes, The southern oscillation and 40-to 60-Day atmospheric oscillations, *IUGG, Interdisciplinary Symposium, Low latitude Ocean-Atmosphere Interactions, IUGG XIX General Assembly, Vancouver, August 1987, Abstracts*, 1, 1987.

Faller, J.E., E. Fischbach, Y. Fujii, K. Kuroda, H.J. Paik, and C.C. Speake, Precision experiments in search for the fifth force, *IEEE Trans. Instrumentation and Measurement*, (in press), 1988.

Felsentreger, T., The Erodyn and QRPIG computer programs, *NASA TM 86123, NASA/GSFC*, 1984.

Ferrari, T.M., W.S. Sinclair, W.L. Sjogren, J.G. Williams, and C.F. Yoder, Geophysical parameters of the Earth-moon system, *J. Geophys. Res.*, 85, 3939-3951, 1980.

Frey, H.V., and J.M. Bosworth, Measuring contemporary crustal motions: NASA's crustal dynamics project, *Earthquakes and Volcanoes, USGS*, 20, 3, 1988.

Fujii, R., and J. Takenaka, Large scale Birkeland Currents and ionospheric conductivities under geomagnetic quiet condition, *Prospect and Retrospect in Studies of Geomagnetic Field Disturbances, Geophys. Res. Lab., U. of Tokyo*, 211-219, 1985.

Gross, R.S., and T.M. Eubanks, Estimating the "noise" component of various atmospheric angular momentum time series, *EOS, Trans. AGU*, 69, 1153, 1988.

Gurnis, M., A. Raefsky, G.A. Lyzenga, and B.H. Hager, Finite element solution of thermal convection on hypercube concurrent computers and applications, Pasadena, CA, January 19-20, 1988, *The Association for Computer Machinery*, New York, 1176, 1988.

Hager, B.H., and A. Mori, Color movies of two-dimensional transient convection, *EOS, Trans. AGU*, 65, 271, 1984.

Harrison, C.G.A., W.M. Kaula, and R.A. Langel, Gravitational and magnetic fields, *EOS, Trans. AGU*, 66, 501-502, 1985.

Hastings, D., On the availability of geoscientific collaborators of and in Africa, *Geoexploration*, 20, 201-205, 1982.

Hastings, D., J. Dwyer, D. Greenlee, J. Reynolds, C. Trautwein, and D. Orr, Case histories in the manual and digital synthesis of Landsat geophysical, and other data, *Geophysics*, 47, 1982.

Hastings, D., Synthesis of geophysical data with space-acquired imagery: A review, *Adv. Space Res.*, 1983.

Haxby, W.F., G.D. Karner, J.L. LaBrecque, and J.K. Weissel, Digital images of combined oceanic and continental data sets and their use in tectonic studies, *EOS, Trans. AGU*, 64, 995-1004, 1983.

Hermance, J.F., Regionalization of global electromagnetic induction data: A theoretical model, *Phys. Earth Planet. Int.*, 27, 1982.

Hermance, J.F., The internal contribution to Sq current systems, *IUGG Gen. Assembly*, 1983.

Hermance, J.F., Internal/external and ionospheric/magnetospheric current systems, *IUGG Gen. Assembly*, 1983.

Hermance, J.F., Electromagnetic induction studies, *Geophys. and Space Phys.*, 21, 1983.

Hermance, J.F., Electromagnetic induction by finite wavenumber source fields in 2-D lateral heterogeneities; The traverse electric mode, *Geophys. J. R. Astron. Soc.*, 78, 1, 159-180, 1984.

Hide, R., and J.O. Dickey, Forecasting and exploiting changes in the Earth's rotation, *Research activities in Atmospheric and Ocean Modeling*, CAS/JSC Working Group on Numerical Experimentation, World Meteorological Organization/ICSU World Climate Research Programme, G.J. Boer, ed., 1988.

Hopfl, R., and N. Brandl, Ein neues empfangerkonzept für das laserentfernungsmesssystem, *Institut für Angewandte Geodäsie*, 1983.

Hothem, L., C. Goad, and B. Remondi, GPS satellite surveying - practical aspects, *Canadian Surveyor*, 38, 3, 177-192, 1984.

Hughes, T.J., D. Wallis, J. Burrows, and M. Wilson, Model predictions of magnetic perturbations observed by Magsat in dawn-dusk orbit, *Geophys. Res. Lett.*, 9, 357-360, 1982.

ICCG, Applications of space technology to operational geodynamic and geodetic measurement services, *Interagency Coordination Committee for Geodynamics*, NASA, Washington DC, 1982.

ICCG, Federal implementation plan for the application of space technology to crustal dynamics and earthquake research, *Interagency Coordination Committee for Geodynamics*, NASA, Washington, DC, 1982.

IASOM, Report of the workshop on the spaceborne geodynamics ranging system, *Institute for Advanced Study in Orbital Mechanics*, Report TR-79-2, University of Texas at Austin, 1979.

Iijima, T., N. Fukushima, and R. Fujii, Transverse and parallel geomagnetic perturbations over the polar regions observed by Magsat, *Geophys. Res. Lett.*, 9, 4, 369-372, 1982.

