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HANDBOOK FOR MAP VOLUME 17

Edited by
C. F. Sechrist, Jr.

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M I D D L E

A T M O S P H E R E

P R O G R A M

HANDBOOK FOR MAP

Volume 17

Edited by

C. F. Sechrist, Jr.
Chairman
MAP Publications Committee

August 1985

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CONDENSED MINUTES OF MAP STEERING COMMITTEE MEETING

November 25, 1984
Kyoto, Japan

1. The Chairman welcomed new members Roper and Manson.

2. The agenda was approved.

3. Minutes of the Hamburg meeting were approved. At Graz, there was a pick-up meeting of MAPSC, the report of it is in Attachment 1.

4. MAC Resolution is given in Attachment 2.

5. New Projects.

   Three new projects were approved: MAC-SINE (Summer in Northern Europe), MAC-EPSILON (Thrane, coordinator); New International Equatorial Observatory (NIEO) (Kato, coordinator). One new project was approved subject to receiving more complete documentation: Middle Atmosphere in the Southern Hemisphere (MASH) (O'Neill, coordinator).

6. Other Business.

   (a) Resignation of Wada as IUPAP representative to MAPSC (Attachment 3). A possible replacement was discussed. The Chairman will write to A. W. Wolfendale. The Chairman will also look into the case of WMO representative to MAPSC.

   (b) Publication of Extended Abstracts of papers presented at the Kyoto MAP Symposium in a MAP Handbook was discussed and recommended.

7. Date and location of next MAPSC meeting.

Prague, Czechoslovakia, August 1985. Evenings of first week. Details to be decided when more information about IAGA meetings is known.

ATTACHMENT 1

REPORT ON MIDDLE ATMOSPHERE PROGRAM STEERING COMMITTEE (MAPSC)

JULY 1984

This report describes the progress in the Middle Atmosphere program since the Ottawa meeting of SCOSTEP. It covers the operations of the Committee itself; publications; symposia and workshops; and other plans for the future. The number of MAP projects has grown from five to 14; detailed descriptions of their progress can be found in the MAP Newsletters and Handbooks.

STEERING COMMITTEE

The MAP Steering Committee met in Hamburg in August 1983, and will meet again in Kyoto in November 1984 and in Prague in August 1985. An informal meeting of the members present in Graz was held in June 1984. The Kyoto meeting is in conjunction with the Second MAP Assembly of national representatives (the first was held in Edinburgh in August 1981), in conjunction with the Kyoto MAP Symposium.

R. Murgatroyd resigned as Vice Chairman of MAPSC and was replaced by K. Labitzke as Vice Chairman and R. G. Roper replaced him as IAMAP representative. J. Gregory resigned as SCOSTEP representative and was replaced by A. H. Manson. The MAP Steering Committee is greatly indebted to Dr. Murgatroyd and Dr. Gregory for their outstanding services in the initial phases of MAP.

PUBLICATIONS

Nine MAP Handbooks have been issued so far and four more will appear by the end of 1984. The MAPSC is grateful to NASA for its assistance in printing and distributing these reports. Seven of these contained administrative material such as national reports; minutes of meetings and the Assembly; the MAP Directory; reports of MAP Study Groups and Projects. Four of these volumes are devoted to proceedings of conferences and workshops. One is devoted to data publication and one is a technique manual. It is anticipated that five more Handbooks will appear in 1985.

The MAP Newsletter is now published by the Indian MAP Commission (IMAP), and the MAP Steering Committee expresses it gratitude to IMAP for this valuable service to the MAP community.

SYMPOSIA AND WORKSHOPS

A symposium on "Ground-Based Studies of the Middle Atmosphere" was held at Schwerin, GDR, in May 1983, and a Middle Atmosphere Sciences Symposium at IUGG in August 1983 in Hamburg. In June 1984, a symposium on "First Results from MAP" was held in Graz, it included six sessions of papers covering the entire field of MAP. Another broad MAP symposium will be held at Kyoto in November 1984. There will be ten sessions on MAP-related subjects at Prague, jointly sponsored by IAMAP and IAGA, in August 1985. MAP results will be a strong component also of the 1986 STP Symposium in Toulouse.

Workshops on MST radar were held in May 1983 and May 1984 at Urbana. The next is to be held in October 1985. Workshops on PMP-1 were held in March 1983 at Oxford and in August 1983 at Hamburg. A workshop on the MAP/WINE project was held in Graz in June 1984, and another will be held in Berlin in January 1985. The GLOBUS project will hold a workshop in Paris in February 1985. Workshops for the projects CLIMAT; ATMAP, and GRATMAP will be held in Kyoto in November 1984.

OTHER PLANS FOR THE FUTURE

We are now just over half way through the Middle Atmosphere Program proper, and the scientific activities of the five study groups and 14 projects are proceeding satisfactorily. It is anticipated that the publication program will continue beyond the end of MAP in December 1985 through to the end of the Middle Atmosphere Cooperation (MAC) in December 1988. Beyond that time, it is anticipated that the MAP effort may become part of a new broadly based program on solar-system energetics (such as STETS, TESS, or IGBP) from 1990 onwards.

One additional activity has been proposed for MAP, namely, cooperation with COSPAR in the preparation of a Reference Middle Atmosphere. This is now under consideration by COSPAR.

ATTACHMENT 2

e MAPSC,

TING the successful progress of MAP and the many new projects just now under-
y and new facilities nearing completion,

D RECALLING the decision of the First MAP Assembly, endorsed by SCOSTEP, to
prove an extension of some MAP activities for an additional 3 years as part of
ddle Atmosphere Cooperation (MAC), to terminate December 31, 1988,

GES countries participating in MAP to continue their participation through the
riod of MAC, particularly for the following activities:

Performance of new projects directly related to MAP projects;

Gathering extended data sets with new facilities participating in MAP and with other facilities that operate in coordination with them;

Extension of a limited number of existing MAP projects;

Data analysis projects, leading into the Data Interpretation Phase of MAP;

Establishing and implementing a framework for easy and universal assess to MAP data; and

Publication activities contributing to the international exchange of MAP information.

ATTACHMENT 3

THE INSTITUTE OF PHYSICAL AND CHEMICAL RESEARCH

COSMIC RAY LABORATORY

713 KAGA 1, ITABASHI, TOKYO 173, JAPAN

Prof. Larkin Kerwin
Secretary-General of IUPAP
Bureau du Recteur
Universite Laval
Quebec, Canada
G1K 7P4

Dear Professor Kerwin:

Enclosed is the report for the XVIIIth General Assembly in October 1984. Unfortunately I will not be able to attend the Assembly.

I understand my delegation job will be terminated at the Assembly. As I wrote before, I am going to leave the Institute at the end of next March. So, would you find another person for the delegate. I hope you may ask Prof. A. W. Wolfendale, the chairman of Cosmic Ray Commission for that.

Thank you for your offering me this delegation job for two terms. I have enjoyed very much to do so, though my contributions in the Steering Committee were not much, for it is rather far from my proper work. There were great occasions to learn much from the Committee meetings and associated meetings.

Yours sincerely,

Masami Wada

CONDENSED MINUTES OF MAP ASSEMBLY

November 23, 25, 1984
Kyoto, Japan

ttendees: S. A. Bowhill, S. Fukao, J. Gille, G. Hartmann, I. Hirota, S. Kato, K. Labitzke, C. H. Liu, P. McCormick, A. H. Manson, R. Megill, A. O'Neill, R. G. Roper, T. Tsuda, T. E. VanZandt, R. Yamamoto

. The Chairman opened the Second MAP Assembly, welcomed everyone and thanked he Host.

. The Agenda was approved with an additional item 6A: Proposal for New MAP rojects.

. Minutes of the First MAP Assembly were approved.

. The Chairman reported on the present status of MAP. He expressed atisfaction with the progress. With MAP past its halfway mark, projects sing existing devices are well underway. New instruments such as MST radars hat are developed mainly during MAP are beginning to become major xperimental tools in many MAP projects. MAP Workshops and Symposia have been ell attended. In MAP Handbooks, MAP has one of the best documentations in ll programs. Looking ahead, we should plan for MAC and future SCOSTEP rograms after MAC. The Chairman also asked the Assembly to suggest changes in peration modes, and discuss data management and dissemination.

. MSG Reports.
(a) MSG 6, Scientific Aspects of International Equatorial Observatory: Kato eported (Attachment 1). There were discussions on the possibility of setting p the Observatory at Nauru Republic. It was noted that strong scientific articipation from the host country is important. VanZandt mentioned that for he TOGA project, the U.S. is planning to set up three ST radars in the quatorial region. The relation of this project to the International quatorial Observatory was discussed. It was pointed out that the site election requirements depend on the scientific goals, for example, equirements for studying convective activities and stratosphere-troposphere xchange are quite different from those for studying equatorial waves. The uestion of financing was also discussed.

The Study Group was dissolved. The Chairman thanked Kato for his efforts. t was proposed that a new MAP Project be established to follow up the ecommendations by the group.

(b) The question about the future of MSG-5, Ions and Aerosols was discussed. abitzke will talk to Arnold and report to the Chairman.

An Ad Hoc Study Group was established for the duration of the meeting eriod to study the scientific goals of MAC. The members were: Roper Chairman), Labitzke, VanZandt and O'Neill. (The Group reported its recommendaions to the Assembly in a later session.)

. MAP Project Reports:
(a) AMA, Antarctic Middle Atmosphere Program, Kato reported for Hirasawa. he Group has investigated aerosols in the Antarctic. It was found by lidar bservations that large seasonal fluctuations exist in the polar region (25` ithin the polar region) with winter enhancement. The effects of a volcano did ot change the aerosol levels in the polar region as drastically as in the low atitude region. It was noted that SCAR will hold a workshop on the Antarctic ext year. The Chairman mentioned the need for more international

participation in the project.

(b) ATMAP, Atmospheric Tides Middle Atmosphere Program, Bowhill reported for Forbes (Attachement 2).

(c) CAMP, Cold Arctic Mesopause Project, a written report by Kopp is given in Attachment 3.

(d) DYNAMICS, Dynamics of the Middle Atmosphere in Winter, Labitzke reported.
Some of the activities of the group have been reported in MAP Newsletter 84-3. Results of the PMP-1 Workshop on Comparison of Satellite Data Sets have been published in HANDBOOK FOR MAP, Volume 12. Another volume is under preparation.
The effort in producing the new CIRA for the middle atmosphere is progressing. This is a COSPAR-SCOSTEP project. The results will be published as a volume of MAP Handbook. O'Neill mentioned the SSU data and will look into the possibility of putting them in the format that can be published in a MAP Handbook.

(e) GLOBMET, Global Meteor Obsevation System, Roper reported. Major emphasis has been providing data for ATMAP. The first GLOBMET symposium will be held in Dushanbe, USSR, August 19-24, 1985 after the Prague IAGA Meeting. Information about the Symposium was published in MAP Newsletter 84-3. Roper will send the GLOBMET calendar to the Newsletter for publication.

(f) GLOBUS, Global Observations and Studies of Stratospheric Aerosols, Labitzke report for Offermann (Attachment 4). The new Chairman is J. P. Pommereau.

(g) MAE, Middle Atmosphere Electrodynamics, the Chairman of the Project, N. Maynard resigned. The Committee agreed that Bowhill should approach L. G. Smith to ask him to take over and reconstitute the group.

(h) MSTRAC, MST Radar Coordination, Bowhill reported for Rastogi (Attachment 5). The relation with the Incoherent Scatter Radar data bank at NCAR was discussed. The possibility of cooperation was mentioned.

(i) OZMAP, Observations of, and Sources of the Spatial and Temporal Variability of Ozone in the Middle Atmosphere on Climatological Time Scales, a written report by Heath is given in Attachment 6.
It was pointed out that new development in ozone absorption cross section may affect data processing in the project.

(j) GRATMAP, Gravity Waves and Turbulence in the Middle Atmosphere Program, there will be a workshop during the week of December 3, 1984 in Kyoto.

(k) SSIM, Solar Spectral Irradiance Measurements, The Chairman will ask Simon for a report.

(l) WINE, Winter in Northern Europe, Labitzke reported for von Zahn. Recent activities have been reported in MAP Newsletter 84-3. An experimenters meeting was held in Graz, June 1984. Fourteen groups discussed preliminary results. The next experimenters meeting will be January 3, 4, 1985 in Berlin.

(m) GOSSA, Global Observations and Studies of Stratospheric Aerosols, McCormick reported on November 25, 1984 (Attachment 7).

(n) CLIMAT, Climatology of the Middle Atmosphere, McCormick reported for Russell (Attachment 8).

6A. Proposal for New MAP Projects

(a) MAC-Summer in Northern Europe (SINE) and MAC-EPSILON, proposed by Labitzke for Thrane.

MAC-SINE will be conducted in summer of 1986, the two summer months. It will be similar to the MAP-WINE campaign.

MAC-EPSILON is planned for October 1987, to study turbulence in the middle atmosphere.

The projects were approved by the Steering Committee. Thrane will be the coordinator for both projects.

(b) New International Equatorial Observatory (NIEO). It was proposed that this new project should take the MSG-6 report as a basis and proceed to implement the recommendations in the report.

The Steering Committee approved the project. Kato will be the coordinator. He will write a brief description of the scope of the Project and propose members of the Project Committee.

(c) Middle Atmosphere of Southern Hemisphere (MASH). The aim is to study the dynamics of the middle atmosphere of the Southern Hemisphere, emphasizing interhemispheric differences. The MASH Project should concentrate on dynamical studies using observational data and data obtained from simulations with numerical models. MASH would be complemented by parallel studies on the transport and photochemistry of trace species in the Southern Hemisphere. O'Neill will be the organizer. The Project is approved subject to the reception of more complete documentation from O'Neill by the MAPSC.

7. Regional Consultative Group.

There was no report.

8. MAP Standing Committee Reports:

(a) Publication: the report by Sechrist is given in Attachment 9. It was suggested that a MAP Index should be published in the future to include contents of all MAP Handbooks.

(b) Data Management: reported by Hartmann and Hirota. There were long discussions on the subject. Based on the report by Hartmann (Attachment 10), a recommendation was drafted as follows:

"The MAP Steering Committee,

NOTING that long-term or global data sets are normally given for archiving to the World Data Centers, whereas short-term data sets and data gathered intermittently are usually not; and

NOTING the importance of communicating the existence of such data sets to the scientific community;

RECOMMENDS that catalogs of unarchived data sets should be prepared by individual investigators and forwarded to the World Data Centers for wider dissemination in the international scientific community; it being understood that proprietary rights to data sets referenced in such catalogs remains with the respective principal investigators and their collaborators, and that requests for such data shall be addressed directly to the appropriate investigators, who agree to consider any proposal for collabortive use of the data."

(c) Dynamics Calendar. VanZandt reported that the calendar has been sent to MAP Newsletter for publication.

9. Middle Atmosphere Cooperation (MAC).

The Ad Hoc Committee met and presented the following report.

"The Ad Hoc Committee on MAC met at 5:15 pm in the Tea Room of the New Miyako Hotel on Saturday, November 24, 1984. Present were: Roper (Chairman), Labitzke, O'Neill and (coopted by the Chair), Gille and Hartmann.

The Chair presented the charge to the committee: to consider what science could (should, would?) be done during MAC.

The following, prepared by the Chair, is presented as a summary of the ensuing discussion. (This summary has not been circulated amongst the Committee members.)

Emphasis was placed on assuring that data gathered during the MAP period, both from ongoing or long-term experiments, as well as campaigns, should be reduced and analyzed. A workshop, or series of workshops, such as those conducted by HAO on Skylab, or in the post-IMS period, should be devoted to intercomparison of data, and the preparation of a MAP Data Catalog on digital tape. Such a tape catalog could be lodged with the WDCs. Emphasis needs to be placed on persuading these experimenters not used to archiving data, that a MAP Data Base is essential to the eventual development of a global climatology of the middle atmosphere. The questions of "What activities need more time" and "What new projects might profitably be started now or during MAC" were ones the Committee did not feel qualified to answer. However, in the interest not only of encouraging interest in the Southern Hemisphere, but also in the unique opportunity to compare two different atmospheres, a project on the Dynamics of the Southern Hemisphere Middle Atmosphere (DOSHMA) was suggested (note that this would not of necessity require the gathering of new data -- a large data base already exists).

Pertinent to the "more time" question is the proposed launching of UARS in 1989. One of the most successful aspects of MAP have been the Pre-MAP Projects. The fact that the analysis of some of these data are still continuing suggests that the time taken for successful completion of projects in MAP may have been underestimated. Hence our emphasis on getting on with the reduction, analysis an interpretation of already gathered data.

The Committee dissolved itself at 6:15 pm."

A resolution was drafted for MAC by the Assembly as follows:
"The MAPSC,
NOTING the successful progress of MAP and the many new projects just now under way and new facilities nearing completion,
AND RECALLING the decision of the First MAP Assembly, endorsed by SCOSTEP, to approve an extension of some MAP activities for an additional 3 years as part of Middle Atmosphere Cooperation (MAC), to terminate December 31, 1988,
URGES countries participating in MAP to continue their participation through the period of MAC, particularly for the following activities:

1. Performance of new projects directly related to MAP Projects;
2. Gathering extended data sets with new facilities participating in MAP and with other facilities that operate in coordination with them;
3. Extension of a limited number of existing MAP Projects;
4. Data analysis projects, leading into the Data Interpretation Phase of MAP;
5. Establishing and implementating a framework for easy and universal access to MAP data; and
6. Publication activities contributing to the international exchange of MAP information.

10. Symposium and Workshop Reports:

PMP-1 Workshops: 1982, Boulder, CO, USA; 1983, Oxford, UK, and Hamburg, FRG (vol. 12, MAP Handbook); 1984, Williamsburg, VA, USA and Graz, Austria
MSG-6 Workshop: 1982, Boulder, CO, USA
SSIM Workshop: 1982, Washington, D. C., USA
ATMAP Workshop: 1983, Hamburg, FRG
First and Second Workshops on Technical Aspects of MST Radars: 1983 (vol. 9, MAP Handbook) and 1984 (vol. 14, MAP Handbook), Urbana, IL, USA
International Symposium on Ground-Based Studies of the Middle Atmosphere: 1983, Schwerin, GDR (vol. 10, MAP Handbook)
Symposium on First Achievements of MAP: 1984 Graz, Austria (COSPAR

Publication)

11. Future Workshops/Symposia
ATMAP and GRATMAP Workshops: Kyoto, Japan, December 1984
GLOBUS Workshop: Paris, France, January 1985
WINE Workshop: Berlin, FRG, January 1985
CIRA Workshop, Prague, Czechoslovakia, August 1985
OZMAP Workshop, Prague, Czechoslovakia, August 1985
MAP-related sessions IAGA assembly, Prague, Czechoslovakia, August 1985
Third Workshop on Technical Aspects of MST Radar, Aguadilla, Puerto Rico, October 1985

11A. Future SCOSTEP Activities:
Liu reported on the planned SCOSTEP activities. They are:
Solar-Terrestrial Energy Transfer Study (STETS) ∿1990s
Solar Interplanetary Variability Study (SIVS), 1987 -1990
Polar Atmospheric Dynamics (PAD), 1986 - 1988.
Planning committees have been set up for these projects. An ad hoc committee has been set up to study the feasibility of Global Ionosphere Study (GIS).

12. National Reports:
The following national reports were presented:
Japan by Kato
Canada by Manson
FRG by Labitzke
USA by VanZandt

These reports and written reports from other nations will be published in a volume of the MAP Handbook

13. Date and Place of next MAP Assembly.
Possible MAP-MAC Assembly, first week of COSPAR in June 1986, Toulouse, France.

ATTACHMENT 1

A Further Activity of MSG-6

1. Our efforts resulted in our request to the SCOSTEP Bureau in Hamburg in 1983 to adopt a resolution which states clearly a need to set up IEOs. We assume that this resolution was already adopted in the last SCOSTEP meeting in Graz.

2. It is now recognized that IEOs are important for understanding well the equatorial middle atmosphere in its peculiar behaviour and its close relation to the middle atmosphere outside the equatorial region. From scientific requirements there are various choices in the location of IEOs and facilities belonging to them.

3. Having attained the goal of our original efforts at this point, we ask that MSG-6 be dissolved. This implies that it seems timely to dissolve MSG-6 in the original form. Since it is a real significance to set up IEOs which satisfy our scientific requirements, a lot of effort among those scientists who are willing to contribute to the IEO establishments should be desired. Nevertheless, we must recognize that there are many problems, some of which are unscientific and vaguely defined.

4. Considering these problems ahead we recommend that the MAPSC endorse efforts of those people who may work for establishing IEOs.

5. Since the last meeting in Hamburg in 1983, Kato (Japan), Balsley (USA), Vincent (Australia) and Chanin (France) have discussed a possibility to set up an IEO at the Nauru Republic. This place seems to satisfy some conditions which are required to IEOs. Its location (160° E) is close enough to the equator (lat 0.53°S) and away enough from the equatorial electrojet (dip -11.6°). The longitudinal alignment with the existing stations seems well. As to other conditions, the investigation is now underway. For instance, Kato is facing sea-clutter problems probably to arise for setting up MST radars there. Chanin wonders how the weather suits lidar observations there.

6. Financial problems must be carefully examined. The situation for them varies from country to country. No definite answer has come out as yet. However, efforts to solve these problems would be worthwhile. As to sharing the expense in construction and maintenance, a certain international corporation should be established, thereby receiving money necessary from each country and using them properly, free from direct national control of the member nations. This system has already been in operation in the EISCAT Scientific Association and the France-Canada-Hawaii Telescope Corporation.

7. We here suggest that the MAPSC encourage the activity of these attempts.

ATTACHMENT 2

ATMOSPHERIC TIDES MIDDLE ATMOSPHERE PROGRAM (ATMAP) PROGRESS REPORT

Jeffrey M. Forbes, Coordinator

October, 1984

At the "Workshop on Tides in the Mesosphere and Lower Thermosphere" held at the IUGG Assembly, Hamburg, FRG, August, 1983, data from the first ATMAP campaign (09 November - 03 December, 1981) were presented and analyzed. These results and conclusions, as well as additional data from the second ATMAP campaign (02 May - 08 May, 1982), comprise ATMAP Report #1. This report has been submitted for publication in the MAP Handbook series (see Page 26).