Iijima, T., T. Potemra, L. Zanetti, and P. Bythrow, Large scale Birkeland Currents in the dayside polar region during strongly northward IMF: A new Birkeland Current system, *J. Geophys. Res.*, 89, 7441-7452, 1984.

Iijima, T., Polar cap signatures in electric fields, currents and particles for northward IMF, *Bz: Prospect and retrospect in studies of geomagnetic field disturbances*, *Geophys. Res. Lab.*, University of Tokyo, 196-210, 1985.

Iijima, T., and T. Shibaji, Global characteristics of northward IMF-associated (NBZ) field-aligned currents, *J. Geophys. Res.*, 92, 2408-2424, 1987.

Iyemori, T., A statistical study of ULF waves observed by Magsat at ionospheric altitude, *Proc. NIPR Symp. Upper Atmos. Phys.*, 1, 146-152, 1988.

Iyemori, T., et al., Amplitude distribution of small-scale magnetic fluctuations over the polar ionosphere observed by Magsat, *J. Geophys. Res.*, 90, 12335-12339, 1985.

JGR, Special issue on Magsat results, *J. Geophys. Res.*, 90, B3, 1985.

JGR, LAGEOS scientific results, *J. Geophys. Res.*, 90, B11, 1985.

Johns, C.M., J.O. Dickey, T.M. Eubanks, and J.A. Steppe, The role of the Antarctic Circumpolar Current in the Earth's angular momentum budget, *EOS, Trans. AGU*, 68, 1244, 1987.

Kamide, Y., D.S. Evans, and J.C. Cain, A comparison of field-aligned current signatures simultaneously observed by the Magsat and TIROS/NOAA spacecraft, *J. Geomag. Geoelect.*, 36, 521-527, 1984.

Kane, R.P., Central plane of the ring current responsible for geomagnetic disturbance in the South-American regions, *Annales Geophysicae*, 37, 271-280, 1981.

Kane, R.P., Comparison of SSC magnitudes at Magsat altitudes and at ground locations, *J. Geophys. Res.*, 90, B3, 2445-2450, 1985.

Kane, R.P., and N.B. Trivedi, Storm time changes of geomagnetic field at Magsat altitudes and their comparison with changes at ground locations, *J. Geophys. Res.*, 90, B3, 2451-2464, 1985.

Kaula, W.M., Geodynamic problems, *Proc. 9th GEOP Conf.*, Rept. 280, Dept. Geod., Ohio State Univ., 345-351, 1979.

Kaula, W.M., Geodynamics from satellites, *Advan. Astronaut. Sci.*, 41, 1980.

Kaula, W.M., The changing shape of the Earth, *Nature*, 303, 756, 1983.

Kaula, W.M., and D. Williams, Transformation of velocity fields on a spherical surface, *Geodesy in Transition*, K.P. Schwartz and G. Lachapelle, eds., Univ. Calgary, Alberta, 177-183, 1983.

Kaula, W.M., C.G.A. Harrison, and 16 others: *The Geopotential Research Mission: Scientific Rationale*, NASA, 18, 1983.

Kaula, W.M., Use of the global positioning system for surveying, *XV Quadr. Gen. Assembly Pan Amer. Inst. Geog. and Hist.*, Rio de Janeiro, 10, 1986.

- Kaula, W.M., Surveying with the global positioning system (GPS), *Proc. Symp. Geod. Pos. for the Surveyor*, Univ. of Cape Town, 121-132, 1986.
- Kaula, W.M., Overview, *The Interdisciplinary Role of Space Geodesy*, I.I. Mueller and S. Zerbini, eds., Springer Verlag, Heidelberg, 1-8, 1988.
- Kaula, W.M., Introduction, *The Interdisciplinary Role of Space Geodesy*, I.I. Mueller and S. Zerbini, eds., Springer Verlag, Heidelberg, 9-17, 1988.
- Kawasaki, K., J.C. Cain, and R.D. Peters, Dipole axially symmetric, external field components of the geomagnetic field, *J. Geomag. and Geoelectr.*, 40, 1085-1102, 1988.
- Kawasaki, K., S. Matsushita, and J.C. Cain, Least squares and integral methods for the spherical harmonic analysis of the Sq-field, *PAGEOPH*, (to be published), 1989.
- Kolenkiewicz, R., and S. Zerbini, LAGEOS II: a collaborative NASA-ASI mission, *CSTG Bulletin, International Coordination of Space Techniques for Geodesy and Geodynamics*, Deutsches Geodatisches Forschungsinstitut, Munich, 11, 13-18, 1989.
- Klumpar, D.M., and D.M. Greer, A technique for modeling the magnetic perturbations produced by field-aligned current systems, *Geophys. Res. Lett.*, 9, 361-364, 1982.
- Koblinsky, C., Ocean circulation studies, *NASA TM 86123*, NASA/GSFC, 1984.
- Lambeck, K., Satellite geophysics, *Terra Cognita*, 3, Australian Nat. Univ., 1983.
- Lambeck, K., *Geophysical Geodesy*, Oxford University Press, 704, 1988.
- Lanchester, B., and D. Wallis, Magnetic field disturbances over auroral arcs observed from Spitsbergen, *J. Geophys. Res.*, 90, B3, 2473-2480, 1985.
- Langel, R.A., Induced fields as measured by the OGO 2, 4, and 6 spacecraft, *Second Workshop on Electromagnetic Induction with the Earth*, abstract, 1974.
- Langel, R.A., G. Ousley, J. Berbert, J. Murphy, and M. Settle, The Magsat mission. *Geophys. Res. Lett.*, 9, 4, 243-245, 1982.
- Langel, R.A., and R.H. Estes, Large-scale, near-earth magnetic fields from external sources and the corresponding induced internal field, *J. Geophys. Res.*, 90, B3, 2487-2494, 1985.
- Langel, R.A., and B.J. Benson, The Magsat bibliography, *NASA TM 87822*, 1987.