At the Hamburg Workshop, additional campaigns were planned. These are reflected on the ATMAP calendar (Page 27). A second workshop is to be held on December 5-6, 1984, in Kyoto, Japan, in conjunction with the International MAP Symposium which will take place the previous week. Nearly all the data collected to date will be extensively analyzed at the Kyoto Workshop. The ATMAP group will assess its findings and develop a strategy for future observational and theoretical efforts.

ATMOSPHERIC TIDES MIDDLE ATMOSPHERE PROGRAM (ATMAP) WORKSHOP

Kyoto, Japan, 5-6 December, 1984

An ATMAP Workshop will be held on 5-6 December, 1984, in conjunction with the International MAP Symposium during 26-30 November, 1984, and a GRATMAP Workshop scheduled for 3-4 December, 1984. The Symposium and Workshops are hosted by Professor Susumu Kato of the Kyoto University.

The purpose of the ATMAP Workshop is to bring together experimentalists, data analysts, and theoreticians to comprehensively study and interpret the results of four solstice campaigns which will have been conducted prior to the symposium. It is planned that all ATMAP participants will receive a booklet of data and supplementary materials by 1 November 1984 consisting, in part, of the following:

(1) Vertical profiles of 4-day average mean, diurnal, and semidiurnal winds from participating radar stations for each of the campaign "core periods".
(2) Various summary plots (for instance amplitude and phase vs. latitude at given heights) of the core period experimental data including comparisons with theoretical simulations.

The Workshop will consist of 4 half-day sessions. To encourage the highest degree of individual participation, 3 working groups will be created. Two "data interpretation" working groups will be independently assigned the same tasks, consisting of the following:

(1) Review the data and evaluate consistency with available theoretical models.

(2) Interpret the data.

(3) Recommend how these results should reach the open literature such that the advancement of middle atmosphere science and the proprietary rights of the individual experimenters are best served.

(4) Make recommendations concerning future campaigns and the future emphasis of ATMAP.

The third working group will consist primarily of a subgroup of the IAMAP/ICMUA Working Group on Tides in the Mesosphere and Lower Thermosphere who have already initiated an evaluation of various methods of tidal data analysis. (However, other volunteers or observers are welcome.) This subject was discussed in a panel form at the 1983 Hamburg Workshop. The purposes of their meeting Kyoto will be to:

(1) Further discuss the pros and cons of various methods of extracting tides from data series (including the Groves method, independent Fourier analyses at different heights, band-pass filters, spectral analyses, etc.). Presumably, given data series will have been examined prior to the Workshop using the various methods to provide justifications and illustrations to back up the Working Group recommendations.

(2) Address the question of "variability" in terms of its implications regarding contamination of "true" tides, appropriate averages to compare with theoretical models, and recommend time spans over which to examine or fit the data.

(3) Arrive at a recommended definition of "uncertainty" or "error bar" to associate with a particular tidal Fourier component, including errors of experimental as well as geophysical origin. A measure of uncertainity is particularly important when attempting to ascertain consistency between observations or between observations and theory.

The overall goal of Working Group #3 will be to provide (1) interim assessments and recommendations to the ATMAP group at Kyoto regarding methods of extracting tidal information from data series and (2) a written draft of same at the 1985 IAMAP/ICMUA Working Group meeting Prague, Czechoslavakia, that is intended for publication and eventual distribution.

A tentative schedule for the Workshop is a follows:

December 5, 1984

Morning	Summary of campaign results (J. M. Forbes) Formal presentations Working Group assignments
Afternoon	Meeting of Working Groups #1 and #2
Evening	Meeting of Working Group chairpersons (#1, #2, and #3) with ATMAP Coordinator

December 6, 1984

Morning	Meeting of Working Group #3 (observers welcome); continuation of Working Groups #1 and #2, if necessary

Afternoon — Summaries of Working Group conclusions with open discussions
Future plans

The formal presentations on 5 December will be relatively few in number and restricted in scope to those contributions having a direct bearing on the interpretation of these campaign data. Contributed and invited papers will be solicited in the following areas:

(1) Data analyses covering two weeks or more around the 4-day "core" campaign periods which place the campaigns into a seasonal context or provide relevant information on variability.

(2) Intercomparisons of campaign data between two or more stations to delineate latitude asymmetries (or symmetries) or longitudinal variations.

(3) Theoretical results which have a direct bearing on the interpretation of the data.

Individuals from the current ATMAP participant list will be contacted regarding working group assignments by 1 May 1984. Other interested scientists are welcome to attend, become actively involved, and become ATMAP participants.

For information contact:

Professor Jeffrey M. Forbes, Coordinator of ATMAP
Department of Electrical, Computer, and Systems Engineering
110 Cummington Street
Boston University
Boston, MA 02215

ATTACHMENT 3

Bern, 20. December 1984

To: CAMP scientists

From: E. Kopp

Our last meetings and paper presentation took place in Graz at the COSPAR meeting 1984. We have presented at this conference a part of the CAMP results in six papers. From this list, three papers will be published in the COSPAR proceedings (5.5.3, 5.5.4, 5.5.6).

At the December 1983 meeting in Stockholm we had an agreement for a joint publication and a preliminary deadline of 1. Dec. 1984 for sending in final papers to me. The new deadline is 1 June 1985. All first authors are invited to send to me a questionnaire until February 1. 1985 with more or less final titles and author lists. In veiw of the good experience with the joint publications of the Energy Budget papers in J. Atmos. Terr. Phys. as first choice. AFGL had a similar campaign STATE in summer 1983 with rocket launchings from Poker Flat. At present I am investigating a joint publication of CAMP results with STATE results.

My distribution to you will contain:

1) List of papers P1-P8
2) The copy of the COSPAR CAMP session in Graz
3) Preprints of papers 5.5.4 and 5.5.6
4) Concentrations of NO, H_2O and H_2O_2 for paper 5.5.7 (P4)

Super CAMP, (SCAMP)

I intend to prepare together with G. Witt, L. G. Bjorn, C. R. Philbrick and G. E. Thomas a proposal for Super CAMP in 1988. This proposal will be presented in Loen, Norway at the 7th ESA symposium on European Rocket and Balloon Programmes and related Research (5-11 May 1985). The main guidelines of SCAMP have been summarized and distributed in December 1983.

The proposal will cover the four major topics:

- Dynamics
- Ion and neutral composition
- Aerosol physics
- Electrodynamic and geomagnetic effects

Previous summer measurements of the cold arctic mesopause in Kiruna 1978 and 1982 (CAMP) have revealed the following requirements for further studies:

- High latitude studies (Thule or Nord in Greenland)
- Longitudinal differences (East-West)
- High spatial resolution measurements (scale 100 m)

An evening meeting for further planning and coordination of SCAMP is being planned for 8 August 1985 at the IAGA symposium in Prague.

I would like to encourage all CAMP scientists to consider contributions to the CAMP session at the IAGA meeting.

ATTACHMENT 4

MAP/GLOBUS 1983

Scientific objectives:	O_3, NO_x, Source Gases
Time and Place:	SEPTEMBER 1983, Western Europe (France, Spain, Belgium, FRG, Switzerland, Italy)
Experimental Set-Up:	Network of 16 ground experiments 1 airplane 8 extra radiosondes 135 ozone sondes (from a network of 8 release stations) 13 balloons (from Aire-sur-L'Adour) 6 rockets (from (El Arenosillo)
Participation:	35 experimenter groups from 9 nations

RESULTS

General:	All 13 balloons successful. Very much data obtained from all parts of the experimental set-up.
Specific: (examples)	Source gases: intercomparison of 2 cryosamplers gives 10% agreement for CH_4, N_2O, F11, F12.
	NO_x: 6 altitude profiles of NO_2 obtained at different times of the day, day/night
difference	clearly seen. Derivation of diurnal variation
of	NO_2 expected from the future data analysis.
	Ozone: good agreement of lidar and ozone sonde results; two successful balloon flights for intercomparison of 6 different O_3 measuring techniques.
	Many more results to be expected from future data evaluation.

FUTURE PLANS:
(tentative)

MAP/GLOBUS 1983:	Workshop, Paris, February 1985
MAP/GLOBUS 1985: (coordinator: J. P. Pommereau, new Chairman)	NO_x campaigns (diurnal variations)
MAP/GLOBUS 1986: (coordinator: P. Simon)	O_3 at high altitudes

ATTACHMENT 5

INTERIM REPORT FROM MST RADAR COORDINATION (MSTRAC) GROUP

P. K. Rastogi

Electrical Engineering & Applied Physics Department
Case Western Reserve University, Cleveland, Ohio 44106

The MST Radar Coordination Group (MSTRAC) was formed over a year ago as a working group under MAP, to serve as a forum for data exchange and other activities related to MST radars. Through the efforts of its past co-chairpersons, Dr. B. B. Balsley and Dr. S. K. Avery, a successful phase of sample data exchange between several participating facilities and external users was initiated. The current chairman assumed responsibilities during Summer, 1984.

To assess the current state of data exchange activities, a questionnaire was sent during October 1984 to the existing and planned radar facilities. A revised list of participating facilities will be published in a future issue of the MAP Newsletter.

The benefits of data-exchange activities to the participating facilities, to the external users, and indeed to the MAP community at large, cannot be emphasized enough. The recent U.S. National Research Council Report(1) from the Panel on the Middle Atmosphere Program recommends <u>Increased Analysis of Available Data</u> with a <u>High Priority</u>, and points out an <u>obvious possibility for increased attention</u>, viz. <u>statistical and time-series analyses of various types of radar data</u>.

As a constructive step towards following these recommendations, the need for a Central Data Repository and Exchange, will be addressed through MSTRAC at a future workshop or meeting. Other topics of interest include a generalized format for MST radar data exchange, and frequency allocations for future MST radars.

Formed: May 1983
Forum for data exchange and other activities related to MST radars
Co-Chairpersons 1983-84: B. B. Balsley and S. K. Avery
- Initiated sample data tape exchange between several observatories and users

Chairman: 1984-85 P. K. Rastogi
- Questionnaire, October 1984
- Current status of data exchange ?
- Future interest ?
- Data base ?
- Results to appear in MAP Newsletter

U.S. NRC Report (1984)
- <u>High Priority</u> - increased analysis of available data
  - statistical analyses of radar data

Future issues to be discussed through MSTRAC
- Data repository and exchange
- Tape formats
- Frequency allocations

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(1)Research Recommendations for Increased U.S. Participation in MAP, National Academy Press, Washington, D.C., 1984

ATTACHMENT 6

REPORT OF THE PRE-WORKSHOP MEETING ON OZONE IN THE MIDDLE ATMOSPHERE PROJECT (OZMAP)

Athens, Greece, September 10, 1984

D. F. Heath (Chairman)

A pre-workshop meeting of (OZMAP), Ozone in the Middle Atmosphere Project was held on September 10, 1984 at the Academy of Athens Research Center for Atmospheric Physics and Climatology in Athens following the Quadrennial Ozone Symposium in Halkidiki, Greece.

The purpose of the pre-workshop meeting of OZMAP was to discuss the organization and approach for a workshop on "Sources, Mechanisms, and Observations of Middle Atmosphere Ozone on Climatological Time Scales" which is planned for 1985. The principal objectives are the following: (a) development of a better understanding of the factors that are responsible for ozone changes in the middle atmosphere on climatological time scales; (b) assessment of the level of consistency between observations and model prediction; (c) use of our theoretical understanding of (a) to aid in definition of measurement requirements for detection of future ozone changes with emphasis on separating "true" geophysical phenomena from those associated with instrument artifacts.

The pre-workshop meeting was attended by 18 people, and much interest in the workshop was expressed by others who were unable to attend. Questions of the scope, objectives, organization, date, location, and relations to other planned workshops were discussed extensively.

Plans are underway to hold the first workshop of OZMAP during the week preceding or following the 1985 meeting in Prague of IAGA at some nearby location. The main emphasis of the first workshop would be on ozone data acquired from satellites during the period from November 1978 through possibly the Spring of 1985. Analysis of ozone variability (total column and profile amounts) in terms of seasonal effects, response to ultraviolet solar flux variations over 27-day solar rotation periods and longer, stratospheric temperature variations, and the eruption of El Chichon would be analyzed. Comparisons of analyzed ozone variations associated with these natural perturbations with the corresponding predicted variations from theoretical models would be made and evaluated. It was recommended that the far more complex question of ozone variations in response to anthropogenic perturbations be considered at a subsequent workshop.

The general comments of the group which met in Athens were that the objectives of OZMAP could best be met by restricting the initial workshop to those time periods for which measurements of ozone, temperature, and ultraviolet solar spectral irradiance are likely to be of high quality and for which there is extensive temporal and spatial coverage. In addition, the only two types of natural perturbations of atmospheric ozone which would be convenient at this time are those resulting from variations in ultraviolet solar spectral irradiance on time scales of 27-days and longer and the eruption of El Chichon in the Spring of 1982.

As part of the proposed OZMAP workshop preceding or following the Prague meeting of IAGA (August 5-17, 1985) a data package consisting of tapes, tabulations of data, reports, reprints, and papers will be sent to persons interested in comparing model predictions with observations for the workshop.

The question of potential conflict or duplication of efforts with other planned workshops was discussed extensively. It is believed that the likelihood of this being a significant problem is small since the major emphasis will be on specific research objectives as opposed to summarizing previously published results.

ATTENDEES:

D. F. Heath, N. Sundararaman, L. B. Callis, A. Belmont, B. H. Subbaraya, P. K. Bhartia, R. D. McPeters, P. Crutzen, D. Wuebbles, M. Nicolet, P. C. Simon, E. Hilsenrath, K. Klenk, J. Lean, A. J. Miller, A. J. Fleig, G. Fiocco, and C. Repapis.

ATTACHMENT 7

GLOBAL OBSERVATIONS AND STUDIES OF STRATOSPHERIC AEROSOLS

M. P. McCormick

Aerosol Research Branch, Atmospheric Sciences Division
NASA, Langley Research Center, Hampton, Virginia, USA 23665

November 1984

The effects of the 1982 El Chichon eruption in Mexico (17.3 N, 93.2 W) have continued to heighten the activities of GOSSA. At least five extensive NASA field missions have been carried out along with intensive worldwide lidar and balloon measurements following the eruption. The stratospheric layer produced has caused many effects, including: a significant warming at low latitudes at about 30 mb for at least the last 7 months of 1982; produced artifacts in data from various remote sensors such as sea surface temperature, water vapor, ozone, etc; there is speculation of a coupling to trigger, or at least enhance, the large El Nino of 1982-83; predictions of cooler surface temperatures on a global average; the possibility of reducing ozone by heterogeneous aerosol surface chemistry; and a possible connection between the enhanced polar region aerosol loading and the record cold arctic temperatures of the last winters.

Many journal publications have appeared describing measurements and effects of the stratospheric material produced by El Chichon. At least two special issues of journals dedicated to El Chichon have appeared. One in GRL, November 1983, and the second, to be published in two parts, in Geofisica Internacional. The papers to appear in Part 1 (December 1984), are listed in Appendix 1. Part 1 of the Geofisica Internacional special issue presents data from the five NASA field campaigns, summarizes a lot of the data taken at a number of fixed locations, describes the satellite tracking of the early stratospheric cloud and its effects on remote sensors, and its effects on stratospheric temperature. The second part primarily describes the results of modeling studies.

During this past year many researchers have continued to report their preliminary results in the monthly Scientific Event Alert Network (SEAN) Bulletin. SEAN has provided a good vehicle for exchaging early information and to announce new eruptions. SEAN can be obtained at a reasonable cost ((202) 357-1511, telex 89599 SCINET WSH). Excerpts are printed in EOS, published by the American Geophysical Union ((800) 424-2488). In addition to providing data to SEAN and publishing in the open literature, GOSSA has encouraged researchers to publish annual or special campaign institutional reports listing all of their data. In this manner, the data are available for various applications and studies.

Drs. Dave, DeLuisi, and Mateer have recently shown (WMO-No.549) that stratospheric aerosols can have a significant effect on Umkehr-ozone measurements. Therefore, the formal archival of stratospheric aerosol lidar data at the World Ozone Data Center is being organized. Dr. John DeLuisi (NOAA, Boulder) has been a prime mover for implementing this activity. This "network" approach for organizing the world lidar data sites is also in the early stages of being applied to volcanic alerts (McCormick, USA), ozone measurements (Megie, France), and cirrus cloud measurements (Platt, Australia).

The satellite instrument SAGE II was successfully launched, October 5, 1984, aboard the Earth Radiation Budget Satellite (ERBS) from Shuttle. ERBS has since been placed into a circular 600 km orbit. SAGE II is a 7 channel sun photometer producing profiles (with 1 km vertical resolution) of ozone, nitrogen dioxide, water vapor, and aerosol optical properties. It became operational on October 24, and is producing excellent data. Three major correlative measurement programs (in the U.S., Europe and Japan) are in place for validating the SAGE results. They involve state-of-the-art "groundtruth" measurements of the species SAGE II is measuring. The European effort is headed by Professor J. Lenoble of the University of Lille, France, the Japanese effort is headed by Professor M. Hirono, Kyushu University, and the U.S. effort is headed by D. S. McDougal, NASA, Langley Research Center. Information on these measurement pro- grams, which will occur between October 1984 and October 1986, can be obtained from those named above or me.

Finally, I am pleased to announce that 5 years of SAM II data (covering October 1978 - September 1983) and 33-months of SAGE data (covering February 1979 - November 1981), have been archived at the National Space Science Data Center, NASA, Goddard Space Flight Center, Greenbelt, Maryland, 20771.

APPENDIX 1 TO ATTACHMENT 7

GEOFISICA INTERNACIONAL

ISSN 0016 - 7169

REVISTA DE LA UNION GEOFISICA MEXICANA, AUSPICIADA POR EL INSTITUTO DE GEOFISICA DE LA UNIVERSIDAD NACIONAL AUTONOMA DE MEXICO

Vol. 23 México, D. F., 1o. de enero de 1984 Núm. 2

Contenido

Págs.

(Pasa a la contraportada).

ATTACHMENT 8

MAP CLIMAT PROJECT DESCRIPTION

GOALS:

Use available satellite data to produce monthly and seasonal mean latitudinal cross sections of temperature and constituents.

Develop MAP document describing cross sections, accuracy and precision of the data theory, and implications of the comparisons.

PURPOSE:

Provide a convenient reference document summarizing observations, theory and comparisons.

Provide an aid for 2D model studies, a crude check for 3D model results, and improved background information for chemical and dynamical studies.

MAP CLIMAT PROJECT REPORT OUTLINE

INTRODUCTION:

Background and purpose of report

EXPERIMENT DESCRIPTIONS (SAMS, LIMS, SAM II, SAGE, SBUV, SME)

Brief instrument description
Measurement approach
Altitude range, horizontal/vertical resolution, coverage
Accuracy and precision
Data limitations

DATA PRESENTATION (BY CONSTITUENT)

Description of plots, i.e., morphology
Description of tables
Significant features
Brief discussion of differences for overlapping parameters (i.e., T, O_3)

MODEL COMPARISONS

Vertical profiles (1D, 2D)
Latitudinal cross sections (2D, 3D)
Implications of differences

CONCLUSIONS

MAP CLIMAT PROJECT STATUS

Middle atmosphere data base from SAMS, LIMS, SAGE, SBUV, and SME resident in Langley Research Center computer (one year after NIMBUS 7 launch and one year of SME data)

Data distributed to project team members in the form of monthly zonal mean plots. Polar stereographic plots to be sent soon.

CH_4, N_2O, H_2O	(Susan Solomon)
O_3	(Jim Miller)
NO_2	(David Rusch)
HNO_3	(Jim Russell)
Aerosols	(Pat McCormick)
Temperature	(John Barnett)

First draft of report partially complete. Sections completed for Introduction, some experiment descriptions, and the CH_4-N_2O-H_2O, O_3, HNO_3, and aerosols sections.

MAP CLIMAT PROJECT REVISED SCHEDULE

Hold meeting to review preliminary document and assess status	November 28, 1984
Prepare first draft of report and circulate for review	February 1, 1985
Hold workshop in the United States to review and revise the first draft	Spring 1985
Prepare second draft and circulate to project team for review	June 1985
Hold meeting at the Prague symposium to critique report and prepare final draft	August 1985

ATTACHMENT 9

MAP PUBLICATIONS REPORT

Twelve MAP Handbooks have been published; seven more are in preparation and/or being planned as indicated below.

These Handbooks are printed and distributed by NASA under the MAP Management Contract.

MAP Handbook Vol. 13. Ground-Based Techniques (Nov. 1984)
14. Papers Presented at Second Workshop on Technical Aspects of MST Radar (Dec. 1984)
15. Balloon Techniques (June 1985)
16. Draft of a New Reference Atmosphere for the Middle Atmosphere (July 1985)
17. MAPSC Minutes, Minutes of Second MAP Assembly Project Reports, National Reports (August 1985)
18. Extended Abstracts of Papers Presented at MAP Symposium, November 1984, Kyoto (October 1985)

MAP Newsletters are published quarterly by the Indian MAP organization.

D1

N86-12838

ATTACHMENT 10

TOWARDS A GLOBAL MAP DATA BASE

G. K. Hartmann, MAP Data Management Co-Chairman

October 1984

ABSTRACT

Scientific and ecological needs call for the generation of a global data base of measured data from the Earth's atmosphere, similar but complementary to the data of the meteorological service. Right now there is a large gap between these needs and the available financial means. If this prevails, it might be prohibitive for the generation of such a data base. In any case, there must be a compromise between the needs and the means; this implies that we have to be prepared to set priorities. Thus, discussions should be started on which data can be or should be stored. Newly generated data for storage in such a data base is recommended to be handled by the World Data Centers (WDCs). This brief report should help to stimulate discussions and subsequent actions.