Lelgemann, D., Application of laser ranging to geodynamics, *Institut fur Angewandte Geodasie*, 1983.

Lichten, S., G. Blewitt, W. Bertiger, and U. Lindqwister, Regional and global fiducial strategies for high-accuracy baselines from GPS, *EOS, Trans. AGU*, 69, 44, 1988.

Linder, H.G., Data management plan for crustal dynamics project, *NASA/GSFC X-931-81-18*, 1981.

Linder, H.G. and C.E. Noll, Crustal dynamics data information system users guide, *NASA/GSFC X-931-82-14*, 1982.

Linder, H.G., C.E. Noll, and J.M. Behnke, The crustal dynamics data information system, *EOS, Trans. AGU*, 68, 16, 1987.

Linder, H.G., C.E. Noll, and J.M. Behnke, Advances of the crustal dynamics data information system, *EOS, Trans. AGU*, 1988.

Lyzenga, G.A., A. Raefsky, and B.H. Hager, Solving finite-element problems on a concurrent processor, *NASA, Tech. Briefs*, 11, 75, 1987.

Lyzenga, G.A., A. Raefsky, and B. Nour-Omid, Implementing finite element software on Hypercube machines, *Proc. Third Conference on Hypercube Concurrent Computers and Applications*, Pasadena, CA. January 19-20, 1988, The Association for Computer Machinery, New York, 1176, 1988.

Maeda, H., Analysis of the daily geomagnetic variation with the use of Magsat data, *J. Geomagn. Geoelectr.*, 33, 181-188, 1981.

Maeda, H., T. Iyemori, T. Araki, and T. Kamei, New evidence of a meridional current system in the equatorial ionosphere, *Geophys. Res. Lett.*, 9, 41, 337-340, 1982.

Maeda, H., T. Kamei, T. Iyemori, and T. Araki, Geomagnetic perturbations at low latitudes observed by Magsat, *J. Geophys. Res.*, 90, B3, 2481-2486, 1985.

Marsh, J.G., F.J. Lerch, and R.G. Williamson, Estimation of geodynamic and geodetic parameters from Starlette laser ranging data, *Proc. Third International Symposium on the Use of Artificial Satellites for Geodesy and Geodynamics*, Ermioni, Greece, September 1982, National Technical University, Athens, Greece, 1984.

Mashhoon, B., H.J. Paik, and C.M. Will, Detection of the gravitomagnetic field using an orbiting superconducting gravity gradiometer: I. Theoretical Principles, *Phys. Rev. D*.39, 2825, 1989.

McNutt, S.R., and R.J. Beavan, Eruptions of Pavlof Volcano, and their possible modulation by ocean load and tectonic stresses, *J. Geophys. Res.*, 92, 11509-11523, 1987.

- Meertens, C.M., and J.M. Wahr, The topographic effect on tilt, strain and displacement measurements, *J. Geophys. Res.*, 91, 14, 057-062, 1986.
- Melbourne, W.G., T.P. Yunck, and S.C. Wu, Precision positioning of Earth orbiting remote sensing systems, *Adv. Astronaut. Sci.*, 64, AAS Publications, 1988.
- Newhall, XX, Numerical representation of planetary ephemerides, *Celest. Mech.*, 45, 1989.
- Newhall, XX, E.M. Standish, and J.G. Williams, DE 102, A numerically integrated ephemeris of the moon and planets spanning fourty-four centuries, *Astron. Astrophys.*, 125, 150-167, 1983.
- Moody, M.V., H.A. Chan, H.J. Paik, and C. Stephens, A superconducting penetration depth thermometer, *Proc. 17th International Conference on Low Temperature Physics*, Karlsruhe, West Germany, August, 1984, B. Echern, A. Schmid, W. Weber, and H. Wuhl, eds., Elsevier, 1984.
- Moody, M.V., Q. Kong, H.J. Paik, and J.W. Parke, Composition-independent null test of the gravitational inverse square law, *Proc. 5th Marcel Grossman Meeting on General Relativity*, Perth, Australia, August, 1988.
- Morelli, C., Activity report 1979-1982, IAG., *International Gravity Comm.*, Universita di Trieste, 1982.
- Morelli, C., Geodesy: Italian national report to IAG, XVIII Gen. Assembly IUGG, Universita di Trieste, 1983.
- Mueller, I.I., Tecnicas geodesicas tridimensionales, *J. Asociacion Salvadorena de Ingenieros y Arquitectos*, 61 and 62, 1980.
- Mueller, I.I. and B. Archinal, Geodesy and the global positioning system, *Proc. International Symposium on Geodetic Networks and Computations*, IAG, vol. IV: *Modern Observations Techniques for Terrestrial Networks*, Deutsche Geodatische Kommission, Series B, 258/IV, Munich, 1982.
- Mueller, I.I., S. Zhu, and Y. Bock, Reference frame requirements and the MERIT campaign - Proposal for extra observations, *Dept. Geodetic Science and Surveying Report 329*, Ohio State University, 1982.
- Mueller, I.I., Report of the IAG/IAU joint working group on the establishment and maintenance of a conventional terrestrial reference system (COTES), *Proc. of IAG Symposia*, XVIII Gen. Assembly, 2, 1983.
- Mueller, I.I., ed., *Proc. International Conference on Earth Rotation and the Terrestrial Reference Frame*, July 31-August 2, 1985, Ohio State University.
- NAS, Applications of a dedicated gravitational satellite mission, *Nat. Acad. Sci., Committee on Geodesy*, Washington, DC, 1979.

NASA, *The terrestrial environment, solid Earth and ocean physics, Applications of space and astronomic techniques*, W.M. Kaula, ed., *Report of a study at Williamstown, MA, to the National Aeronautics and Space Administration*, August 1969.

NASA, et al., *The coordinated federal program for the applications of space technology to crustal dynamics and earthquake research*, Washington, DC, 1979.

NASA, *Application of space technology to crustal dynamics and earthquake research*, NASA TP-1464, 1979.

NASA, *Geodynamics program: Annual Report for 1979*, NASA TM 81978, Geodynamics Program Office, Washington, DC, 1980.

NASA, *The requirements and feasibility of the gravsat mission: A report of the gravsat users working group*, Geodynamics Program Office, Washington, DC, 1980.

NASA, et al., *Interagency plan for coordination and use of Earth gravity field survey data from space*, Geodynamics Program Office, Washington, DC, 1980.

NASA, et al., *Interagency coordination plan for the development of the application of the NAVSTAR global positioning system (GPS) for geodetic surveying*, Geodynamics Program Office, Washington, DC, 1980.

NASA, *Laser ranging system development for crustal dynamics applications*, Geodynamics Program Office, Washington, DC, 1980.

NASA, *Geodynamics program: Annual report for 1980*, NASA TM 84010, Geodynamics Program Office, Washington, DC, 1981.

NASA, *Geodynamics program: Annual report for 1981*, NASA TM 85126, Geodynamics Program Office, Washington, DC, 1982.

NASA, *Geopotential research program*, Geodynamics Program Office, Washington, DC, 1982.

NASA, *Report of the gravity field workshop held at NASA/GSFC, February 24-26, 1982*, NASA TM 84003, Geodynamics Program Office, Washington, DC, 1982.

NASA, *Report of a magnetic field workshop, July 7-9, 1982*, Geodynamics Program Office, Washington, DC, 1982.

NASA, *Fourth annual conference on the NASA geodynamics program (Abstracts)*, Geodynamics Program Office, Washington, DC, 1982.

NASA, *Geodynamics program: Annual report for 1982*, NASA TM 85842, Geodynamics Program Office, Washington, DC, 1983.

NASA, *The NASA geodynamics program: An overview*, NASA TP-2147, Geodynamics Program Office, Washington, DC, 1983.

NASA/PSN, Report of the NASA/PSN LAGEOS-II study group, NASA Geodynamics Program Office and Piano Spaziale Nazionale, 1983.

NASA, Geopotential research mission scientific rationale, Report of the geopotential research mission science steering group, Geodynamics Program Office, Washington, DC, 1983.

NASA, Spaceborne gravity gradiometers, NASA Conference Pub. 2305, Geodynamics Program Office, Washington, DC, 1984.

NASA, Report of a geodynamics workshop, NASA Conference Pub. 2325, Geodynamics Program Office, Washington, DC, 1984.

NASA, Geodynamics program: Fifth annual report, NASA TM 87359, Geodynamics Program Office, Washington, DC, 1984.

NASA, Magnetic field survey working group, A satellite mission to measure the geomagnetic field and its secular change, Geodynamics Program Office, Washington, DC, 1984.

NASA, Life cycle cost comparison of four space technologies for crustal motion measurements (Final Report, ORI), Geodynamics Program Office, Washington, DC, 1984.

NASA, Geopotential research mission, Proc. Conference at the Univ. of Maryland, College Park, MD, October 29-31, 1984, NASA Conference Pub. 2390, Geodynamics Program Office, Washington, DC, 1985.

NASA, Geopotential research mission scientific rationale, Report of the geopotential research mission science steering group, Geodynamics Program Office, Washington, DC, 1985.

NASA, Crustal dynamics project: Catalogue of site information, NASA TM 86218, NASA/GSFC August 1985.

NASA, Geopotential research mission science, engineering and program summary, NASA TM 86240, NASA/GSFC 1986.

NASA, Geophysical and geodetic requirements for global gravity field measurements: 1987-2000, Report of a Gravity Workshop held in Colorado Springs, CO, February 1987, to the Geodynamic Program Office, Washington, DC, 1988.

NASA, Superconducting gravity gradiometer mission, Vol. II, Study team technical report, , S.H. Morgan and H.J. Paik, eds., NASA TM 4091, NASA/MSFC, 1988.

NASA, Crustal dynamics project: Catalogue of site information, C.E. Noll, ed., NASA RP 1198, NASA/GSFC, 1988.