INTRODUCTION

The shock which was produced in recent years by the growing possibility of a Third World War with ABC arms (WEIZSACHER, 1984) hopefully changes the consciousness of the human beings in time to prevent it. The shock situation is amplified by the fear of an ecological catastrophe, especially visible in the highly industrialized (western) societies. If a World War can be avoided within the next 10-15 years, very likely global economical-ecological problems will dominate our human activities (HARTMANN, 1983b). This new danger might be a chance to focus in time our attention more to global economical-ecological problems than to short-sighted arms problems.

However, there are two principal problems which can be observed in any large system, the more the less linear they are, e.g., in our ecosystem/biosphere:

1. The time delay problem (reaction time constant).

2. The accumulation problem (irreversibility).

The two problems are amplified by a third factor, the increasing speed of anthropogenic environmental changes. This implies that any planning of and/or for the future of our ecosystem gets the more imperfect the longer the time-frame and the more we go from local via regional to global aspects.

This implies that we have to live between the following two different possible actions:

1. Controlling and planning, e.g. in a biocybernetic sense (VESTER, 1984), (Providence, Prevention).

2. Clearing dangerous consequences of faults from "yesterday" (Healing). Right now we have an overemphasis of the second possibility.

The dangerous situation can be relieved the more the time constants can be reduced. This implies better and faster information transfer (communication), (HARTMANN, 1984b). In the case of our environmental problems this means, amongst others, the generation of information systems -- data bases that can act as sensitive, flexible early warning/surveillance systems, (HARTMANN, 1983b, 1984b). It is the intention of this report to the MAP community to stimulate discussions on the following subjects:

1. Which data have been generated or should be generated in the future for such a global data base?

2. Which already existing basic research programs can support these applications aspects best and which have to be newly started?

3. How to bridge the present large gap between scientific-ecological needs and the available financial means?

This is at present the main focus of the MAP data management committee. The generation of local and/or regional data bases, as well as the relevant small-scale data exchange and/or cooperation programs, are only dealt with in a sense that provision is made that the information will be stored and distributed by so-called data inventories and/or data catalogues to the MAP community. It is further recommended that only such "global MAP data sets" will be stored and handled by the World Data Centers (WDCs), (HARTMANN, 1983a,b).

THE NEED FOR RESEARCH OF THE ATMOSPHERE

The atmosphere of the Earth does not only play an important role in meteorology and climatology but is also -- besides the hydrosphere and the pedosphere -- third important part of the biosphere in which life takes place.

The atmosphere is a very sensitive, complex global system. In the industrialized countries there is a growing concern about anthropogenic damages of our environment, e.g. about climatological changes. Global and longer term observations of our atmosphere as required for studies of life conditions in the biosphere or for research of the climat are in a very early stage till now. Because of the time delay problems, the speed of changes and the accumulation problem of our ecosystem we have to start now with our actions, rather than only talk and argue.

Even if the majority of the human beings till now does not realize to which extent economy and ecology are linked on a long term and global basis, the ecology shock at least started to change the consciousness and prepares the political background for creative actions which must comprise, amongst others, more basic research activities for the Earth's atmosphere and its application in establishing a global data base for atmospheric data -- similar but complementary to the data of the meteorological service -- which can be used as an input for a sensitive, flexible, early warning/surveillance system which should help us to react in time when the viability of our biosphere is threatened by anthropogenic activities.

THE MIDDLE ATMOSPHERE

The investigation of the middle atmosphere (stratosphere and lower mesosphere-ionosphere) is a lot more difficult than the investigation of the lower atmosphere (troposphere) and today this belongs almost completely to the domain of basic research. The middle atmosphere is an example of a complex multiparameter system. These parameters are interdependently linked in a complicated manner. The many relationships between the gases and their dynamics and the energy budget, together with many nonstationary boundary conditions, are a strong challenge for the scientific community. For the solution of many problems, various new technical and theoretical tools are required. An important practical aspect was brought to middle atmosphere research since it became obvious that anthropogenic influences started to change the atmosphere and hence might threaten the viability of the biosphere. A possible example is the possible depletion of stratospheric ozone by an anthropogenic increase of other traces gases. New model calculations of the glass house effect of our atmosphere demonstrate that besides the increase of carbondioxide (CO_2) further trace gases like N_xO_x, CH_4, and CCFs contribute significantly. They double the warming of the atmosphere produced by CO_2. A further significant impact of the middle atmosphere on the climate becomes visible in a significant increase of stratospheric water vapour content, produced by the warming of the tropical tropopause as a consequence of an increase in CCFs concentration. A change in the stratospheric radiation budget and thus an effect on the troposphere can be expected.

A GLOBAL MAP DATA BASE

In order to serve the earlier-mentioned purposes and to justify the term international in its broader sense, some special selected data sets should be prepared for storage in the so-called global MAP Data Base -- to be handled by the World Data Centers (WDCs).

Table 1 gives an example of the 3 x 3 matrix in space and time into which the various MAP data can be grouped. Only those data that belong into the matrix element III 3 are recommended for storage in the WDSs.

However, to make them useful for broader and faster use some requirements on the technical format and the scientific status of the data must be considered. They are displayed in Table 2 another 3 x 3 matrix. Again only data from matrix element III 3 should be stored in WDCs (HARTMANN, 1983a).

This is widely agreed, however, data in these matrix elements are in general the most expensive ones in terms of hardware and software costs and thus this stage can be achieved only in few cases. An example of another 3 x 3 matrix -- Table 3 -- can demonstrate this for the hardware aspects of geophysical measurements in the Earth´s atmosphere (HARTMANN, 1983a). A compromise between ecological needs and economical means must be found and result in a selection of some major important data and/or experiments providing an input into the global data base.

Provided that we get selected data sets for our global data base then we are faced with some other problems. First of all there is the problem of ordering of the information as displayed in Figure 1 and the fact that we have to deal with various types of geophysical data -- see Figure 2. Finally we need an effective, interactive information system to be able to deal efficiently and successfully with the data stored in the WDCs. Something like the VIGRODOS (Video Graphic Communication and Documentation System) - see Figures 3 and 3a might be envisaged (HARTMANN, 1983a,b).

REMARK

Tables 1 and 2 are modified versions of questionnaires conceived in 1983 by the author and submitted to the MAP Steering Committee which approved in 1983 these modified forms as the final and official questionnaires to be used within the MAP community.

ACKNOWLEDGEMENT

The author thanks the Max-Planck-Institut fur Aeronomie through its director Prof. V. M. Vasyliunas for the support of this work and the DFG (Deutsche Forschungsgemeinschaft) for travel support to the MAP Assembly at Kyoto.

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Table 1

Temporal duration (t) and spatial coverage (x) of measurements.

t \ x	I Local	II Regional	III Global
1. Instantaneous	e.g. ground, balloon or rocket	(rocket, salvo, Instrument network)	?
2. Short term (weeks to months)	ground	aircraft	Low altitude satellite, Space Transportation System (STS)
3. Long term (years)	ground (e.g. Dobsen network)	e.g. national ionosonde net	Ground network orbiting satellite(s)

Table 2

Technical format and scientific status of data,

Technical (format) \ Scientific	I Only for PI use, i.e. individual evaluation, small datography, pre-edited data.	II Also for "Regional Data Center" use, i.e. refined, broad evaluation, medium datography.	III Also for World Data Center, i.e. broad evaluation, large datography
1. Only for PI use, i.e local individual formats			
2. Processed for collection in Regional Data Centers			
3. Processed for deposit with World Data Center, i.e. in international exchange format			

Table 3

Geophysical measurements in the Earth's atmosphere (e.g., stratosphere, mesosphere, and cost estimations.

MAP-Data

A. Discrete measurements; time intervals Δt or space intervals Δx large compared with the relevant variability of the measured parameters Δa (t,x): $\Delta t >> \Delta a$
B. Continuous measurements $\Delta t << \Delta a$

n		1	2	3
m	x / t	Local	Regional	Global
1	Instantaneous (coarse resolution)	ground (α) balloon (α,β) (rocket) (α,β)		
2	Short term (middle)	ground (α)	aircraft (α,β) [IR,MW,OPT]	e.g., MAS (α) 1986
3	Long term (fine)	ground (α) (e.g. Dobson)	radiosonde network (β)	e.g., UARS (α) $\gtrsim$1990

(α) Remote sensing
(β) In situ

The estimated costs for the experiments are due to hardware and software. The costs for infrastructure like logistics, overhead, etc. are disregarded here because no reasonable estimate was possible. By the costs of experiments in the matrixelement of line 1 and column 1 K_{11}, we can approximately calculate the costs for experiments for the other matrix elements (rocket experiments disregarded) as follows

$$K_{nm} \approx K_{11} \cdot n^{2(n-1)} \cdot m^{2.5(n-1)}$$

This implies that

$K_{22} \approx 25\ K_{11}$ and $K_{32} \approx 500\ K_{11} \approx 20\ K_{22}$ and $K_{33} \approx 19000\ K_{11} \approx 40\ K_{32}$

It was assumed that all 9 experiment types have about the same mean data rate. The upper limit is mainly given by the state-of-the-art of today's techniques, the lower limit by geophysical considerations.

<u>Humanities</u> | <u>Science</u>

e.g. history -- cosmology - geosciences -- physics

Humanities		Science
Ordering Principles 1. Time (t) 2. Space (x) 3. Subject		1. Subject Hitherto unknown grouped around already known 2. Time 3. Space
Nonstationairty (Inhomogeneity)	- Quasi-stationarity -	Stationarity (Homogeneity)
$F = F(x,t) = F(x_o,t_o,\Delta x,\Delta t,z)$		$F = F(\Delta x,\Delta t,z)$
Nonreversible		Reversible
Nonclassical statistics		Laws; classical
Accumulative ↓		statistics ↓
large growth rates of information		information compression
*(predominantly intensive information) ↓		*(predominantly extensive information) ↓
Software problems larger than hardware problems ↓		Critical data evaluation problems (data validation and data quality) ↓
Browsing ↓		Documentation ↓
VIGRODOS ("interactive")	- DBMS -	Data catalogue/ Dictionary/datography ("batch")

*see HARTMANN (1983a)

Figure 1. Information ordering principles.

A. Three types of geophysical data

1. Long-term data (time series character, service character)
2. Short-term data (sampling character, project character)
3. Constants (laboratory physics character)

B. Three types of time series data

1. Persistent data (signals)
2. Quasi-persistent data
3. Nonpersistent data (noise)

C. Problems with time series data

1. Data from stationary effects (B.1. - B.3.) or from non-stationary effects (turbulences, dissipative structures)
2. Band pass filtering → "uncertainty principle" blurredness of persistent and nonpersistent data
3. Series correlation
4. Correlation or association, significance levels
5. Linear approximations (filtering) no feedback effects
6. Sampling effect errors

Figure 2. Geophysical data, types and problems.

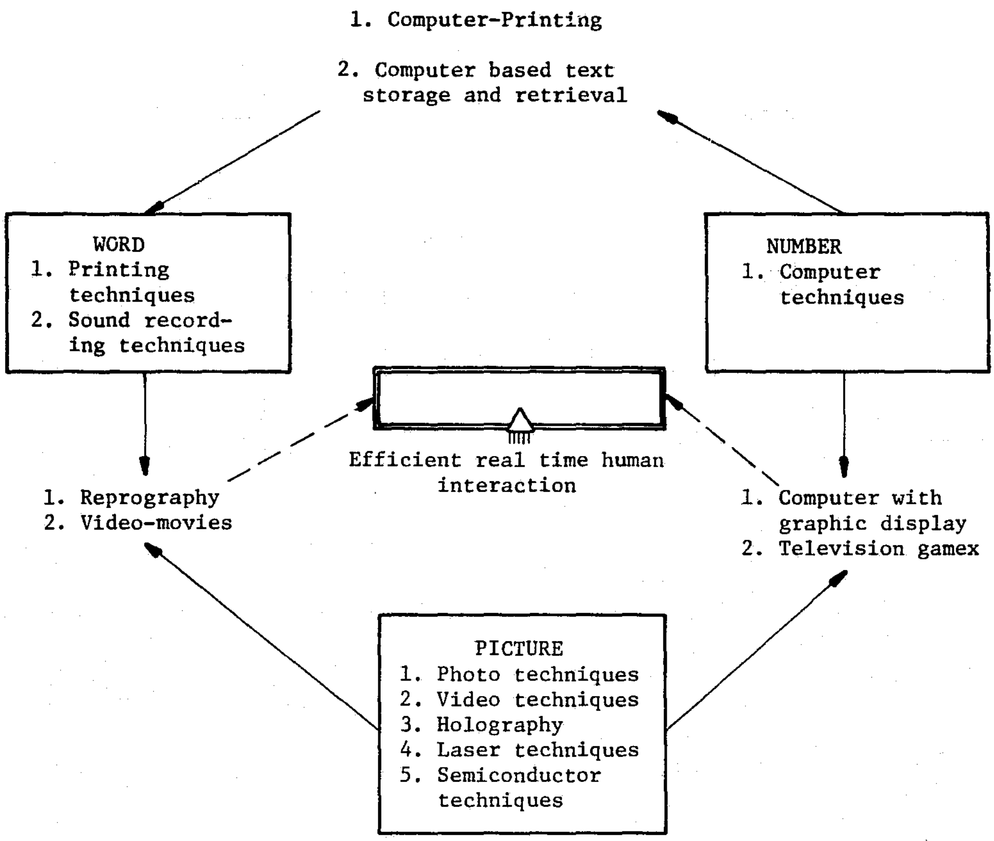

Figure 3. The three basic elements of literature in a broader sense and their major documentation techniques with combinations, indicated by arrows. The broken arrows indicate the possible future combination of the recent combination techniques, towards a Video-Graphic-Communication and Documentation System (VIGRODOS, term defined by HARTMANN, 1983a,b).

Video Graphic Communication and Documentation System

Serves for:
- Data preediting
- Data selection by "browsing", filtering
- Interactive processing
- Data editing
- Linkage to DBMS in a more general sense like PIDBU, PDBU, DDBU

Bibliography and text retrieval
Datography
Pictography
Data presentation and "play" with data (evoke intuition) like in the past with "paper and slide ruler"
Linkage to mainframe/large systems

(HARTMANN, 1983a)

DBMS: Data Base Management System
PIDBU: Principal Investigator Data Management Unit
PDBU: Project Data Managment Unit
DDBU: Discipline Scientific Data Management Unit

Figure 3a. VIGRODOS summary.

D2

N86-12839

ATMOSPHERIC TIDES MIDDLE ATMOSPHERE PROGRAM (ATMAP): Report of the November/December 1981, and May 1982, Observational Campaigns

Edited by Jeffrey M. Forbes, Coordinator of ATMAP

1. INTRODUCTION

Atmospheric tides, oscillations in meteorological fields occurring at subharmonics of a solar or lunar day, comprise a major component of middle atmosphere global dynamics. The nature of atmospheric tides requires investigations and coordination on a global, and hence international, scale. The purpose of ATMAP is to create an interaction among observationalists, data analysts, theoreticians and modellers working towards the following goals:

1) To delineate the global morphology of tides in the middle atmosphere including temporal and spatial variability on various scales;
2) To elucidate the role of tides in affecting mean winds and temperatures in the middle atmosphere;
3) To elucidate the role of tides in giving rise to gravity waves and turbulence through non-linear cascade and instability processes; and
4) To better understand the influence of mean wind and temperature fields on tidal wave propagation.

The focus for this interaction is a series of global observational campaigns involving ground-based remote sensing methods. The mechanism for interchange is workshops and symposia dealing specifically with the interpretation of these measurements.

The calendar of activities for ATMAP is presented in Table I. The calendar specifies two early winter (I and III) and two early summer (II and V) campaigns, as well as spring (IV) and autumn (VI) equinox transition campaigns. The campaigns are approximately 30 days in length; however, realizing that a number of radars may experience scheduling difficulties, and to provide greater focus to the interpretation of the measurements, 4-day "core periods" are defined within each campaign. For each core period, average vertical profiles of the mean, diurnal, and semidiurnal wind fields are constructed by each participating radar station. A 4-day fit is considered the minimum length to reduce signal to noise to acceptable levels at some stations, to remove nontidal transients, and is an integer multiple of 2 days recognizing that 48-hour, 16-hour, and 9.6-hour oscillations might be present as well. The emphasis of analysis and interpretation is on the core-period data. Data from some stations for the full 30-day observational periods are utilized to "place into context" the tidal and mean flow behaviors. The 4 solstice core periods are imbedded in fairly quiet and steady flow conditions typical of their respective solstice periods; this behavior was hoped for and anticipated on the basis of previous years' data at Saskatoon, Durham, and Adelaide, which formed the basis for the choice of these particular periods.

The purpose of this report is to assemble together the results of solstice campaigns I and II, and to present a preliminary interpretation of the results. Campaign I was analyzed extensively at the Workshop held in conjunction with the IAMAP Assembly, Hamburg, Federal Republic of Germany, August 1982. The interpretations and conclusions of those Workshop participants have been slightly modified here, taking into account the May 1982 (Campaign II) results. Again, the few conclusions presented here should be viewed as preliminary, pending interpretation of all four solstice campaigns at the ATMAP workshop to be held in Kyoto, Japan, 5-6 December, 1984, just after the Kyoto MAP symposium. These results will be presented in a subsequent MAP Handbook report. In addition, it is anticipated that a number of collaborative publications

Table I

Atmap Calendar (as of September 1984)

Dates	Comments
09 Nov. 81 - 03 Dec. 81 (core Period 19, 20, 21, 22 Nov. 81)	CAMPAIGN # I.
02 May 82 - 08 May 82 (Core Period 03, 04, 05, 06 May 82)	CAMPAIGN # II.
17 Aug. 82	Tides Workshop, Hamburg, FRG
21 nov. 83 - 16 Dec. 83 (Core Period 06, 07, 08, 09 Dec. 83)	CAMPAIGN # III.
15 Mar. - 15 Apr. 84 (Core Period 28, 29, 30, 31 Mar. 84)	CAMPAIGN # IV.
01 June 84 - 30 June 84 (Core Period 12, 13, 14, 15 June 84)	CAMPAIGN # V.
(Second Core Period 26, 27, 28, June 84)	Global Thermosphere Mapping Study (GTMS)
15 Sept. 84 - 15 Oct. 84	CAMPAIGN # VI.
05, 06, Dec. 84	ATMAP Workshop, Kyoto, JAPAN
15, 16, 17, Jan. 85	Global Thermosphere Mapping Study (GTMS)

between experimenters and theoreticians will contain details of the new science to emerge from the ATMAP program.

2. ATMAP PARTICIPATION

Table II lists the names and affiliations of currently active ATMAP participants. The success of the ATMAP program is due to the dedication and unselfish cooperation of these individuals, and their efforts are acknowledged and appreciated.

The participating radar facilities are listed and described in Table III. These range in type from meteor, partial-reflection drift, MST, and incoherent-scatter radars to the low-frequency D1-Method, which yields a height-averaged drift somewhere in the vicinity of 90-95 km. Most of the radars yield data in the 80-100 km height region, and this is the common regime for which wind measurements are provided in this report. Note that all but three of the stations are confined to middle latitudes (35°-55°). This is a distinct disadvantage when attempting to modally decompose tidal variations. However, the distribution of stations at middle latitudes does open the possibility of investigating the existence of longitudinally varying (nonmigrating) tidal components.

Table II

ATMAP Participants

Participant	Affiliation
S. Kato T. Aso T. Tsuda	Radio Atmospheric Science Center Kyoto University, Gokanosho, Uji, Kyoto 611, JAPAN
S. K. Avery	CIRES, University of Colorado, Campus Box 449 Boulder, CO., 80309 USA
S. A. Bowhill O. Royrvik	Aeronomy Laboratory Dept. of Electrical and Computer Engineering University of Illinois, Urbana, Il., 61801 USA
D. A. Carter B. B. Balsley	Aeronomy Laboratory, NOAA/ERL, Boulder, CO. 80303 USA
G. Cevolani	Laboratorio FISBAT, Via de´Castagnoli 1, Bologna, Bologna, 40126, ITALY
R. R. Clark	Department of Electrical Engineering, University of New Hampshire, Durham, NH., 03824, USA
G. Elford R. A. Vincent	Department of Physics, University of Adelaide, Adelaide 5001, SOUTH AUSTRALIA
J. M. Forbes	Department of Electrical, Computer and Systems Engineering, Boston University, Boston, MA., 02215, USA
G. J. Fraser	Department of Physics, University of Canterbury Christchurch, NEW ZEALAND
K. M. Greisiger	Zentral-Institut fur Solar-Terrestrial Physik Observatorium fur Ionospharenforschung, Kuhlungsborn, 2565 Ostseebad Kuhlungsborn, Mitschurinstrasse 4-6 GERMAN DEMOCRATIC REPUBLIC
E.S. Kazimirovsky	Siberian Institute, Irkutsk 33, P.O. Box 4, Sibizmir, USSR
R. S. Lindzen	Department of Earth, Atmospheric, and Planetary Sciences, Massachusetts Institute of Technology, Cambridge, MA., 02138, USA
A. H. Manson	Institute of Space and Atmospheric Studies, University of Saskatchewan, Saskatoon, S7N-0W0, CANADA
J. D. Mathews	Department of Electrical Engineering, Case Western Reserve University, Cleveland, OH., 44106, USA
S. Miyahara	Geophysical Fluid Dynamics Program, Princeton University Princeton, NJ., 08540, USA
W. L. Oliver	NEROC/MIT, Haystack Observatory, Westford, MA., 01826 USA

Table II (cont.)