NASA, NASA geodynamics program summary report: 1979-1987, Progress and future outlook, NASA TM 4065, Geodynamics Program Office, Washington, DC, 1988.

Newhall, X.X., J.O. Dickey, and J.G. Williams, Lunar laser ranging: Geophysical results, *EOS, Trans. AGU*, 69, 333, 1988.

Newhall, X.X., J.G. Williams, and J.O. Dickey, Relativity modeling in lunar laser ranging data analysis, *Proc. IAG Symposia, Relativistic Effects in Geodesy, Advances in Gravity Field Modelling, Analysis of Satellite Altimetry*, 78-82, 1988.

Noll, C.E., The development of selected data base applications for the crustal dynamics data information system, *NASA TM 83886, NASA/GSFC*, 1981.

Noll, C.E., J.M. Behnke, and H.G. Linder, Quick-look guide to the crustal dynamics project's data information system, *NASA TM 87818, NASA/GSFC*, 1987.

Noll, C.E., The crustal dynamics data information system (CDDIS), *NASA Research and Technology*, 1987, *NASA/GSFC*, 1989.

Nour-Omid, B., A. Raefsky, and G.A. Lyzenga, Solving finite element equations on concurrent processors, *Proc. of the Symposium on Parallel Computations and their Impact on Mechanics*, Boston, MA, December 13-18, 1987.

Oguti, T., et al., Proof of ionospheric origin of PiC pulsation, *Prospect and Retrospect, Studies of Geomagnetic Field Disturbances*, Geophys. Res. Lab., University of Tokyo, 180-195, 1985.

Paik, H.J., and H.A. Chan, A null test of the gravitational inverse square law, *Proc. 3rd Marcel Grossmann Meeting on Recent Developments of General Relativity*, Shanghai, China, 1982.

Paik, H.J., Precision gravity experiments using superconducting accelerometers, *Near Zero: New Frontiers of Physics*, C.W.F. Everitt, ed., Freeman, San Francisco, 1982.

Paik, H.J., and J. Murphy, Test of gravitational inverse square law using an orbiting gravity gradiometer, *EOS, Trans. AGU*, 65, 196, 1984.

Paik, H.J., Geodesy and gravity experiment in Earth orbit using a superconducting gravity gradiometer, *IEEE Trans. Geosci. and Remote Sensing*, GE-23, 524, 1985.

Paik, H.J., Laboratory and geophysical experiments of gravitation - an overview, *Proc. International Symposium on Experimental Gravitational Physics*, Guangzhou, China, 1987.

Paik, H.J., B. Mashhoon, and C.M. Will, Detection of gravito-magnetic field using an orbiting superconducting gravity gradiometer, *Proc. International Symposium on Experimental Gravitational Physics*, Guangzhou, China, 1987.

Paik, H.J., J.-S. Leung, S.H. Morgan, and J. Parker, Global gravity survey by an orbiting gravity gradiometer, *EOS, Trans. AGU*, 1988.

- Paik, H.J., Gravity gradiometers, *Proc. Workshop on Relativistic Gravitation Experiments in Space*, Annapolis, MD, 1988.
- Paik, H.J., Q. Kong, M.V. Moody, and J.W. Parke, Composition-independent null test of the gravitational inverse square law, *5th Force - Neutrino Physics*, O. Fackler and J. Tran Thanh Van, eds., Editions Frontieres, Gif-sur-Yvette Cedex, France, 531, 1988.
- Paik, H.J., Tests of general relativity using a superconducting gravity gradiometer in Earth orbit, *Proc. 5th Marcel Grossman Meeting on General Relativity*, Perth, Australia, 1988.
- Paik, H.J., Tests of general relativity in Earth orbit using a superconducting gravity gradiometer, *Adv. Space Res.*, 9, 41, 1989.
- Parke, J.W., H.J. Paik, H.A. Chan, and M.V. Moody, Sensitivity enhancement of inertial instruments by means of a superconducting negative spring, *Proc. 10th International Cryogenic Engineering Conference*, Helsinki, Finland, 1984.
- Pearlman, M.R., Some current issues in satellite laser ranging, *Proc. Fourth International Workshop on Laser Ranging Instrumentation*, 1981.
- Potemra, T.A., Studies of auroral field-aligned currents with Magsat, *APL Technical Digest, Johns Hopkins Univ.*, 1, 228-232, 1980.
- Potemra, T.A., et al., By-dependent convection patterns during northward interplanetary magnetic field, *J. Geophys. Res.*, 89, 9753-9760, 1984.
- Potemra, T.A., Field-aligned (Birkeland) currents, *Space Sci. Rev.*, 42, 295-311, 1985.
- Purcell, G.H., J.M. Srinivasan, L.E. Young, S.J. DiNardo, E.L. Hushbeck, T.K. Meehan, T.N. Munson, and T.P. Yunck, Measurement of aircraft position, velocity, and attitude using Rogue GPS receivers, *5th International Geodetic Symposium on Satellite Positioning*, Las Cruces, NM, March 13-17, 1989.
- Raefsky, A., M. Gurnis, B.H. Hager, and G.A. Lyzenga, Finite element solution of thermal convection on a hypercube concurrent computer, *EOS, Trans. AGU*, 69, 463, 1988.
- Raefsky, A., and G.A. Lyzenga, Parallel processing techniques for finite element simulations of tectonics: Hypercubes and related multiprocessors, *EOS, Trans. AGU*, 69, 1327, 1988.
- Robertson, D.S., Some considerations in the use of very-long-baseline interferometry to establish reference coordinate systems for geodynamics, *Reference Coordinate Systems for Earth Dynamics*, E.M. Gaposchkin and B. Kolaczek, eds., D. Reidel, 205-216, 1981.

Robertson, D.S., and W.E. Carter, Operation of the National Geodetic Survey Polaris Network, *Proc. Symposium No. 5: Geodetic Applications of Radio Interferometry*, NOAA Technical Report NOS 95, NGS 24, 63-70, 1982.

Robertson, D.S., and W.E. Carter, Relativistic deflection of radio signals in the solar gravitational field measured with VLBI, *Nature*, 310, 1984.

Robertson, D.S., The astrometric possibilities of VLBI, *Proc. IAU Symposium 109*, D. Reidel, 1984.

Robertson, D.S. and W.E. Carter, Relativistic deflection of radio signals in the solar gravitational field measured with very-long-baseline interferometry, *Nature*, 310, 572-574, 1984.

Robertson, D.S., The astrometric possibilities of VLBI, astrometric techniques, H. Eichhorn and R. Leacock, eds., D. Reidel, 143-156, 1986.

Robertson, D.S., F.W. Fallon, and W.E. Carter, Celestial reference coordinate systems: Submillisecond of arc repeatability demonstrated with VLBI Observations, *Astron. J.*, 91, 1456-1462, 1986.

Robertson, D.S., Radio Interferometry, *Rev. of Geophys.*, 25, 867-870, 1987.

Robertson, D.S., Very long baseline interferometry, *Encyclopedia of Geophysics*, (in press), 1988.

Rogers, A.E., et al., Very-long baseline radio interferometry: The mark III system for geodesy, astrometry, and aperture synthesis, *Science*, 219, 1983.

Rosen, R.D., D.A. Salstein, T. Nehr Korn, M.R.P. McCalla, A.J. Miller, J.O. Dickey, T.M. Eubanks, and J.A. Steppe, Medium range numerical forecast of atmospheric angular momentum, *Monthly Weather Review*, 115, 2170-2175, 1987.

Rosen, R.D., D.A. Salstein, T. Nehr Korn, J.O. Dickey, T.M. Eubanks, J. Steppe, M.R.P. McCalla, and A.J. Miller, Forecasting length-of-day using numerical weather prediction models, *Proc. IAU Symposium No. 128, The Earth's Rotation and Reference Frames for Geodesy and Geodynamics*, A.K. Babcock and G.A. Wilkins, eds., D. Reidel, 285-286, 1988.

Rosen, R.D., D.A. Salstein, T. Nehr Korn, J.O. Dickey, T.M. Eubanks, J.A. Steppe, M.R.P. McCalla, and A.J. Miller, Forecasting atmospheric angular momentum and length-of-day using operational meteorological models, AGU Geophysical Monograph, *Proc. IUGG, Interdisciplinary Symposium, Variations in the Earth's Rotation*, IUGG XIX General Assembly, Vancouver, August 1987, (in press), 1989.

- Rossen, M. and J. Hermance, Identifying origin of instabilities of induction parameter estimations from Sq data, *EOS, Trans. AGU*, 64, 1983.
- Roy, M., Equatorial ionospheric currents derived from Magsat data, *Geophys. Res. Lett.*, 10, 741-744, 1983.
- Salstein, D.A., and R.D. Rosen, Earth rotation data as a proxy index of global wind fluctuations, *Am. Meteor. Soc. Conf. on Climate Variations*, Los Angeles, 1985.
- Salstein, D.A., and R.D. Rosen, Earth rotation as a proxy for interannual variability in atmospheric circulation: 1860-present, *J. Climate Appl. Meteor.*, 25, 1870-1877, 1986.
- Schaffrin, B., Model choice and adjustment techniques in the presence of prior information, *Dept. of Geodetic Sci. and Surveying Rep. 351*, Ohio State University, 1983.
- Schneeberger, R., D. Pavlis, and I.I. Mueller, Use of simultaneous Doppler-derived ranges in the geometric mode, *Proc. Third International Geodetic Symposium on Satellite Doppler Positioning*, Las Cruces, New Mexico, 1982.
- Schneider, M., et al., VLBI in Wettzell, *CSTG Bulletin*, 5, *Institut fur Angewandte Geodasie*, 1983.
- Settle, M., and J.V. Taranik, Mapping the Earth's magnetic and gravity fields from space: Current status and future prospects, *Adv. Space Res.*, 3, 147-155, 1983.
- Shapiro, I.I., Geodesy by radio interferometry: A critical review, *IEEE Digest, International Geoscience and Remote Sensing Symposium (IGARSS '81)*, 1, 1981.
- Shapiro, I.I., Use of space techniques for geodesy, *Mass. Inst. of Tech.*, 1983.
- Sheng-Yuan, and I.I. Mueller, Effects of adopting new precession nutation and equinox correction on the terrestrial reference frame, *Bull. Geodesique*, 57, 1, 1983.
- Skrumeda, L., W. Melbourne, G. Blewitt, S. Lichten, T. Meehan, T. Yunck, and U. Lindqwister, Developments in GPS results and technology at JPL, *Ron Mather Symposium on Four-Dimensional Geodesy*, Sydney, Australia, March 1989.
- Smith, D., et al., Geodetic and geophysical results from LAGEOS, *Adv. Space Res.*, 5, 2, 219-228, 1985.
- Smith, D., Space techniques for earthquake studies, *Earthquake Predict. Res.*, 3, 379-389, 1985.
- Spieß, F., et al., Seafloor referenced positioning: Needs and opportunities, *Panel on Ocean Bottom Positioning of the National Research Council's Committee on Geodesy*, 54, National Academy Press, 1983.