Y. I. Portnyagin	USSR State Committee for Hydrometeorology and Control of Natural Environment, Institute of Experimental Meteorology, Lenin Str. 82, Obnisk, Kaluga Region, USSR
C. A. Reddy	Space Physics Division, Vikram Sarabhai Space Centre, Trivandrum, 695022, INDIA
R. G. Roper	School of Geophysical Sciences, Georgia Institute of Technology, Atlanta, GA., 30332, USA
J. Rottger	EISCAT Scientific Association, P.O. Box 705, S-981 27 Kiruna, SWEDEN
R. Schminder	Geophysikalisches Observatorium Collm der, Karl-Marx-Universitat Leipzig, DDR-7261 Collm, GERMAN DEMOCRATIC REPUBLIC
H. Teitelbaum F. Vial	Laboratoire de Meteorologie Dynamique, CNRS Ecole Polytechnique, 91128, Palaiseau Cedex, FRANCE
R. L. Walterscheid	Space Sciences Laboratory, The Aerospace Corporation, P.O. Box 92957, Los Angeles, CA., 90009, USA

Table III

Radars participating in the November/December 1981 and/or May 1982 ATMAP Campaigns

Facility	Latitude (Deg)	Longitude (Deg)	Radar Type*	Altitude Range (km)
Poker Flat, USA	65 N	147 W	MST/MR	80-100
Kuhlungsborn, GDR	54 N	12 E	MR	95 ± 5
Collm, GDR	52 N	15 E	D1	** 95 ± 5
Badary, USSR	52 N	104 E	D1	90 ± 5
Saskatoon, CAN	52 N	107 E	PRD	70-110
Durham, USA	43 N	71 W	MR	80-110
Urbana, USA	40 N	88 W	MR	80-110
Atlanta, USA	34 N	84 W	MR	80-110
Kyoto, JAPAN	35 N	136 E	MR	85-105
SOUSY-VHF (at Arecibo)	18 N	67 W	VHF	62-90
Jicamarca, PERU	12 S	77 W	IS	60-90
Adelaide, AUSTRALIA	35 S	138 E	PRD	70-110
Christchurch, NEW ZEALAND	44 S	173 E	PRD	70-110

* MR = Meteor Radar
PRD = Partial Reflection HF Radar
IS = Incoherent Scatter Radar
** More precise height determination after August 1982

3. CAMPAIGN RESULTS

3.1 Vertical Structures. Data descriptions and vertical structure plots for mean, diurnal, and semidiurnal components of eastward and northward velocity are included in the Appendix to this report. It was noted at the Hamburg Workshop that some of the vertical tidal structures exhibit amplitude nodes and 180° phase shifts, and it was furthermore recommended that a theoretical problem that should be addressed is the relative importance of reflection of tides and the interference between tidal modes in producing such structures. Arguments were presented by Vial, Teitelbaum, and others that the reflection mechanism may be more relevant than mode interference in explaining these observations.

3.2 Horizontal Structures. In one scheme of data presentation at the Hamburg Workshop, tidal amplitudes and phases measured at each station at 90 km altitude were plotted as a function of latitude and compared with theoretical curves which summarized the predictions of tidal models due to ASO et al. (1982), FORBES (1982a,b), and WALTERSCHEID et al. (1980). These depictions of data as discussed at the Workshop, with the May 1982 campaign results also included, appear in Figures 1-4. The interpretation of these results more or less follows the general consensus arrived at in Hamburg by the ATMAP group on the basis of the November 1981 Campaign alone. The two core periods are essentially undisturbed and the mean circulations are representative of typical early winter and early summer conditions. With regard to the semidiurnal component, the observations from various stations exhibit fairly consistent behavior as a function of latitude, as do the three theoretical models between themselves. A notable discrepancy occurs at high latitudes where the theoretical amplitudes are generally in excess of those observed during early winter, suggesting that the models may underestimate the role of damping, particularly for the higher order modes which appear to predominate in winter. Semidiurnal phases exhibit remarkable consistency with all three models. The phase structures suggest a predominance of symmetric-type modes. Departures from symmetry in this relatively small data sample appear to originate from hemispheric as well as seasonal differences.

The diurnal tide observations are consistent with the general theoretical prediction of a dominant (1,1) mode at tropical latitudes and smaller evanescent-type components at high latitudes. The data indicate the predominance of symmetric behavior, except for the winter diurnal eastward velocity which suggests small amplitudes and earlier phases than its winter counterpart. This may be a reflection of the trapped (1,-1) mode excited by asymmetric heating, or perhaps of the influence of mean winds on the propagating (1,1) mode.

Areas recommended for further theoretical research included studies of nonmigrating tides, the breaking of tides in the mesosphere, longitudinal variations in ozone and water vapor heating, the interaction of tides with gravity waves and planetary waves, mechanisms for dissipating tides above 85 km, seasonal variations in the diurnal trapped mode components in the mesosphere, and the effect of mean winds on the latitude structure of the diurnal propagating tide.

ACKNOWLEDGMENTS

J. M. Forbes acknowledges support from NSF Grant ATM-8319487 for preparation of this report.

INDIVIDUAL EXPERIMENTERS AND FACILITIES ACKNOWLEDGE SUPPORT FOR THEIR PARTICIPATION IN ATMAP FROM THE FOLLOWING SOURCES

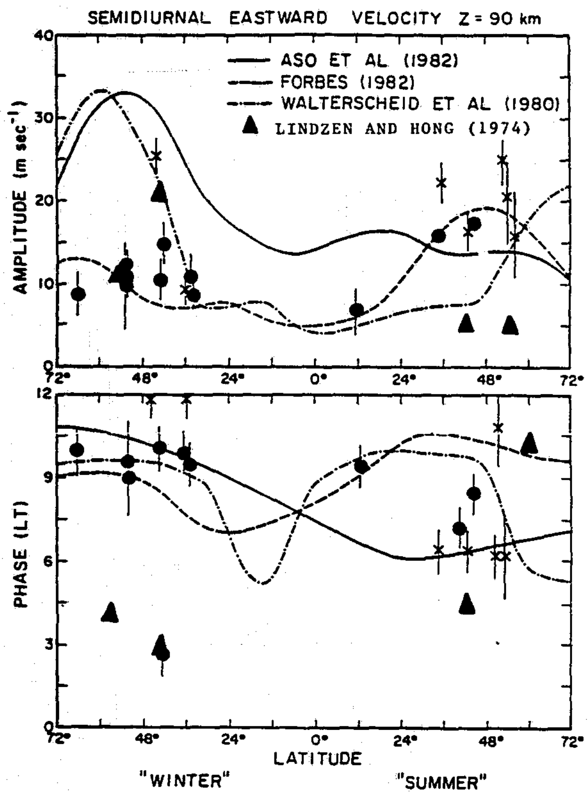

Figure 1. Semidiurnal amplitudes (top) and phases (bottom) of eastward velocity at 90 km as observed by participating radar facilities (Table III) during the November 19-22, 1981 (solid circles), and May 3-6, 1982 (crosses) ATMAP Campaign core periods, and compared with the theoretical models of ASO et al (1982), FORBES (1982a,b), and WALTERSCHEID et al. (1980).

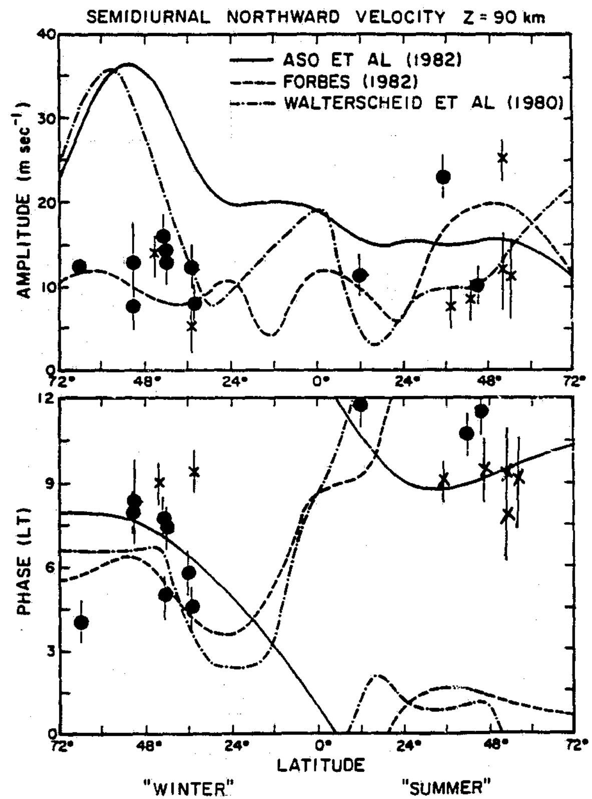

Figure 2. Same as Figure 1, except for semidiurnal northward velocity.

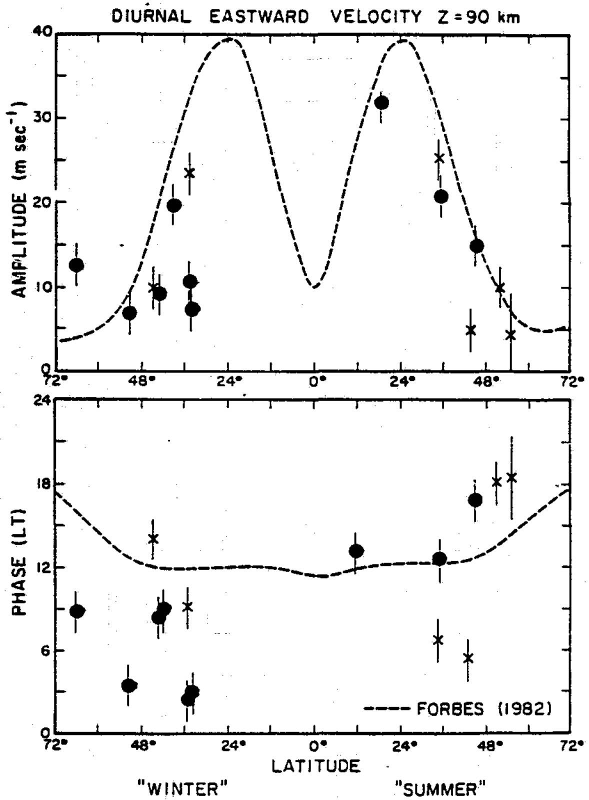

Figure 3. Same as Figure 1, except for diurnal eastward velocity.

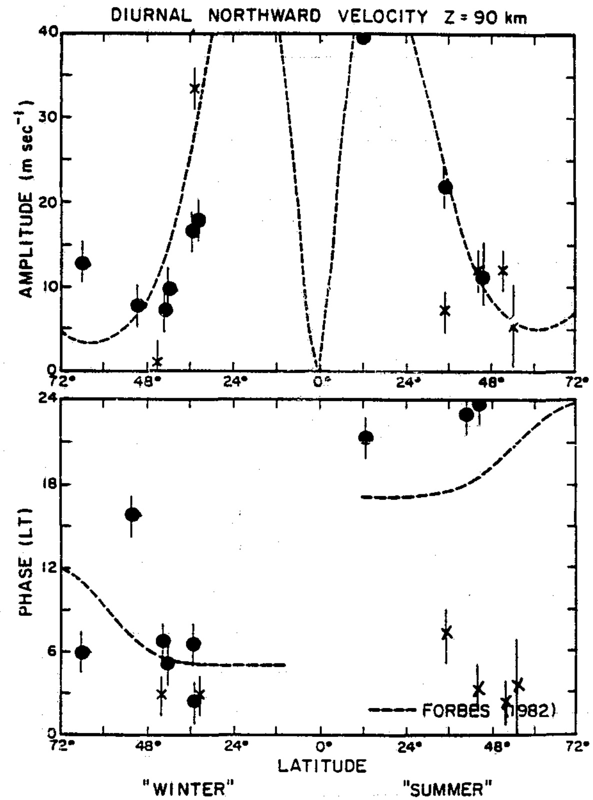

Figure 4. Same as Figure 1, except for diurnal northward velocity.

G. J. Fraser, Christchurch and Scott Base facilities, supported by the Univversity of Canterbury; New Zealand University Grants Committee; New Zealand Antarctic Research Program.

A. H. Manson, Saskatoon facility, supported by Natural Sciences and Engineering Research Council, Canada; Atmospheric Environment Service, Environment Canada, Canada; Institute of Space and Atmospheric Studies, University of Saskatchewan, Saskatoon, Saskatchewan, Canada.

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Aso, T.,T. Naoyama, and S. Kato (1982), Numerical simulation of semidiurnal atmospheric tides, J. Geophys. Res., 86, 388.

Forbes, J. M. (1982a), Atmospheric tides 1. Model description and results for the solar diurnal component, J. Geophys. Res., 87, 5222.

Forbes, J. M. (1982b), Atmospheric tides 2. The solar and lunar semidiurnal components, J. Geophys. Res., 87, 5241.

Walterscheid, R. L., J. G. DeVore, and S. V. Venkateswaran (1980), Influence of mean zonal motion and meridional temperature gradients on the solar semidiurnal atmospheric tide: A revised spectral study with improved heating rates, J. Atmos. Sci., 37, 455.

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APPENDIX TO ATMAP REPORT

DATA DESCRIPTIONS AND VERTICAL STRUCTURE PLOTS FOR MEAN, DIURNAL, AND SEMIDIURNAL COMPONENTS OF EASTWARD AND NORTHWARD VELOCITY (ordered by latitude)

MEAN WINDS AND TIDES OVER POKER FLAT, ALASKA (65° N, 147° W), DURING NOVEMBER 1981

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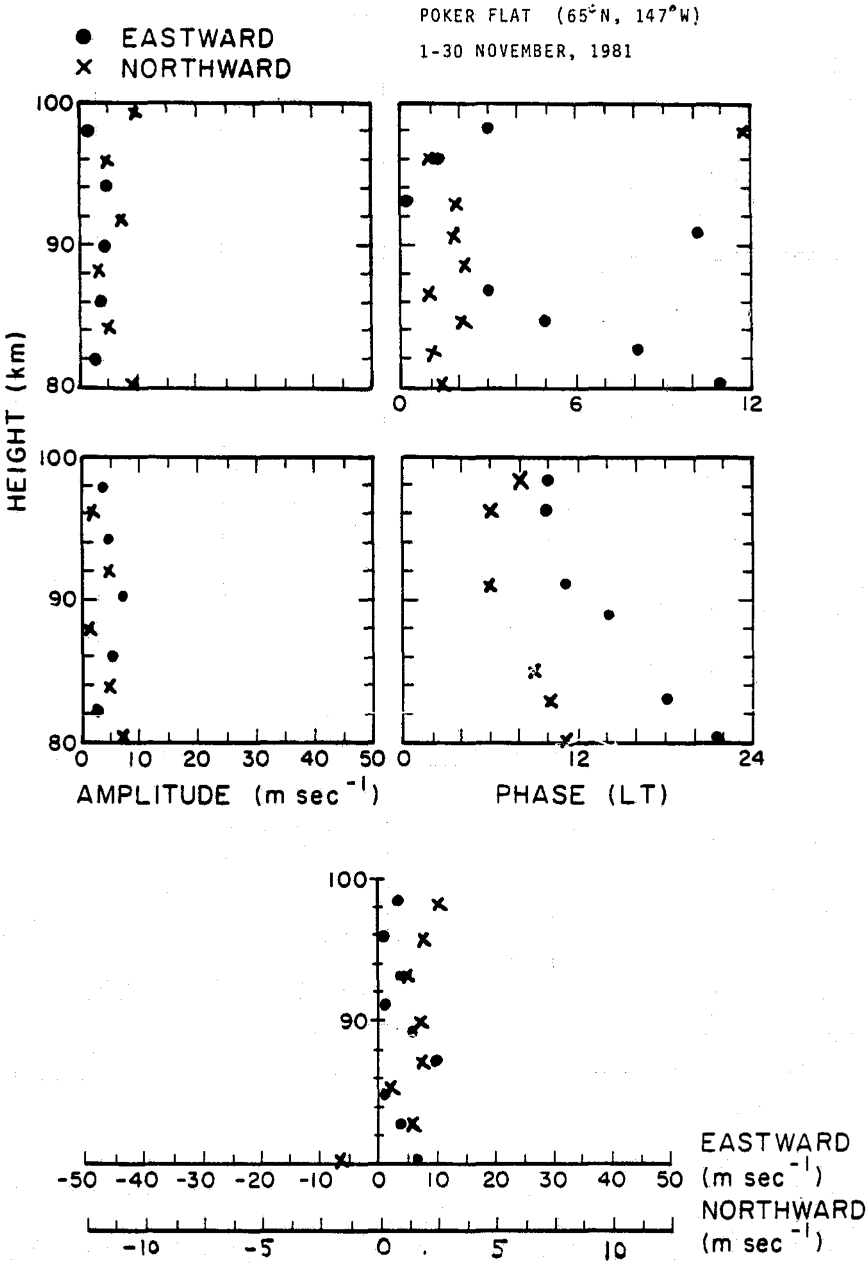
The Poker Flat, Alaska, MST (mesosphere-stratosphere-troposphere) radar operates on a continuous basis. The system receives echoes from electron-enhanced turbulence and from meteor ionization trails. Because sunlight is required to produce the electron enhancement, upper mesospheric winds from electron-enhanced turbulence echoes are available 24 hours a day only in summer. The meteor echoes, although sporadic, are present 24 hours a day throughout the year and hence provide an excellent means of supplementing the wind measurements at Poker Flat (AVERY et al., 1983).

Because the Poker Flat MST radar is not optimally designed to detect meteors, the meteor echo rate is small compared to most meteor-radar systems. However, by using data covering a month, we are able to extract the mean wind and tidal components. We compute hourly averages from the raw data and then apply a sinusoidal least-squares fit containing the tidal harmonics. We perform this procedure for data taken along two beam directions. The vertical wind is assumed to be small and therefore neglected when we decompose the line-of-sight data into zonal and meridional directions.

Figure 1 shows the mean zonal and meridional winds and the amplitude and phase structures for the tidal harmonics for the month of November, 1981. The mean winds are weak westerlies and weak southerlies. The westerlies are approximately 10 ms^{-1} lower than those during November 1980 and 1982. The diurnal amplitudes are small (7 ms^{-1}) in both the zonal and meridional wind components. The diurnal phase structures are characteristic of a propagating wave having a vertical wavelength of approximately 50 km. The semidiurnal tidal harmonic amplitudes are slightly larger (10 ms^{-1}) than the diurnal amplitudes. However, the phase structures are different for the zonal and meridional components. The meridional phase structure appears evanescent. The zonal phase structure has a phase reversal at 88 km with downward phase progression below that level and upward phase progression above that level. The vertical wavelength is approximately 12 km. This short vertical wavelength occurs during other months of the year but longer wavelengths are more common.

REFERENCE

Avery, S. K., A. C. Riddle, and B. B. Balsley, (1983), The Poker Flat, Alaska MST radar as a meteor radar, Radio Sci., 18, 1021-1027.



POKER FLAT (65°N, 147°W)
1-30 NOVEMBER, 1981
● EASTWARD
× NORTHWARD
HEIGHT (km)
100
90
80
0
6
12
0 10 20 30 40 50
AMPLITUDE (m sec^{-1})
0
12
24
PHASE (LT)
EASTWARD (m sec^{-1})
-50 -40 -30 -20 -10 0 10 20 30 40 50
NORTHWARD (m sec^{-1})
-10 -5 0 5 10

Figure 1.

D4

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RESULTS OF THE MAY 1982 ATMAP CAMPAIGN AT THE METEOR WIND STATION KUEHLUNGSBORN (54°N, 12°E), GDR

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Meteor Wind Group, Observatory Kuehlungsborn
Central Institute of Solar Terrestrial Physics,
Academy of Sciences of the GDR

A sinusoisal least-squares fit over the entire data of 1-6 May 1982 was computed. The results are shown in the following Table. Wind results refer to an average height of 95 km (no height determination).

The wind results correspond, in general, to the average behavior of early May at our station. The zonal prevailing west wind, however, is stronger than the term mean value (-5 m/s). Also, the amplitude of the semidiurnal tidal wind is larger (mean value 1977-1983: 8 m/s).

1-6 May 1982 Tidal Components at Kuehlungsborn

		Eastward	Northward
Mean	(m/s)	-16	-8
24-hour component	Amplitude (m/s)	4	6
	Time of Max. (LMT)	18.7	15.9
12-hour component	Amplitude (m/s)	15	11
	Time of Max. (LMT)	6.6	3.3
8-hour component	Amplitude (m/s)	2	1
	Time of Max. (LMT)	-	-

REMARKS ON THE ATMAP CAMPAIGNS IN NOVEMBER 1981 AND MAY 1982 AT COLLM (52°N, 15°E)

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Collm, German Democratic Republic

The results given in Tables 1 and 2 and Figures 1 and 2, are based on daily nighttime L. F. wind measurements over Central Europe (52°N, 15°E) on three measuring paths at 179, 227, and 272 kHz. Absolute reflection height measurements were carried out for the first time in August 1982 so that values of the months of 1982 and 1983 have been taken for the campaigns in November 1981 and May 1982. The prevailing wind and the semidiurnal tidal wind components are calculated daily. Means of the month or means of parts of a month are formed (with inhomogenous wind conditions) for climatological investigations. An estimation of the diurnal tidal wind components is dispensed with, as the results would be dubious due to the short period of analysis of 10 hours in summer and 16 hours in winter. A 24-hour analysis is not possible due to the very different reflection heights during the daytime and nighttime, even with measurements being carried out the whole day long in the winter season. The critical examination of the choice of the measuring intervals (November/May) selected is dependent, to a large extent, on the visual angle. A wind field change is observed over Central Europe very often around the 20th of November (transition to mid-winter conditions) 1981 this wind field variation being in the "core period" and leading over to a more stable tidal wind. Regular wind conditions would exist mostly in December, which would be favorable especially for meteorological comparisons to be made between the results of different wind-measuring facilities. The same is applicable for September due to the large tidal wind amplitudes and the high phase stability. May is, as is November, a transitional month. The measuring period of May 1982 is at the outset of the "spring anomaly" with very large fluctuations in the tidal wind field. Periods in July/August (not least because of the quasi-two-day-wave in the prevailing wind on the summer hemisphere) or in April or September would be more favorable here, too, for the beginning of a regionally or globally organized synopsis. The question whether the tidal structures and prevailing wind conditions in the two measuring periods mentioned above were typical for this time of the year can be answered positively.

Table 1. November 1981 mean and tidal components at Collm.

Night	zonal			meridional		
	V_o	V_2	T_2	V_o	V_2	T_2
01./02.11.81	+06	10	18.7	00	15	16.5
02./03.11.81	+14	06	18.5	+01	08	17.7
03./04.11.81	-01	15	19.2	+01	09	15.1
04./05.11.81	+03	14	19.0	+02	13	16.7
05./06.11.81	00	06	15.6	00	06	15.9
06./07.11.81	+04	06	22.4	-03	13	21.2
07./08.11.81	+10	07	21.4	+04	10	19.7
08./09.11.81	+14	05	22.2	+07	16	20.6
09./10.11.81	+08	10	21.2	+08	10	18.8
10./11.11.81	+09	13	22.2	-07	14	21.0
11./12.11.81	-05	07	16.5	+04	10	13.3
12./13.11.81	-03	15	19.2	+03	06	18.0
13./14.11.81	+06	06	18.0	-03	06	17.7
14./15.11.81	+10	11	18.6	+03	11	17.3
15./16.11.81	+10	09	16.0	-01	13	14.2
16./17.11.81	+11	11	16.7	+04	07	15.1
17./18.11.81	+05	13	17.0	+03	12	15.9
18./19.11.81	+14	05	18.4	+05	07	17.2
19./20.11.81	+12	09	20.6	-01	17	18.7
20./21.11.81	+11	08	22.2	00	08	19.6
21./22.11.81	00	21	21.3	-10	19	20.5
22./23.11.81	+05	10	22.8	00	13	20.8
23./24.11.81	+05	16	20.6	-06	13	19.7
24./25.11.81	+13	13	22.3	+01	10	20.1
25./26.11.81	+03	13	22.5	+02	17	20.4
26./27.11.81	+09	13	21.1	+09	10	20.7
27./28.11.81	+02	15	21.9	-07	18	20.1
28./29.11.81	+05	21	22.8	-04	22	21.1
29./30.11.81	+07	07	21.9	-03	13	19.8
30.11./1.12.	+04	11	21.0	00	25	20.8

Table 2. May 1982 mean and tidal components at Collm.

Night	zonal v_o	zonal v_2	zonal T_2	meridional v_o	meridional v_2	meridional T_2
01./02.05.82	-19	00		-10	13	15.2
02./03.05.82	-04			-10		
03./04.05.82	+06	17	16.4	-04	08	12.9
04./05.05.82	-19	08	13.4	-01	15	13.7
05./06.05.82	-03	34	18.9	-06	34	16.5
06./07.05.82	-17	09	00.5	00	20	00.6
07./08.05.82	-10	07	00.2	-03	21	21.8
08./09.05.82	-10	17	18.2	-22	10	13.7
09./10.05.82	-10	16	23.6	-13	07	14.8
10./11.05.82	-14	07	19.9	-03	13	21.8
11./12.05.82	-16	15	00.7	-15	04	21.7
12./13.05.82	-26	02	02.3	-24	05	23.3
13./14.05.82	-10	13	19.5	-06	22	16.6
14./15.05.82	-09	18	00.9	-05	17	00.5
15./16.05.82	+01	06	20.5	-13	08	18.6
16./17.05.82	-21	09	19.2	-19	16	15.9
17./18.05.82	-16	08	01.1	-07	08	02.5
18./19.05.82	+08	22	17.1	-05	06	14.1
19./20.05.82	+10	22	18.2	-05	17	16.3
20./21.05.82	-12	14	15.8	-25	03	12.9
21./22.05.82	-19	20	18.0	-04	15	14.9
22./23.05.82	-06	21	18.3	+03	13	16.4
23./24.05.82	+10	06	17.1	-10	07	16.5
24./25.05.82	+04	29	17.0	-11	24	15.8
25./26.05.82	+04	20	18.6	-03	17	16.2
26./27.05.82	+04			-09	13	19.5
27./28.05.82	-06	10	16.9	-08	00	-
28./29.05.82	+07	13	17.9	-11	13	15.4
29./30.05.82	-01	18	16.6	-07	11	15.7
30./31.05.82	+12	15	20.0	-02	20	17.0
31.5./1.6.82	-06	09	19.6	-13	09	16.1

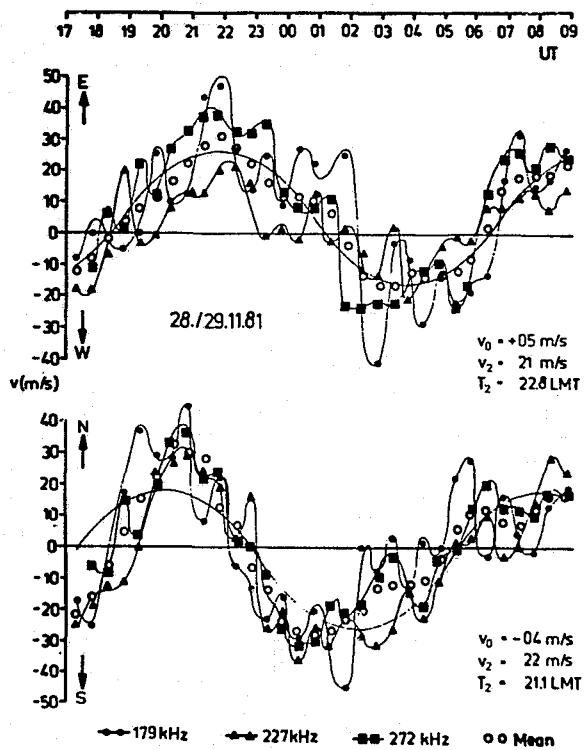

Figure 1. Nighttime wind variations at 93 km altitude over Central Europe (52°N, 15°E) for an individual night in November 1981 obtained from LF wind measurements at the Collm Geophysical Observatory.

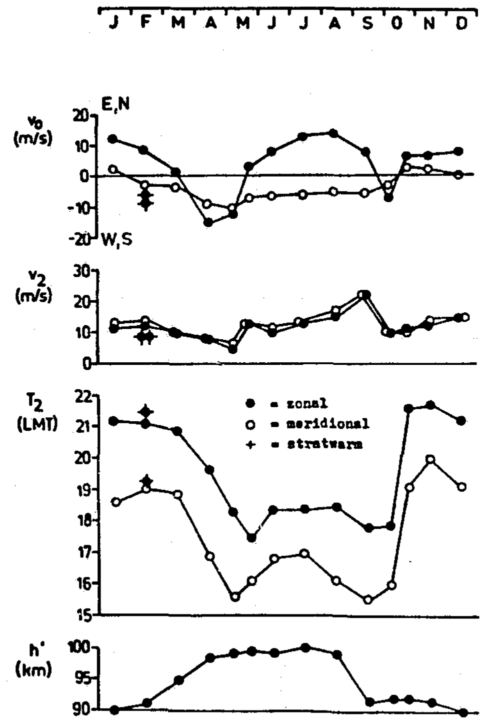

Figure 2. Results of high atmosphere wind observations over Central Europe (52°N, 15°E) in an altitude of 90-100 km obtained from LF wind measurements on 179, 227, and 272 kHz at the Collm Geophysical Observatory (G.D.R.) in 1979-1983.

TIDAL WINDS DURING THE NOVEMBER 1981 AND MAY 1982 ATMAP CAMPAIGNS AT BADARY (52°N, 104°E), USSR

E. Kazimirovsky

Siberian Institute of Terrestrial Magnetism, Ionosphere and Radio Propagation, Siberian Department, Academy of Science, USSR

Prevailing and semidiurnal wind components obtained from drift measurements at 85-95 km D-1 method (200 kHz) over Badary, USSR are presented in the following table:

	Eastward Component (ms^{-1})			Northward Component (ms^{-1})		
Night	mean	semid. ampl.	semid. phase	mean	semid. ampl.	semid. phase
November 1981						
19./20.	24.4	6.8	1.78	7.7	7.3	4.33
20./21.	28.9	8.2	0.89	5.9	13.6	3.96
21./22.	29.6	6.9	7.11	10.1	10.7	5.36
22./23.	29.4	6.3	10.40	0.9	19.9	5.50
23./24.	30.1	5.5	3.47	7.7	1.2	9.12
May 1982						
02./03.	25.0	26.3	10.47	15.5	12.8	2.79
03./04.	16.1	5.8	9.41	14.3	10.6	1.14
04./05.	25.0	20.4	11.25	18.7	8.8	1.25
05./06.	29.0	21.2	11.18	8.8	10.2	2.92
06./07.	25.2	30.0	11.08	17.7	18.8	1.46
07./08.	15.1	7.5	0.50	12.1	10.4	4.04

omit

D6

N86-12843

SASKATOON M. F. RADAR SYSTEM: (52°N, 107°W), CANADA

A. H. Manson and C. E. Meek

Institute of Space and Atmospheric Studies, University of Saskatchewan, Saskatoon, Sask., Canada

The system runs continuously, producing 1-h profiles ∿75-110 km, 1978-1983: in particular for the 30-d (Nov. 9 - Dec. 7), 10-d (Nov. 16-26), 4-d core periods (Nov. 19-23). The means (EW, NS) and fourier components (24-, 12-h) fitted for the 4-d are shown in Figure 1: s.d. are shown, as derived from four 24-h fits in the interval. Confidence in these data is high; and comparisons with the 10-, 30-d intervals confirm this and the lack of major variability in November. The 1-h profiles are means of $\leq$ 12 profiles so intrinsic errors are minimal.

Figures 2, 3, and 4 compare the 4-, 10-d fourier fits, and also the 30-d means from 48-h fits: in these amplitudes are N^2+E^2 as N/E $\approx$1. Means differ slightly due to planetary wave activity; 24-h tides are variable in Novembers ($\infty > \lambda >$ 40 km, 1978-1982); and the 12-h variation is small > 80 km. The final figure is a high resolution spectra for the November month: the 12-, 24-h dominate; the 8-h appears >100 km; and up to 90 km there is a 4-d oscillation. Reports by MEEK et al. (1982) and MANSON et al. (1982a) assess the November campaign and the 1981/82 year in detail.

Finally, this November is typical of others, 1978-1983. The EW mean is always well established (GREGORY et al., 1981; MANSON et al., 1981). For the 24-h tide, the two states (long/short λ in summer/winter) are less regular (MANSON and MEEK, 1983), and long or short λ may occur in most months of a given year: this year evanescent modes/standing waves were present. The seasonal variation of the 12-h is very regular (MANSON et al., 1982b, 1983). The λ - change to short winter values ($\lesssim$ 45 km) is usually complete in November, and λ was small in 1981 (∿30 km); and the large ϕ change (maximum rate ∿ October 30- November 10) was just completed by the inner core interval of 1981. November is not a fully solstitial month, and theoretical comparisons with December are recommended.

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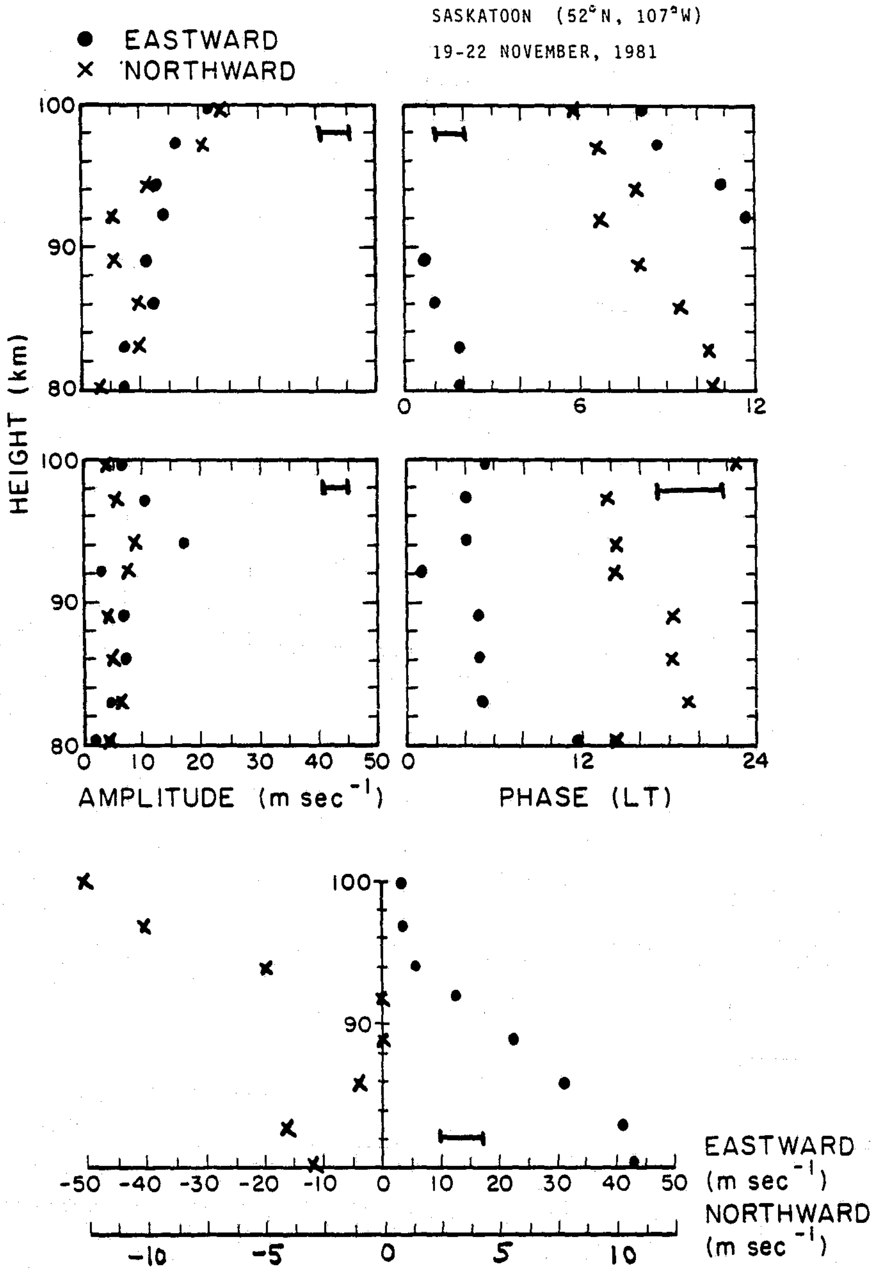
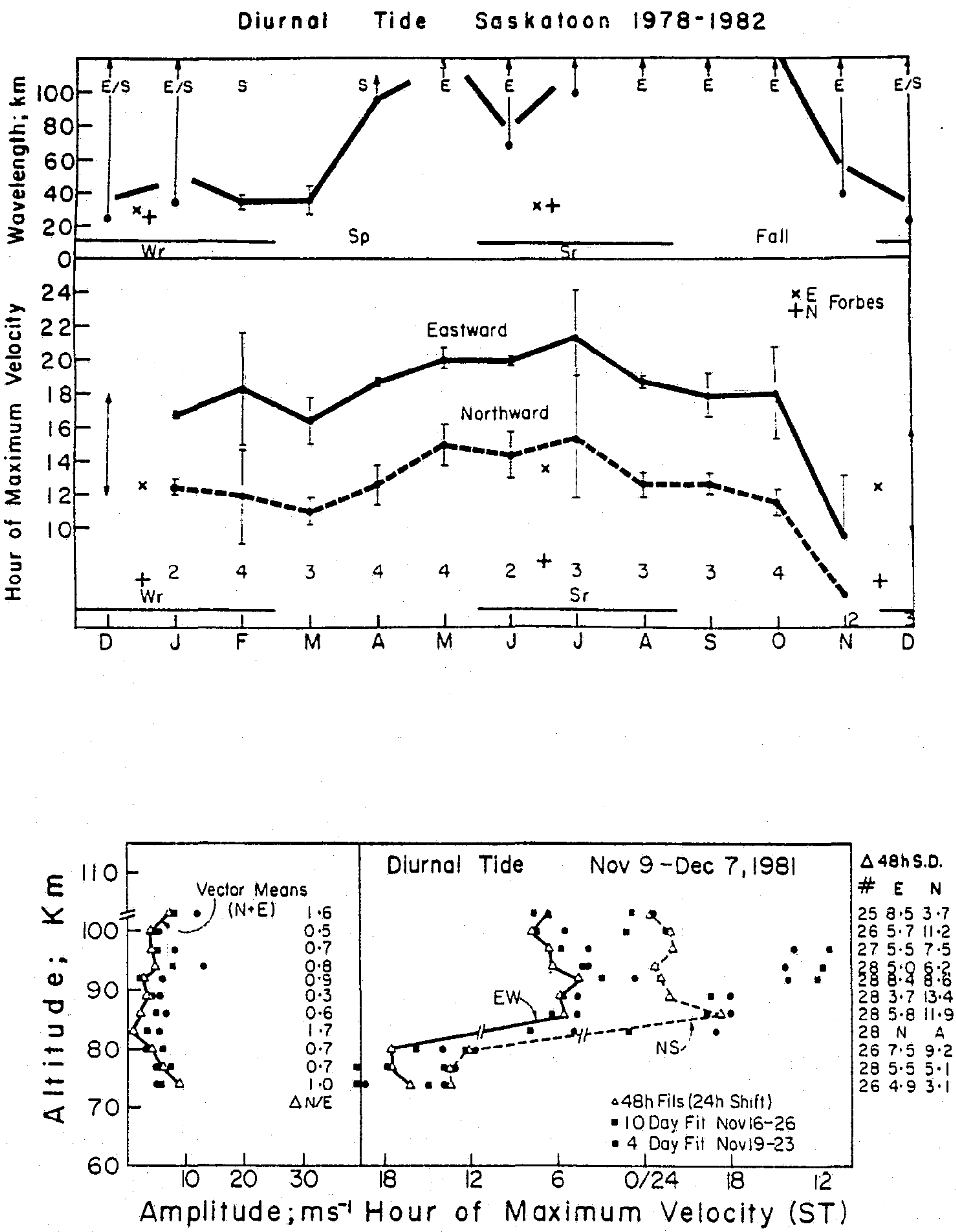
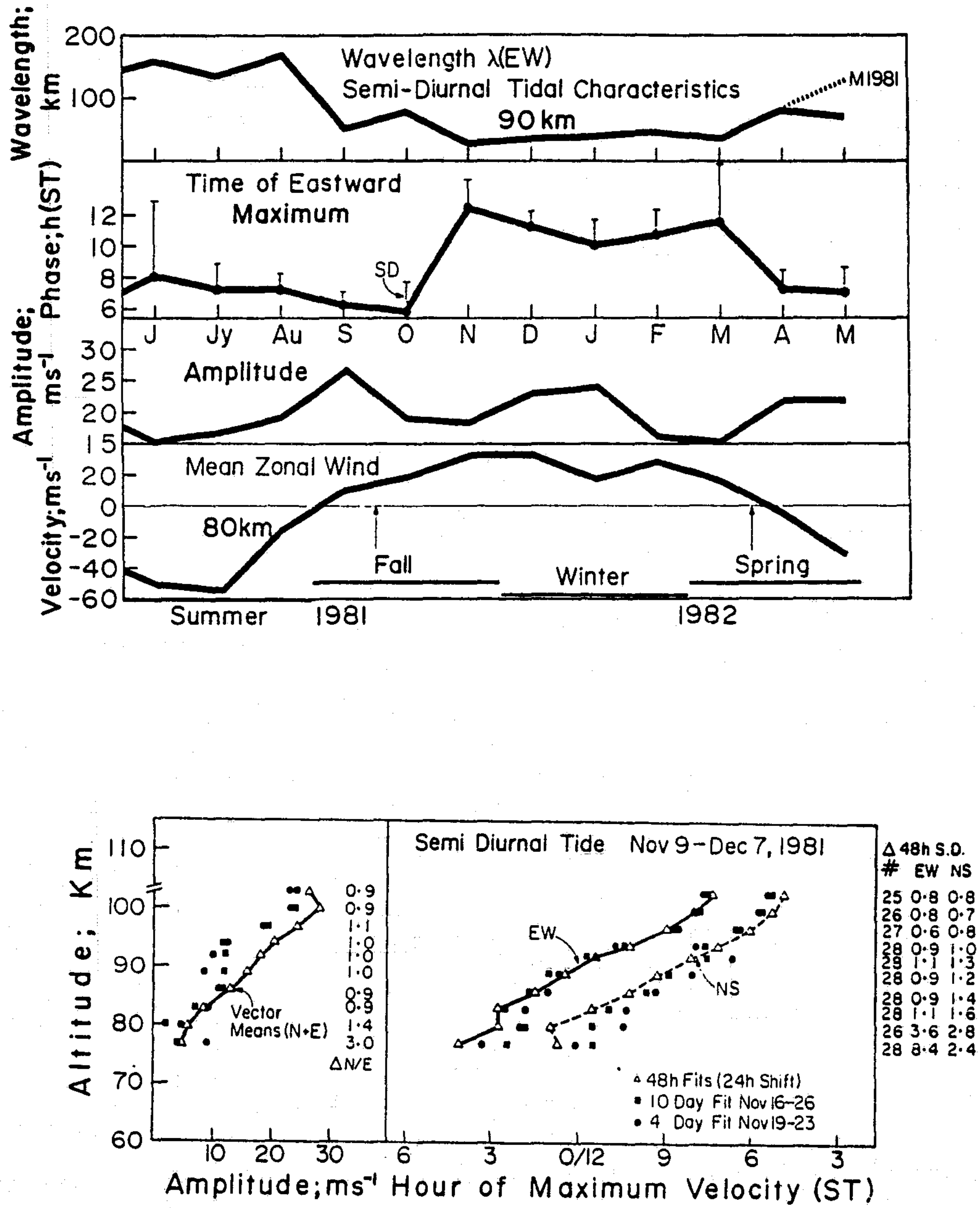

SASKATOON (52°N, 107°W)
19-22 NOVEMBER, 1981
EASTWARD
NORTHWARD
HEIGHT (km)
100
90
80
0
6
12
0
10
20
30
40
50
0
12
24
AMPLITUDE (m sec^{-1})
PHASE (LT)
100
90
-50
-40
-30
-20
-10
0
10
20
30
40
50
EASTWARD
(m sec^{-1})
-10
-5
0
5
10
NORTHWARD
(m sec^{-1})

Figure 1.