Standish, E.M., X.X. Newhall, J.G. Williams, and J.O. Dickey, Reference frame of the ephemeris, *Proc. IAU Symposium No. 128, The Earth's Rotation and Reference Frames for Geodesy and Geodynamics*, A.K. Babcock and G.A. Wilkins, eds., D. Reidel, 49-54, 1988.

Standish, E.M. and J.G. Williams, Dynamical reference frames in the planetary and Earth-moon systems, *Inertial Coordinate Systems on the Sky, Proc. IAU Symposium 141*, Kluwer Academic Publishers, Dordrecht, (in press), 1989.

Steinmetz, L., et al., A 550Km long Moho traverse in the Tyrrhenian Sea, from O.B.S. recorded PN waves, *Geophys. Res. Lett.*, 10, 6, 1983.

Stolz, A., B. Harvey, D. Jauncey, A. Neill, D. Morabito, R. Preston, G. Green, K. Lambeck, A. Tzioumis, A. Watkinson, G. Royle, and D. Johnson, Geodetic surveying with quasar radio interferometry, *Australian Surveyor*, 31, 305-314, 1983.

Stolz, A., et al., Geodesy in Australia: National report for 1979-83. *Australian Academy of Sci. Report*, July 1983.

Sugiura, M., and D. Poros, An improved model equatorial electrojet with a meridional current system, *J. Geophys. Res.*, 74, 1969.

Sugiura, M., and M.P. Hagan, Geomagnetic Sq variations at satellite altitudes: Is Sq correction important in Magsat data analysis?. *Geophys. Res. Lett.*, 6, 397, 1979.

Suzuki, A., and N. Fukushima, Sunward or anti-sunward electric current in space below the Magsat level, *Geophys. Res. Lett.*, 9, 4, 345-348, 1982.

Suzuki A., and N. Fukushima, Anti-sunward space current below the Magsat level during magnetic storms, *J. Geomagn. Geoelectr.*, 36, 493-506, 1984.

Suzuki, A., M. Yanagisawa, and N. Fukushima, Anti-sunward space current below the Magsat level during magnetic storms and its possible connection with partial ring current in the magnetosphere, *J. Geophys. Res.*, 90, B3, 2465-2472, 1985.

Takeda, M., Three-dimensional ionospheric currents and field-aligned currents generated by asymmetric dynamo action in the ionosphere, *J. Atmos. Terr. Phys.*, 44, 187-193, 1982.

Takeda, M. and H. Maeda, F-Region dynamo in the evening-interpretation of equatorial D anomaly found by Magsat, *J. Atmos. Terr. Phys.*, 45, 401-408, 1983.

Taylor, P., T. Keating, W. Kahn, R. Langel, D. Smith, and C. Schnetzler, GRM: Observing the terrestrial gravity and magnetic fields in the 1990's, *EOS, Trans. AGU*, 64, 609-611, 1983.

- Taylor, P.T., Spaceborne magnetometry, *ESA-NASA Workshop on a Joint Solid Earth Programme, ESA Sp-1094*, 17-22, 1987.
- Truen, A., and J.M. Wahr, Spectroscopic analysis of global tide gauge sea level data, *Geophys. J. Int.*, (in press).
- Trupin, A.S., and J.M. Wahr, Stack of global tide gauge sea level data, *Variations in Earth Rotation, AGU Monograph Series*, D. McCarthy, ed., (in press).
- Turcotte, D., R. Smalley, and S. Solla, On the collapse of loaded fractal trees, *Nature*, 31, 1985.
- Turcotte, D., Fractals and fragmentation, *J. Geophys. Res.*, 91, B2, 1986.
- Wadge, G., and T. Dixon, A geological interpretation of Seasat-SAR imagery of Jamaica, *J. of Geol.*, 92, 5, 1984.
- Wahr, J.M., The rotation of the Earth, *Sky and Telescope*, 71, 545-549, 1986.
- Wahr, J. M., Geodesy and geophysics, *Quo Vadimus: Where Are We Going?*, *AGU Monograph Series*, G. Garland, V. Keilis-Borok and H. Moritz, eds., (in press).
- Welker, J., Seasat altimetry for surface height of inland seas, *NASA TM 86123, NASA/GSFC*, 1984.
- Williams, J., Lunar and planetary ephemerides: Accuracy, inertial frames, and zero points, *Proc. Fourth International Workshop on Laser Ranging Instrumentation*, 1. University of Bonn, 1982.
- Williams, J.G., J.O. Dickey, W.G. Melbourne, and E.M. Standish, Unification of celestial and terrestrial coordinate systems, *Proc. IAG/IUGG XVIIIth General Assembly, Hamburg, FRG, August 15-27, 1983*, H. Kautzleben, J.D. Bossler, G. Lachapelle, and A.M. Wassef, eds., Ohio State University, 2, 493-508, 1983.
- Williams, J., J. Dickey, W. Melbourne, and E. Standish, Unification of celestial and terrestrial coordinate systems, *Proc. IAG Symposia*, 2, 1984.
- Williams, J.G., X.X. Newhall, and J.O. Dickey, Lunar laser ranging: Dynamics mixed with geodynamics, lunar science and relativity, Division of Dynamical Astronomy Meeting, *Bull. Amer. Astron. Soc.*, 1986.
- Williams, J.G., X.X. Newhall, and J.O. Dickey, Lunar gravitational harmonics and reflector coordinates, *Proc International Symposium: Figure and Dynamics of the Earth, Moon and Planets, special issue of the Monograph Series of the Research Institute of Geodesy, Topography and Cartography*, September 1986, Prague, Czechoslovakia, P. Holota, ed., 643-648, 1987.