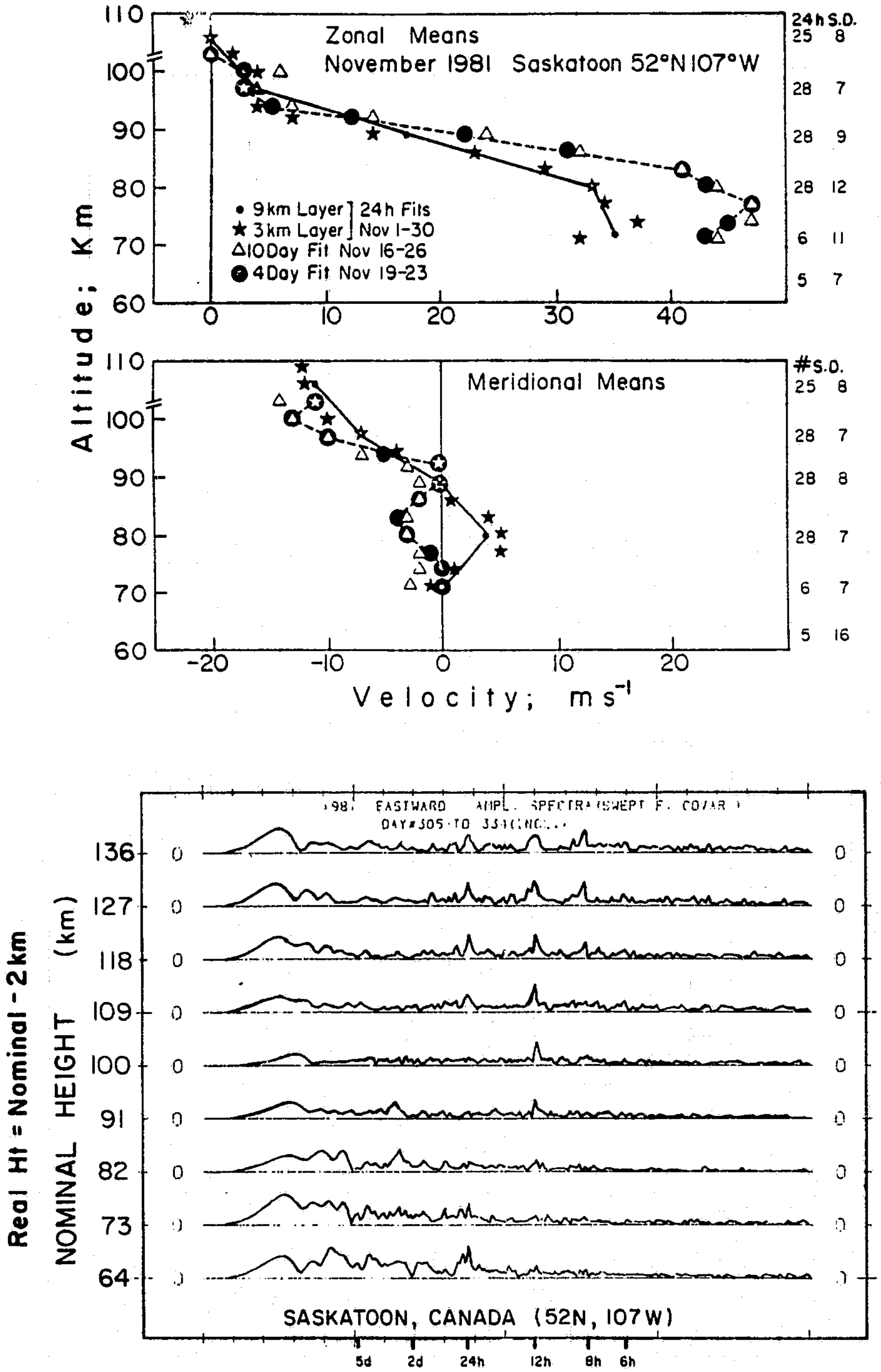
SASKATOON (52°N, 107°W)

Figure 2.



SASKATOON (52°N, 107°W)

Figure 3.



Zonal Means
November 1981 Saskatoon 52°N 107°W
24h S.D.
• 9km Layer] 24h Fits
★ 3km Layer] Nov 1-30
△ 10Day Fit Nov 16-26
● 4Day Fit Nov 19-23
Altitude; Km
Meridional Means
#S.D.
Velocity; m s⁻¹
EASTWARD AMPL. SPECTRA
NOMINAL HEIGHT (km)
Real Ht = Nominal - 2km
SASKATOON, CANADA (52N, 107W)
5d
2d
24h
12h
8h
6h

Figure 4.

May 1982, SASKATOON M. F. RADAR SYSTEM: (52°N, 107°W), CANADA

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The system runs continuously, producing 1-h profiles ∿75-110 km, 1978-1983: in particular for the 30-d (April 20 - May 19) centered on the inner core (May 3-6), 10-d (May 2-11). Incredibly, the only days missed for April/May were May 4/5, so 4-d fits for the core could not be made! However the winds and tides were stable during May, so that the 10-d fits can be taken for comparison with other locations.

The means (EW/NS) and Fourier components (24-, 12-h) for the 10-d (May 2-11) are shown in Figure 1; also those for the 30 days. Standard deviations are shown -- they are quite small. There is also little difference between 10- and 30-d profiles. The zonal flow is quite weak, showing that the summer westward flow has not fully developed -- this is not a solstitial state. The 24-h tide has large λ: ∿100 km (EW) and ∞(NS). Below 90 km the tide is circular, but above almost linear with EW amplitudes larger than NS. The 12-h tide is circular and λ is small (4-45 km) below 95 km; and more linear and variable ($40 < \lambda < \infty$) above (MEEK and MANSON, 1983; MANSON et al., 1982a). The 30-d May spectral figure (Figure 2) shows that 12-, 24-h tides are comparable; otherwise there is a 3.85-d oscillation to ∿90 km; there were no other significant peaks.

Finally, this May was quite typical of others, 1978-83 (MANSON et al., 1981a,b). For the 24-h tide, the figure shows that λ is always large (1978-82) and that the s.d. of the phase is quite small (MANSON and MEEK, 1983); May is well clear of the winter short-λ state. The seasonal variation of the 23-h is very regular (MANSON and MEEK, 1983; MANSON et al., 1982b; 1983). and the figure for 1981/82 is very typical. The 90-km phase change is normally complete by April 1; but λ at 90 km is typically 50-130 km for April/May, with the appearance of $> \lambda$ from above. The summer long-λ was not developed until June 1982, so that May was again not a fully solstitial month for the 12-h tide; or the mean winds.

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Manson, A. H., C. E. Meek, and J. B. Gregory (1983), J. Atmos. Sci. 40, 969.
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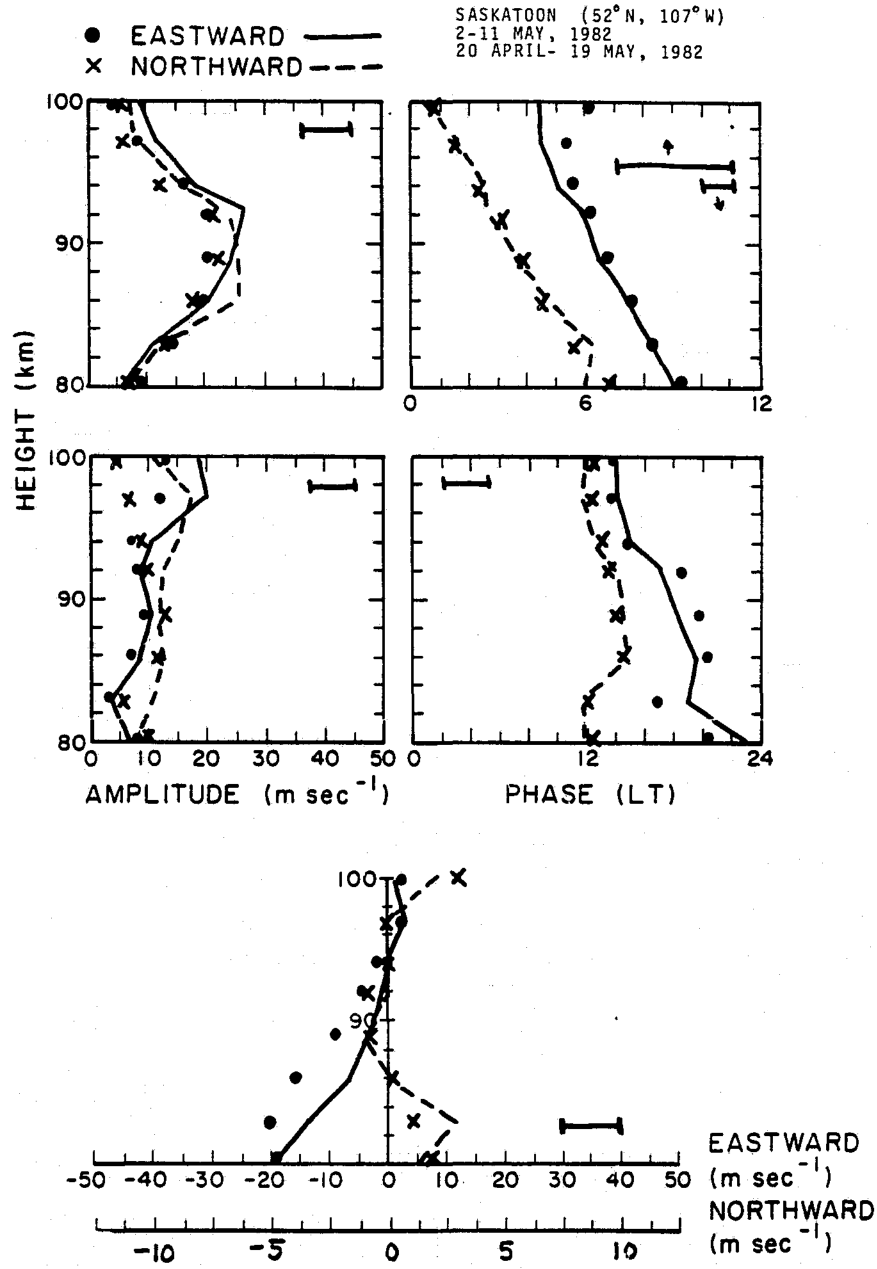
● EASTWARD ———
× NORTHWARD - - -
SASKATOON (52°N, 107°W)
2-11 MAY, 1982
20 APRIL- 19 MAY, 1982
HEIGHT (km)
100
90
80
0
6
12
10
20
30
40
50
24
AMPLITUDE (m sec^{-1})
PHASE (LT)
EASTWARD
(m sec^{-1})
NORTHWARD
(m sec^{-1})
-50 -40 -30 -20 -10 0 10 20 30 40 50
-10 -5 0 5 10

Figure 1.

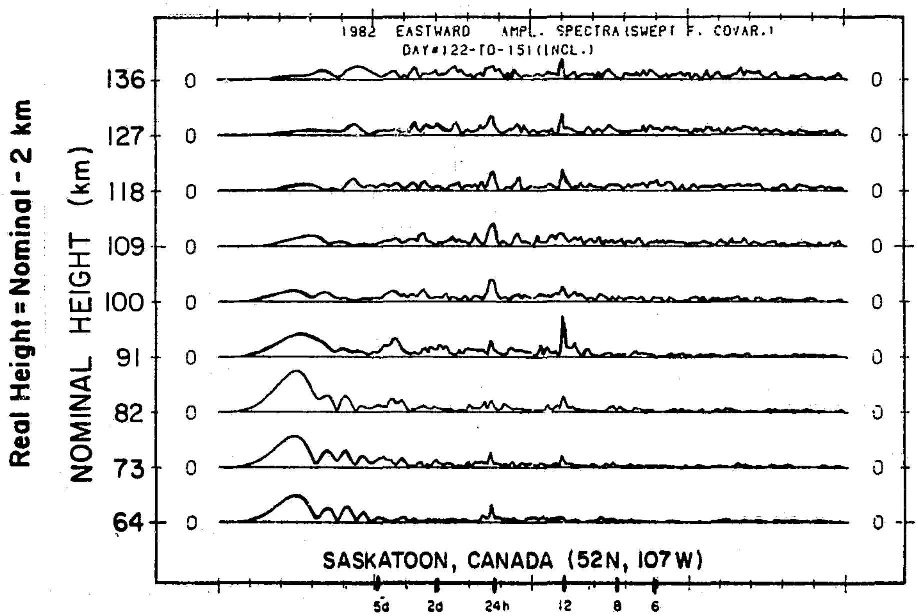
1982 EASTWARD AMPL. SPECTRA (SWEPT F. COVAR.)
DAY#122-TO-151 (INCL.)
Real Height = Nominal - 2 km
NOMINAL HEIGHT (km)
136
127
118
109
100
91
82
73
64
0
SASKATOON, CANADA (52N, 107W)
5d
2d
24h
12
8
6

Figure 2.

D8 N86-12845

METEOR WIND RESULTS AT DURHAM (43°N, 71°W) DURING THE ATMAP NOVEMBER 1981 AND MAY 1982 CAMPAIGNS

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This paper presents winds modeled from data measured with the University of New Hampshire Meteor Wind Radar System at Durham, New Hampshire, USA over the two 4-day periods November 20-23, 1981 (Figure 1) and May 8-11, 1982 (Figure 2). The raw meteor wind data has been fit in a least-square sense to a three-dimensional model containing mean, 12-, 24-, and 48-h periods.

The mean winds for both periods are very close to the three-year average values at Durham (CLARK, 1983) during May and November, respectively. The semidiurnal component for the November period had a normal (CLARK, 1983) amplitude and phase, and an estimated vertical wavelength of 60 km. The May period results were essentially typical except that the Northward amplitude was 3 to 4 times smaller than normal. The diurnal amplitudes measured for both periods are typical for Durham (CLARK, 1983) and the diurnal phase is normally not very consistent. The 48-hour component amplitude is typical for these months.

The intrinsic errors of the radar are approximately ± 2 km in position and ± 4 m/s in radial velocity including quantization errors. These errors are random with zero mean and should not bias the wind results.

For the November 1981 period, the data from approximately 500 meteor trails were used in determining the model parameters. Some data at high meteor rate times are discarded to provide a more uniform coverage throughout the day. The standard deviations indicating the tightness of the least-squares model fit on the sine and cosine amplitudes of each component are 4 m/s at 95 km height and 9 m/s at the height extremes of 77 and 110 km. The fit relative to phases can be inferred since phase is computed from the ratio for sine and cosine. For the May 1982 period the data from approximately 1000 meteor trails were used, and the standard deviations were virtually the same as for the November period.

REFERENCE

Clark, R. R. (1983), J. Atmos. Terr. Phys., 45, 621.

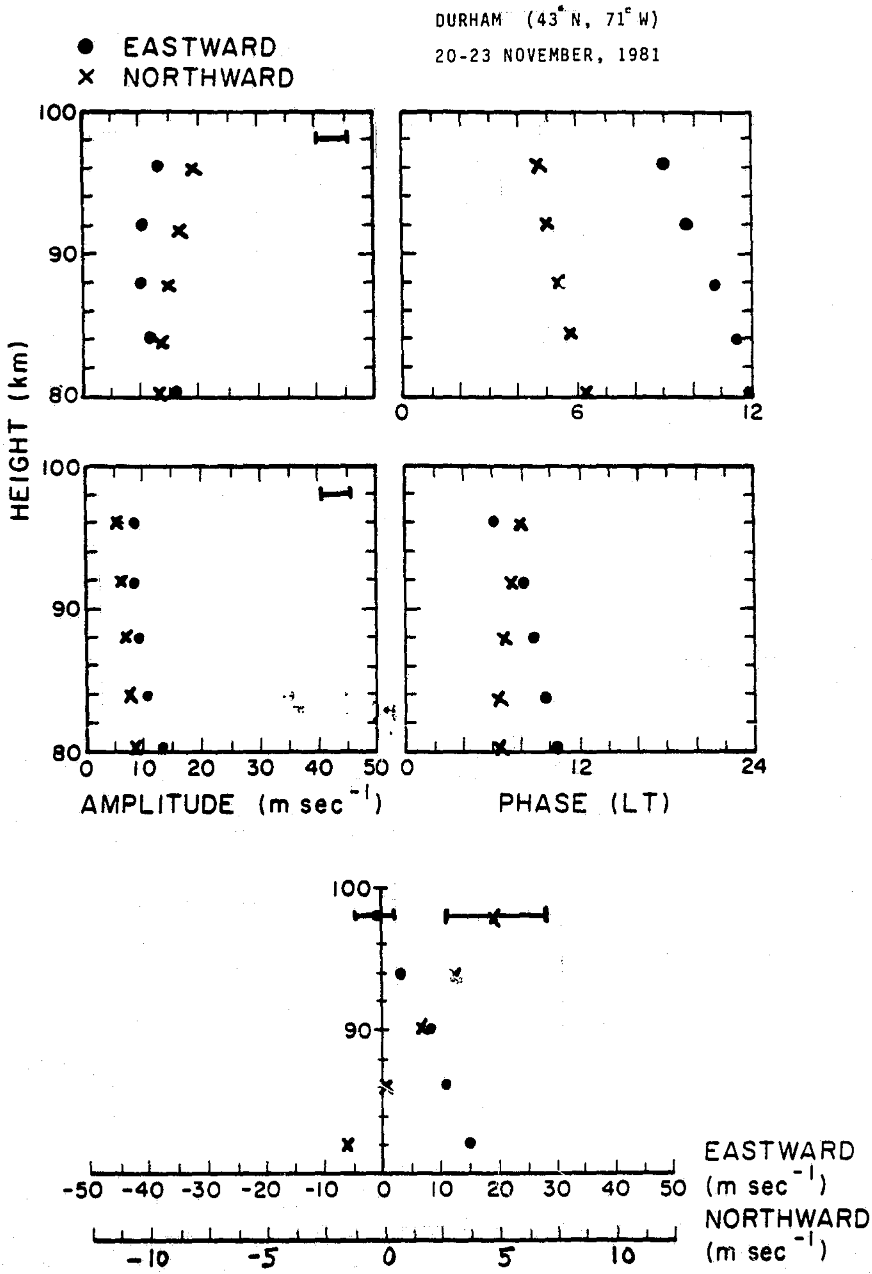
DURHAM (43° N, 71° W)
20-23 NOVEMBER, 1981
EASTWARD
NORTHWARD
HEIGHT (km)
100
90
80
0
6
12
0 10 20 30 40 50
0 12 24
AMPLITUDE (m sec⁻¹)
PHASE (LT)
-50 -40 -30 -20 -10 0 10 20 30 40 50
EASTWARD (m sec⁻¹)
-10 -5 0 5 10
NORTHWARD (m sec⁻¹)

Figure 1.

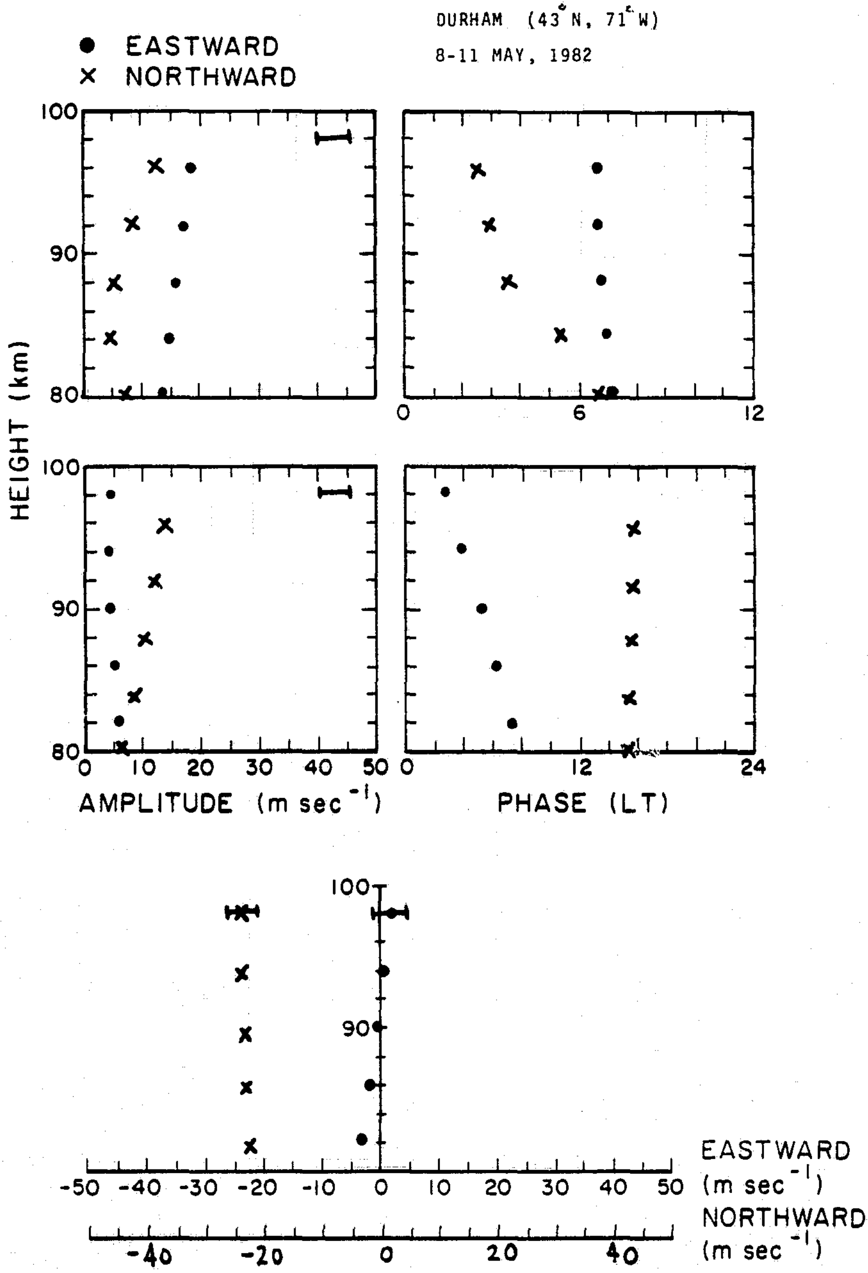
DURHAM (43°N, 71°W)
8-11 MAY, 1982
● EASTWARD
× NORTHWARD
HEIGHT (km)
100
90
80
0
6
12
100
90
80
0
10
20
30
40
50
0
12
24
AMPLITUDE (m sec⁻¹)
PHASE (LT)
100
90
-50
-40
-30
-20
-10
0
10
20
30
40
50
EASTWARD
(m sec⁻¹)
-40
-20
0
20
40
NORTHWARD
(m sec⁻¹)

Figure 2.