Williams, J.G., and E.M. Standish, Dynamical reference frames in the planetary and Earth-moon systems, *Reference Frames in Astronomy and Geophysics*, B. Kolaczek, J. Kovalevsky, and I.I. Mueller, eds., Kluwer Academic Publishers, 67-90, 1989.

Wilkins, G.A., ed., *Project MERIT, Joint Working Group on the Rotation of the Earth*, IAU/IUGG, 1980.

Wilson, P., Das mobile laserentfernungsmesssystem und sein geplanter einsatz im rahmen der internationalen arbeiten zur geodynamik, *Institut fur Angewandte Geodasie*, 1983.

Wilson, P., Regional activities: Western, central and eastern Mediterranean areas, *Institut fur Angewandte Geodasie*, 1983.

Wilson, P., and L. Aardoom, Seasat tracking over Europe, Ellis Horwood Ltd. Publ., 1983.

Yoder, C.F., J.G. Williams, J.O. Dickey, and XX Newhall, Tidal dissipation in the Earth and moon from lunar laser ranging, *Conference on the origin of the Moon*, Kona, Hawaii, October 14-16, Lunar and Planetary Institute, 1985.

Yukutake, T., and J.C. Cain, Solar cycle variations in the annual mean values of the geomagnetic components of observatory data, *J. Geomag. Geoelectr.*, 39, 19-46, 1986.

Yunck, T.P., and B.H. Hager, Roles for the global positioning system in tracking short term change in the oceans, atmosphere, and lithosphere, *International Alfred Wegener Conference on the Contribution of Solid Earth Sciences to the IGBP*, Hamburg, FRG, December 13-15, 1988.

Yunck, T.P., G.F. Lindal, and C.-H. Liu, The role of GPS in precise Earth observation, *IEEE Position Location and Navigation Symposium (PLANS 88)*, Orlando, FL, December 1988.

Yunck, T.P., and W.G. Melbourne, Geoscience from GPS tracking by Earth satellites, *Proc. IAG General Meeting*, Edinburgh, August 3-12, 1989.

Yunck, T.P., The GPS Earth observatory, *4th Annual Workshop on GPS Geodesy at JPL*, April 1989.

Yunck, T., S. Wu, S. Lichten, W. Bertiger, U. Lindqwister, and G. Blewitt, Toward centimeter orbit determination and millimeter geodesy with GPS, *5th International Geodetic Symposium on Satellite Positioning*, Las Cruces, NM, March 1989.

Zanetti, L.J., and T.A. Potemra, Correlated Birkeland Current signatures from the Triad and Magsat magnetic field data, *Geophys. Res. Lett.*, 9, 349-352, 1982.

Zanetti, L.J., T.A. Potemra, and M. Sugiura, Evaluation of high altitude disturbances with Magsat (The importance of the Magsat geomagnetic field model), *Geophys. Res. Lett.*, 9, 4, 365-368, 1982.

Zanetti, L.J., et. al., Ionospheric and Birkeland Current distributions inferred from the Magsat magnetometer data, *J. Geophys. Res.*, 88, 4875-4884, 1983.

Zanetti, L.J., et. al., Three-dimensional Birkeland-ionospheric current system determined from Magsat, *Magnetospheric Currents*, T. Potemra, ed., AGU, Wash. D.C., 28, 123-130, 1983.

Zanetti, L.J., T.A. Potemra, T. Iijima, W. Baumjohann, and P. Bythrow, Ionospheric and Birkeland Current distributions for northward interplanetary magnetic field: Inferred polar convection, *J. Geophys. Res.*, 89, 7453-7458, 1984.

Zanetti, L.J., and T. A. Potemra, The relationship of Birkeland and ionospheric current systems to the interplanetary magnetic field, *Solar Wind-Magnetosphere Coupling*, 547-562, 1986.

Zerbini, S., The LAGEOS-II Project, *Proc. Intern. Conference on The Interdisciplinary Role of Space Geodesy*, E. Majorana Centre, Erice, July 22-29, 1988, I.I. Mueller and S. Zerbini, eds., Spring Verlag, Heidelberg, 1988.





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