N86-12846 D9

MEAN WINDS AND TIDES OVER URBANA, ILLINOIS DURING NOVEMBER 16-22, 1981

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The Urbana Meteor Radar uses a high-power pulse transmitter to achieve high echo rates, and an interferometer to spatially locate the individual echoes. The irregularly spaced (in time) observations of range, radial velocity, and direction cosines are reduced to a rectangular grid, evenly spaced in time and height, of estimates of the zonal and meridional wind. This is accomplished using the method of GROVES (1959) whereby a constant horizontal wind is fitted, using least-squares, to all echoes occurring within a fixed time/height interval. This interpolation region is then stepped in time and height. The size of the interpolation region is 2 hours by 5 km, the time step is approximately 11 minutes, and the height step is 2 km. The filtering of high temporal and spatial frequencies is somewhat reduced by weighting the echoes according to their distance from the center of the interpolation box.

The data shown were computed using a least-squares fit to a mean + 48 + 24 + 16 + 12 + 8 + 6 hour waves over the entire 7 days' winds. The daily mean, diurnal, and semidiurnal tides were quite variable; we feel that the standard errors of the 7-day fits are thus underestimated. The standard errors of the zonal components tend to be a factor of 3 greater than those of the meridional components, a result of radar antennas pointing north. We feel that the meridional winds are reliable, but hesitate to attach much significance to the (average) zonal components. The data are currently being re-examined, and we will be able to provide confidence intervals for the average Fourier fits in the near future.

Figure 1 shows weak northerlies at all heights, westerlies below 94 km, and easterlies above 94 km. The zonal diurnal tide below 96 km exhibits a 26 km vertical wavelength; the meridional phase structure, however, is irregular. The zonal semidiurnal tide shows a 6-km vertical wavelength, while the meridional component shows a vertical wavelength of about 50 km (below 98 km).

REFERENCE

Groves, G. V. (1959), A theory for determining upper-atmosphere winds from radio observations on meteor trails, J. Atmos. Terr. Phys., 16, 344-356.

*Current address: CIRES, Box 449, University of Colorado, Boulder, Colorado, 80309

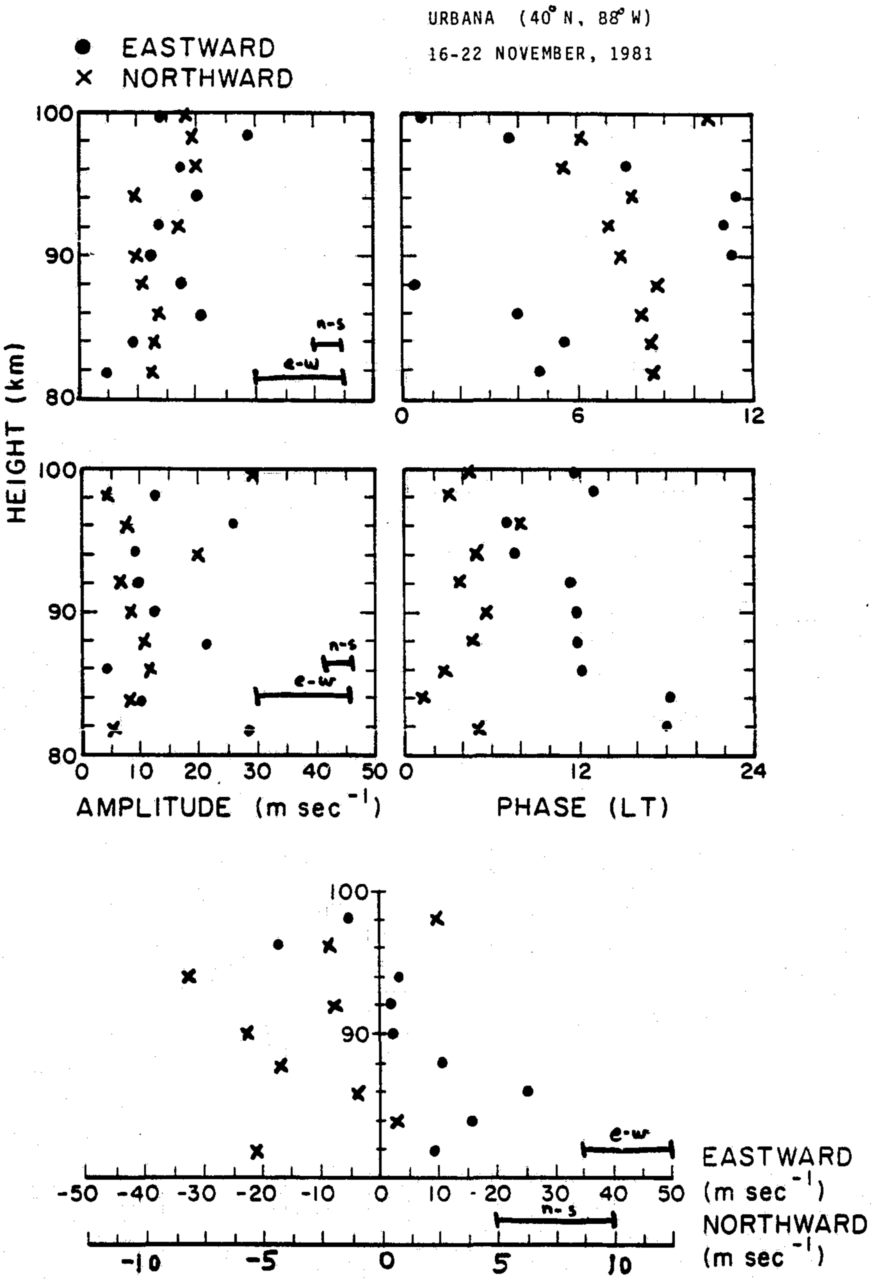
URBANA (40° N, 88° W)
16-22 NOVEMBER, 1981
● EASTWARD
× NORTHWARD
HEIGHT (km)
AMPLITUDE (m sec⁻¹)
PHASE (LT)
n-s
e-w
EASTWARD (m sec⁻¹)
NORTHWARD (m sec⁻¹)

Figure 1.

KYOTO METEOR RADAR OBSERVATION IN NOVEMBER, 1981 AND MAY, 1982

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Radio Atmospheric Science Center,
Kyoto University, Uji, Kyoto 611, JAPAN

SYSTEM DESCRIPTION

The Kyoto meteor radar is located at 136°06′E and 34°51′N. It is a pulsed Doppler radar and operates at 31.57 MHz with peak power of 10 kW. An interferometer is adopted for arrival angle measurement. Height resolution is approximately 1-3 km depending on both azimuth and elevation angles.

OBSERVATION PERIODS

(a) November 1981: The Kyoto meteor radar was activated at 20:00 LT (nine hours ahead of UT) on November 18, and continued observation until 18:50 LT November 23. Because of trouble with the transmitter, the peak power was reduced to less than half the nominal value. So that, the number of total echoes was as small as 2,500. Because the antenna was directed eastward, the northward component of the wind velocity is less significant than the eastward component, although it can be delineated by using Groves′ algorithm.

(b) May 1982: Observation was done from 17:00 LT on May 3 to 12:00 LT on May 9. The antenna direction was switched every eight hours so as to be pointed both north and east periodically. Data on May 7 are missing because of malfunction of the interferometer.

DATA ANALYSIS

We basically analyse data according to an algorithm approved by GROVES (1959). All data in height range 84-104 km are separated into five layers, whose altitude width is 4 km. In each layer, least-square fitting is performed for ten parameters, which are amplitudes of northward/eastward mean wind and sin/cos component of diurnal/semidiurnal tide. Reliable range for each parameter is also calculated.

Figure 1 shows the November 1981 amplitude of the eastward diurnal tide is 20 m/sec at altitude 90 km, and decreases to less than 10 m/sec above. That of the semidiurnal tide becomes zero around 95 km. The northward component seems to be affected by the eastward one because the number of meteor echoes was small, as mentioned above.

In May 1982, both eastward and northward components are detected independently (Figure 2). As for tides, the eastward component is approximately three times larger than the northward one which, however, is smaller than average northward profiles in 1979-1980 (TSUDA et al., 1983).

Figure 3 shows mean winds for 1983-1984 at Kyoto, and Figure 4 shows Atlanta results for comparison.

REFERENCES

Groves, G. V. (1959), J. Atmos. Terr. Phys., 16, 344-356.
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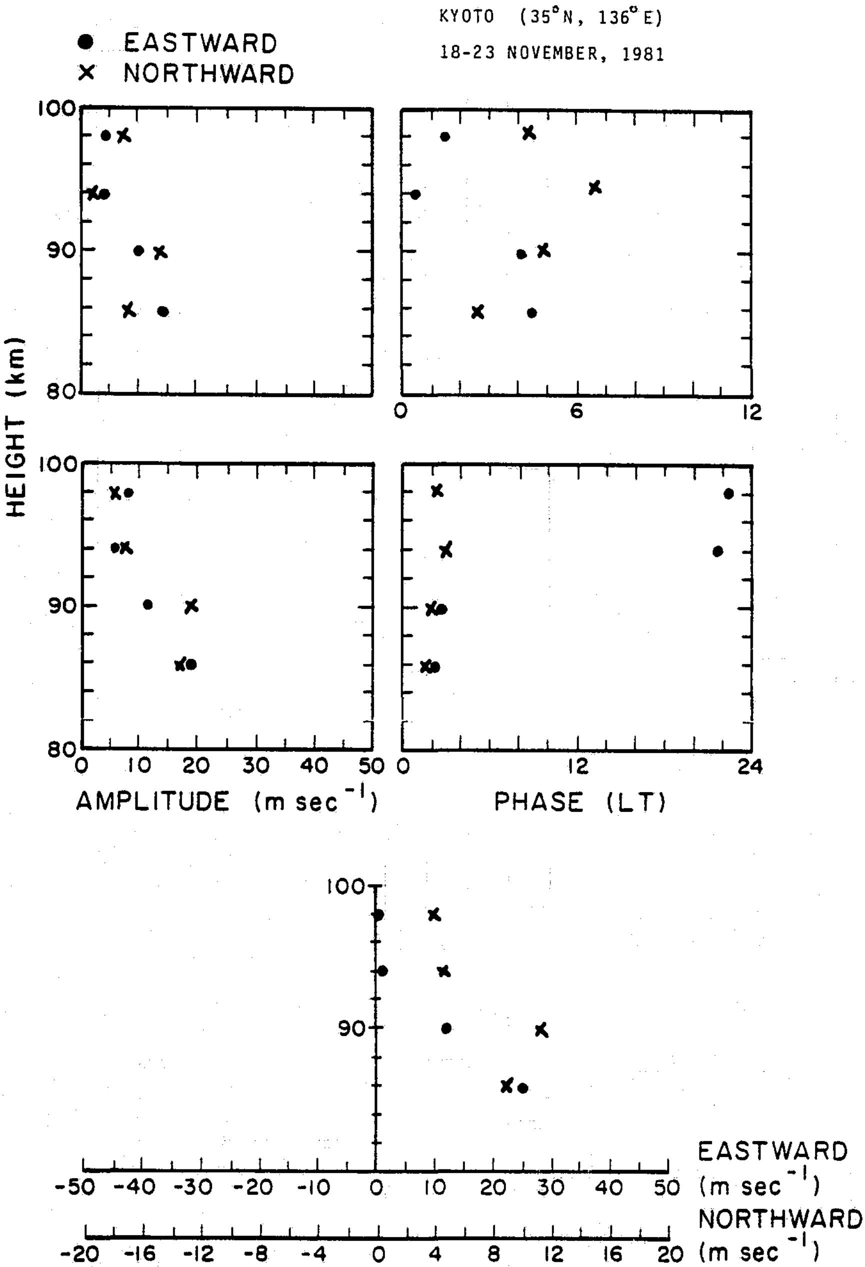
KYOTO (35°N, 136°E)
18-23 NOVEMBER, 1981
EASTWARD
NORTHWARD
HEIGHT (km)
100
90
80
0
6
12
0
10
20
30
40
50
0
12
24
AMPLITUDE (m sec⁻¹)
PHASE (LT)
100
90
-50 -40 -30 -20 -10 0 10 20 30 40 50
EASTWARD (m sec⁻¹)
-20 -16 -12 -8 -4 0 4 8 12 16 20
NORTHWARD (m sec⁻¹)

Figure 1.

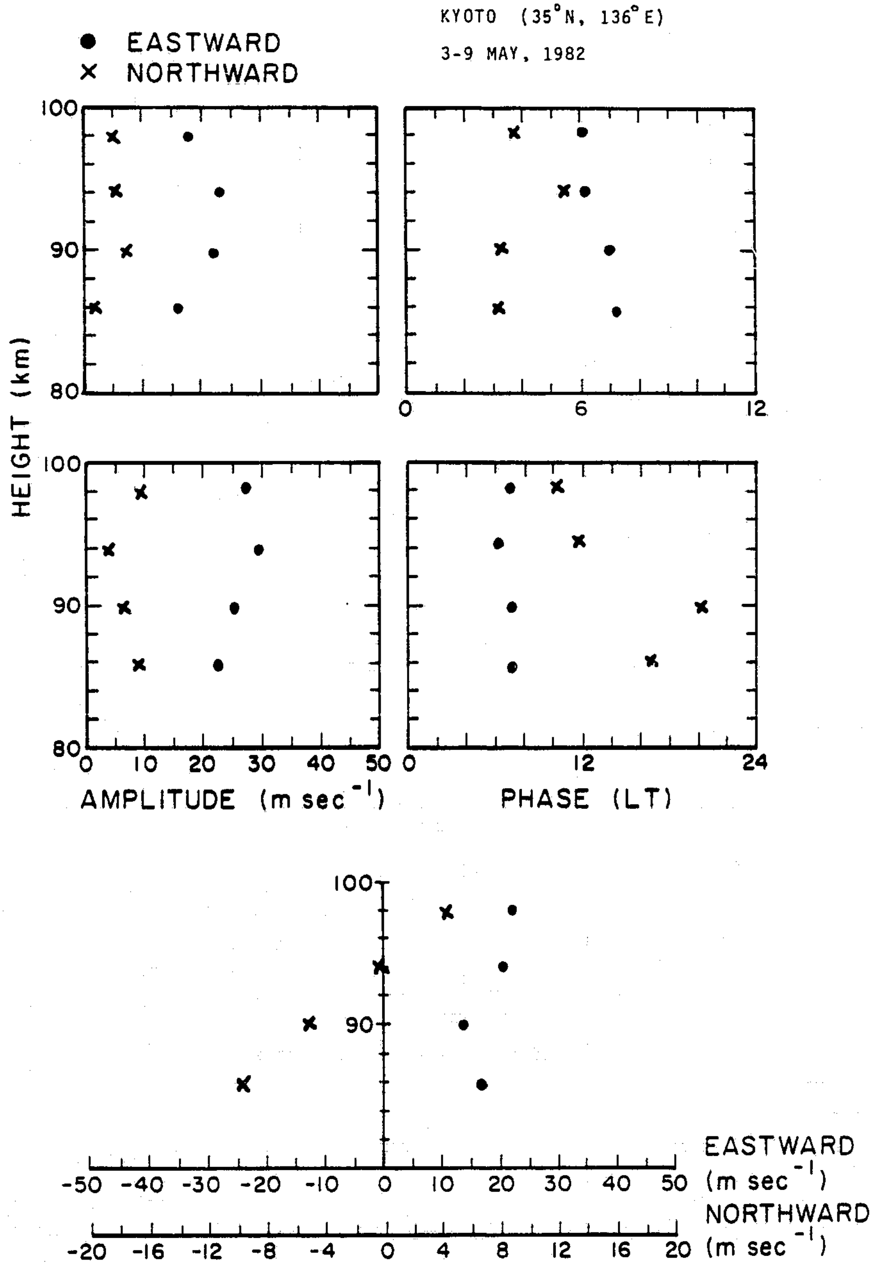
KYOTO (35°N, 136°E)
3-9 MAY, 1982
EASTWARD
NORTHWARD
HEIGHT (km)
AMPLITUDE (m sec⁻¹)
PHASE (LT)
EASTWARD (m sec⁻¹)
NORTHWARD (m sec⁻¹)

Figure 2.

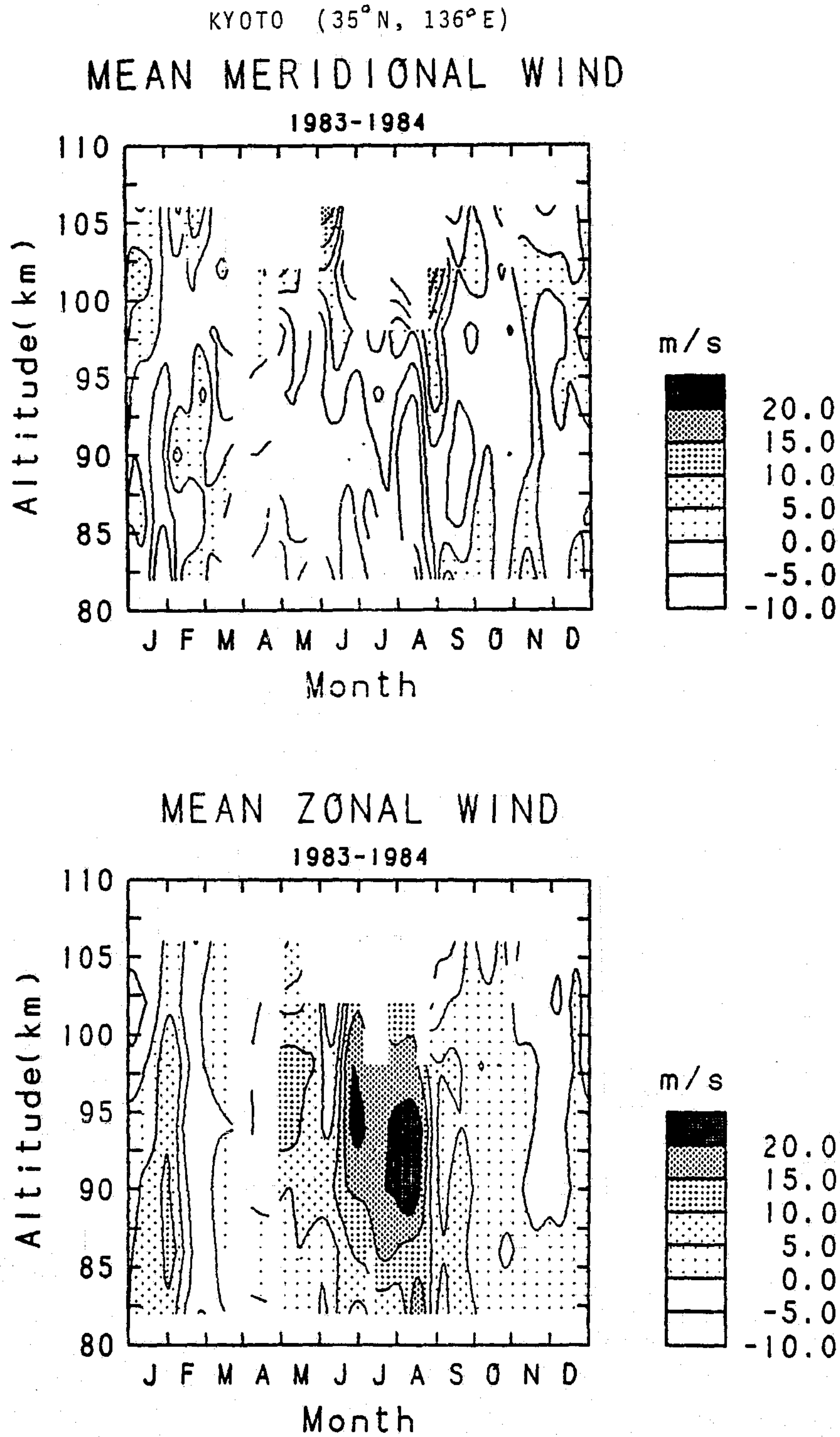
KYOTO (35°N, 136°E)
MEAN MERIDIONAL WIND
1983-1984
Altitude(km)
110
105
100
95
90
85
80
J F M A M J J A S O N D
Month
m/s
20.0
15.0
10.0
5.0
0.0
-5.0
-10.0
MEAN ZONAL WIND
1983-1984
Altitude(km)
110
105
100
95
90
85
80
J F M A M J J A S O N D
Month
m/s
20.0
15.0
10.0
5.0
0.0
-5.0
-10.0

Figure 3.

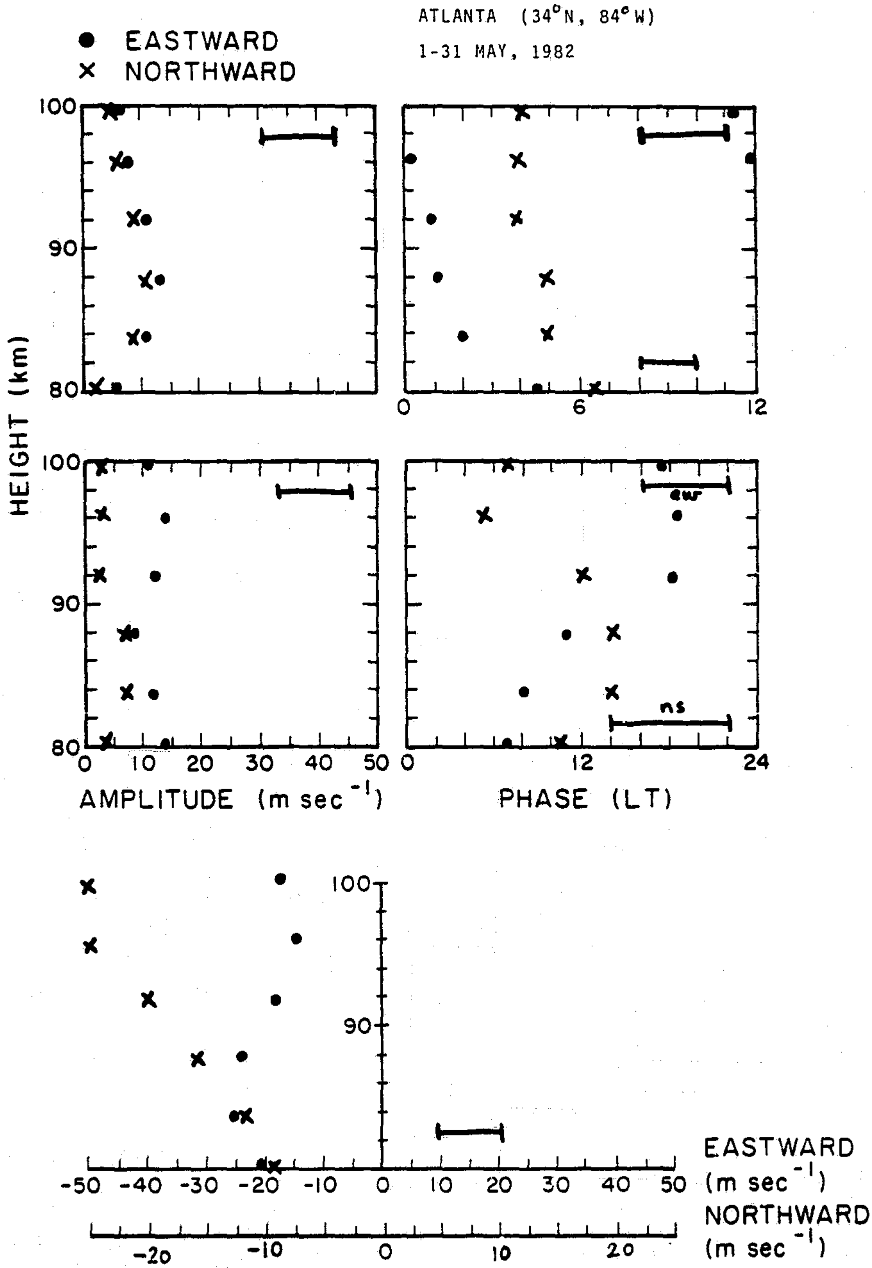
ATLANTA (34°N, 84°W)
1-31 MAY, 1982
EASTWARD
NORTHWARD
HEIGHT (km)
100
90
80
0
6
12
0 10 20 30 40 50
0 12 24
AMPLITUDE (m sec⁻¹)
PHASE (LT)
ew
ns
-50 -40 -30 -20 -10 0 10 20 30 40 50
-20 -10 0 10 20
EASTWARD (m sec⁻¹)
NORTHWARD (m sec⁻¹)

Figure 4.

MESOSPHERIC WINDS AND TIDES AT ARECIBO/PUERTO RICO/ (18°N, 67°W) NOVEMBER 20-23, 1981

J. Rottger +)

EISCAT Scientific Association,
Kiruna, SWEDEN

The SOUSY-VHF-Radar was operated in the period November 20-23, 1981 during a continuous run at the Arecibo Observatory. The data used for this analysis were recorded from 06 AST on November 20 until 06 AST on November 23. Meridional winds were measured at odd hours and zonal winds at even hours.

The occurrence of mesospheric VHF radar echoes was limited as usual to the daylight hours between about 06 and 18 AST (AST = GMT - 4h). The height limits, variable from day to day, were roughly 62-90 km. The intermittency of echoes in time and height, as well as radio interference, made it fairly difficult to deduce tidal information for this time period. About 10-45 single velocity estimates (basic analysis period about 1 minute) could be used to calculate an hourly mean. The variance of the displayed resulting in data, obtained by weighted averaging over the 3-day period, is about similar to the mean.

The winds were extremely low during the observation period as shown in Figure 1. Velocities of the prevailing wind, observed during an earlier campaign November 1980 - January 1981 (ROTTGER et al., 1983), were 5-10 times larger than in the period of November 20-23, 1981. It turns out, however, that the amplitudes of the diurnal tide are comparable.

The height profile of the phase of the diurnal component of the meridional velocity indicates a downward propagating phase and vertical wavelength of about 12 km. Whereas this places confidence on the meridional diurnal component, the analysis of zonal velocities did not yield significant results. The semidiurnal component of the meridional wind was less than 2-3 ms^{-1}, which is below the significance level.

It turns out as a summary of this observational campaign, that much longer time intervals than a couple of days should be used in future to improve the significance of tidal information obtained with VHF radars.

The operations were done in a cooperative project of the Arecibo Observatory and MPAe (coinvestigators: P. Czechowsky, R. Ruster, and G. Schmidt).

REFERENCE

Rottger, J., et al. (1983), J. Geophys. Res., 52, 34-39.

+) On leave from Max-Planck-Institut fur Aeronomie (MPAe), Katlenburg-Lindau, W. Germany

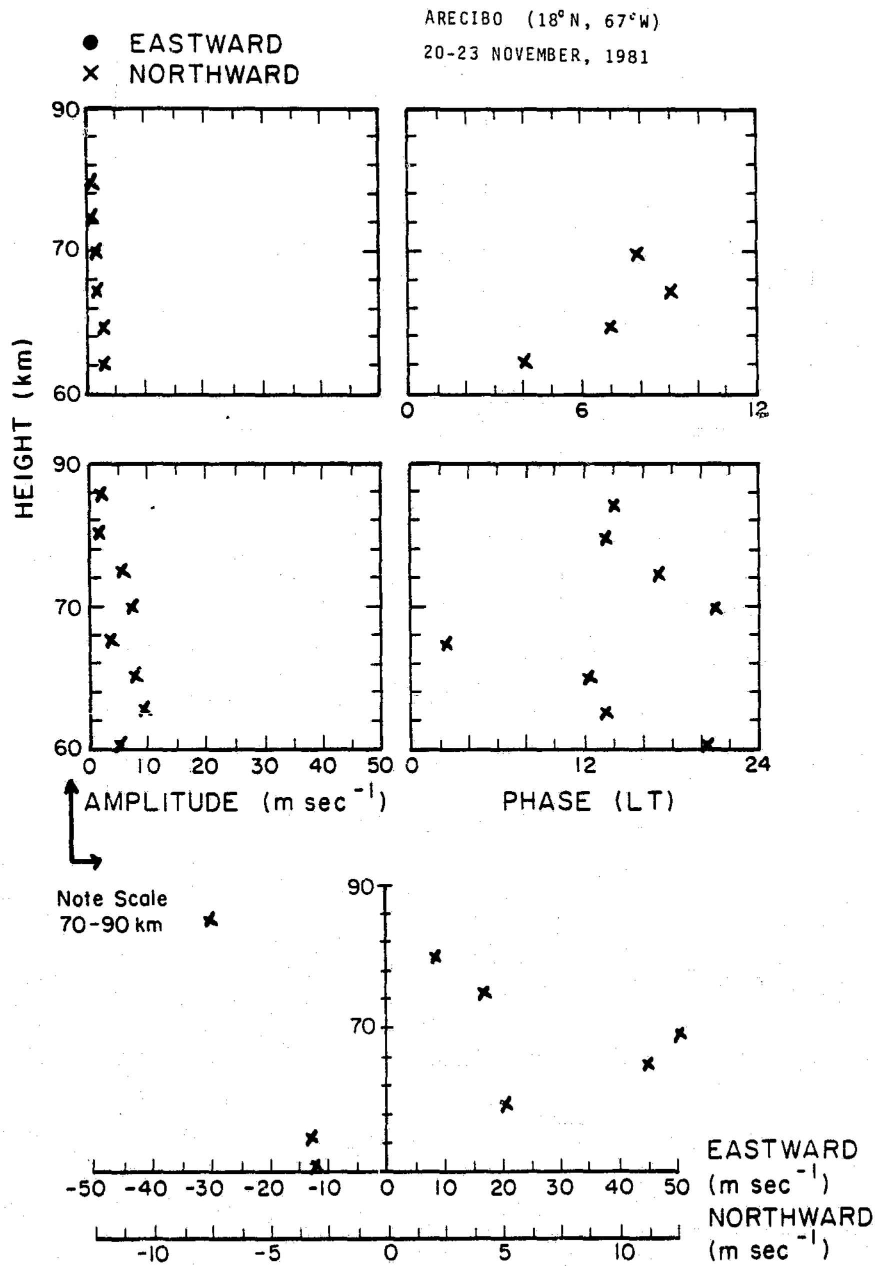
ARECIBO (18°N, 67°W)
20-23 NOVEMBER, 1981
EASTWARD
NORTHWARD
HEIGHT (km)
90
70
60
0
6
12
0 10 20 30 40 50
0 12 24
AMPLITUDE (m sec⁻¹)
PHASE (LT)
Note Scale
70-90 km
-50 -40 -30 -20 -10 0 10 20 30 40 50
EASTWARD
(m sec⁻¹)
-10 -5 0 5 10
NORTHWARD
(m sec⁻¹)

Figure 1.

D12 N86-12849

MESOSPHERIC WINDS AT JICAMARCA, PERU (12°S, 77°SW), November 19-21, 1981

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** Radio Atmospheric Science Center, Kyoto University, Kyoto, Japan
*** Geophysical Institute, Kyoto University, Kyoto, Japan
**** Instituto Geofisico del Peru, Lima, Peru

A joint synchronous observation between the Kyoto University group at Jicamarca, Peru (12°S, 77°W) and the Max-Planck Institute at Arecibo, Puerto Rico (18°N, 67°W) was carried out on November 19-21, 1981. At Jicamarca, three daytime (0600 - 1800) runs for the stratosphere (15 - 30 km, 7 altitudes) and the mesosphere (60 -90 km, 13 altitudes) were successfully performed. In the experiment, two beams, i.e. vertical and oblique (3.44 westward, 0.15 northward) were simultaneously employed using two orthogonal arrays. Pulse width and associated sampling interval were 25 μs and 2.5 km, respectively, with interpulse period of 1 ms. For mean wind and tidal analysis, hourly values of zonal velocities are estimated from these two line-of-sight velocities averaged over 1 hour. The present report is related to the mesospheric result.

Figure 1 shows the altitude profile of mean zonal wind in the mesosphere during the whole daytime observations. Positive value refers to eastward. At around 70 km, wind corresponds to summer easterly, and changes to westerly with increasing altitude above about 77 km. These are fairly compatible with known features of zonal wind at this latitude.

Contour plot in Figure 2 shows local time variations of zonal wind with daytime mean subtracted and averaged over three days. Shaded area designated westward wind with contour level of 2 m/s. It is obvious that the daily variation is almost in phase with altitude in the 65 - 80 km region. Thus the semidiurnal tide with long vertical wavelength is inferred to exist. Above 80 km, phase tilt occurs which indicates the contribution of the propagating diurnal component. Here the combination of dc and 12-hr. component is fitted to the data below 80 km. The altitude profiles of the amplitude and phase of this semidiurnal component are shown in Figure 3. In the figure, theoretical values by FORBES and GILLETTE (1982) at 12°S are also shown. It is seen that these are reasonably consistent with those by COUNTRYMAN and DOLAS (1982) in December 1976 and October 1977 at Jicamarca.

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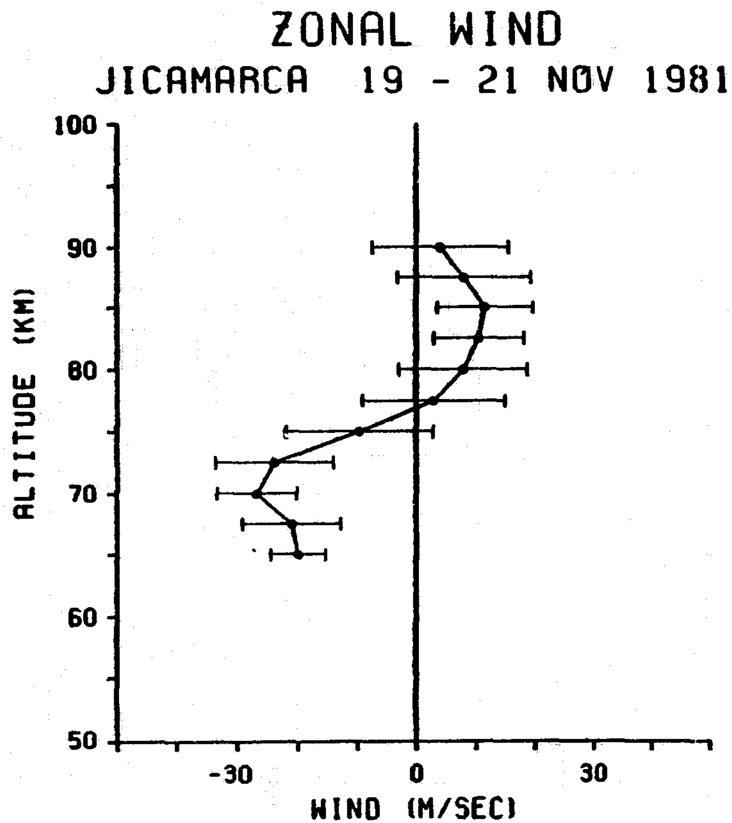
Countryman, I. D. and P. Dolas (1982), J. Geophys. Res., 87, 1336-1342.
Forbes, J. M. and Gillette (1982).


ZONAL WIND
JICAMARCA 19 - 21 NOV 1981
ALTITUDE (KM)
100
90
80
70
60
50
-30
0
30
WIND (M/SEC)

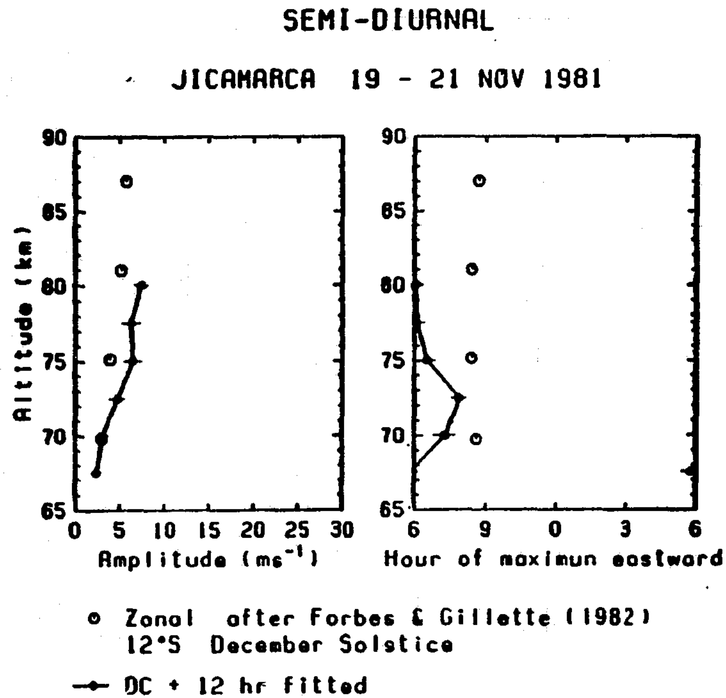

SEMI-DIURNAL
JICAMARCA 19 - 21 NOV 1981
Altitude (km)
90
85
80
75
70
65
0 5 10 15 20 25 30
Amplitude (ms⁻¹)
6 9 0 3 6
Hour of maximun eastward
○ Zonal after Forbes & Gillette (1982)
12°S December Solstice
—◆— DC + 12 hr fitted

Figure 1.

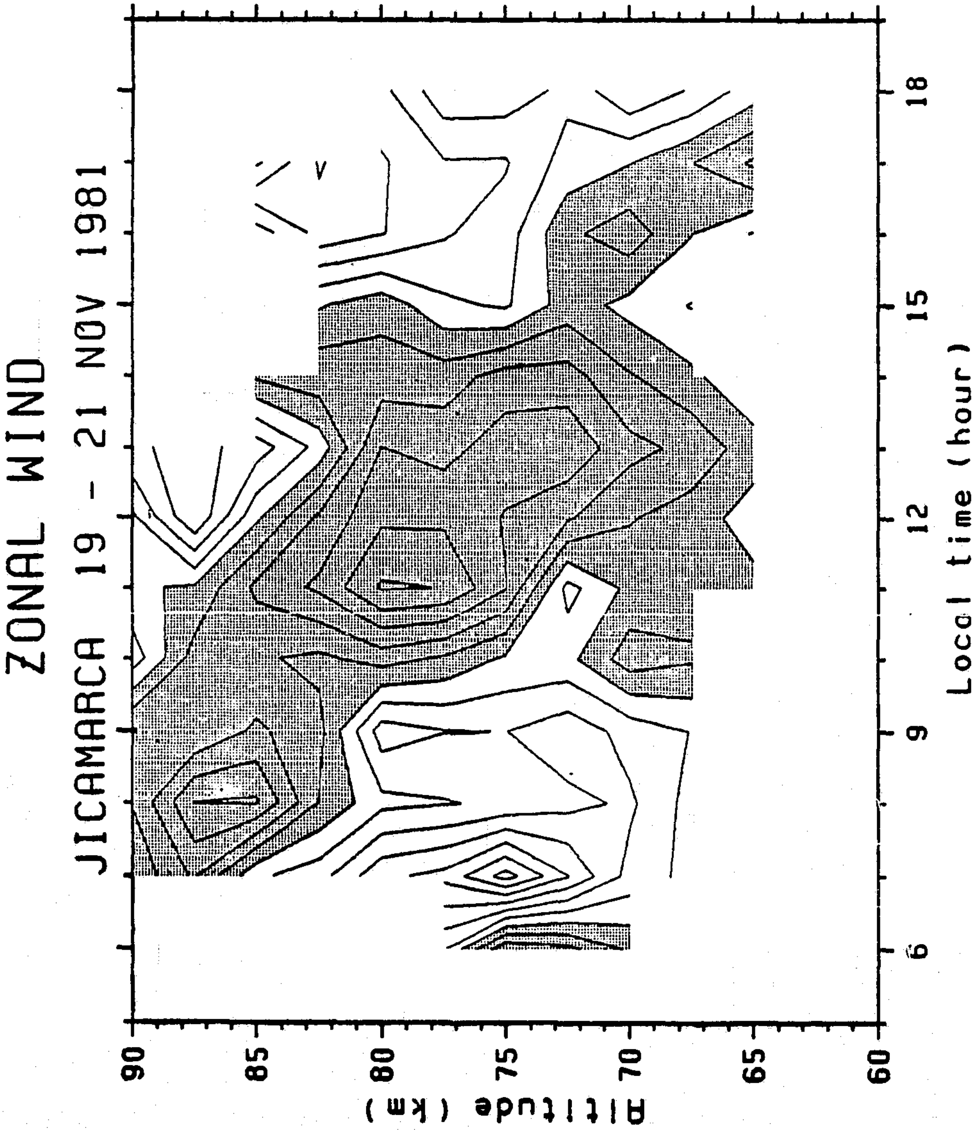

ZONAL WIND
JICAMARCA 19 - 21 NOV 1981
Altitude (km)
90
85
80
75
70
65
60
Local time (hour)
6
9
12
15
18

Figure 2.

N86-12850 D13

RESULTS OF NOVEMBER 1981 AND MAY 1982 ATMAP CAMPAIGNS AT ADELAIDE (35°S, 138°E)

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The data for the November and May campaigns were analyzed in the same way. Prevailing, 24-hr and 12-hr components were harmonically fitted to all the data available during the core intervals at each height of observation where over 20 hr of data were available (78 km and above). The quality of data in both campaigns was excellent, there being no significant gaps due to equipment failure, etc.

The mean zonal circulation for both the November and May campaigns are representative of early summer and winter conditions. The mean meridional flow in November was stable and typical of summer conditions at Adelaide. The conditons in May were, however, more variable and appeared to be changing significantly during the campaign. It is possible that there was a strong influence from a large-scale wave which could account for the large meridional wind values observed. Refer to Figures 1, 2, and 3.

Overall, the mean tidal structures observed during the core periods were not significantly different from those observed in two-week intervals centered on the cores. The November 1981 data were very similar to that reported by VINCENT and BALL (1981) for Adelaide in November 1978 with an evanescent type of structure in the meridional component and a larger contribution from a propagating component in the zonal. In May both components show evidence for propagating components with 30-40 km vertical wavelengths. For the semidiurnal components, the phase structures show evidence for vertical propagation with apparent vertical wavelengths of the order of 50 km. The mean amplitudes for the semidiurnal components in May are close to the "noise level".

Typical errors from the harmonic analysis are ± 1-2 ms^{-1} in amplitude and ± 0.5 hr in phase but these are probably underestimates.

REFERENCE

Vincent, R. A. and S. M. Ball (1981), J. Geophys Res., 86, 9159-9169.

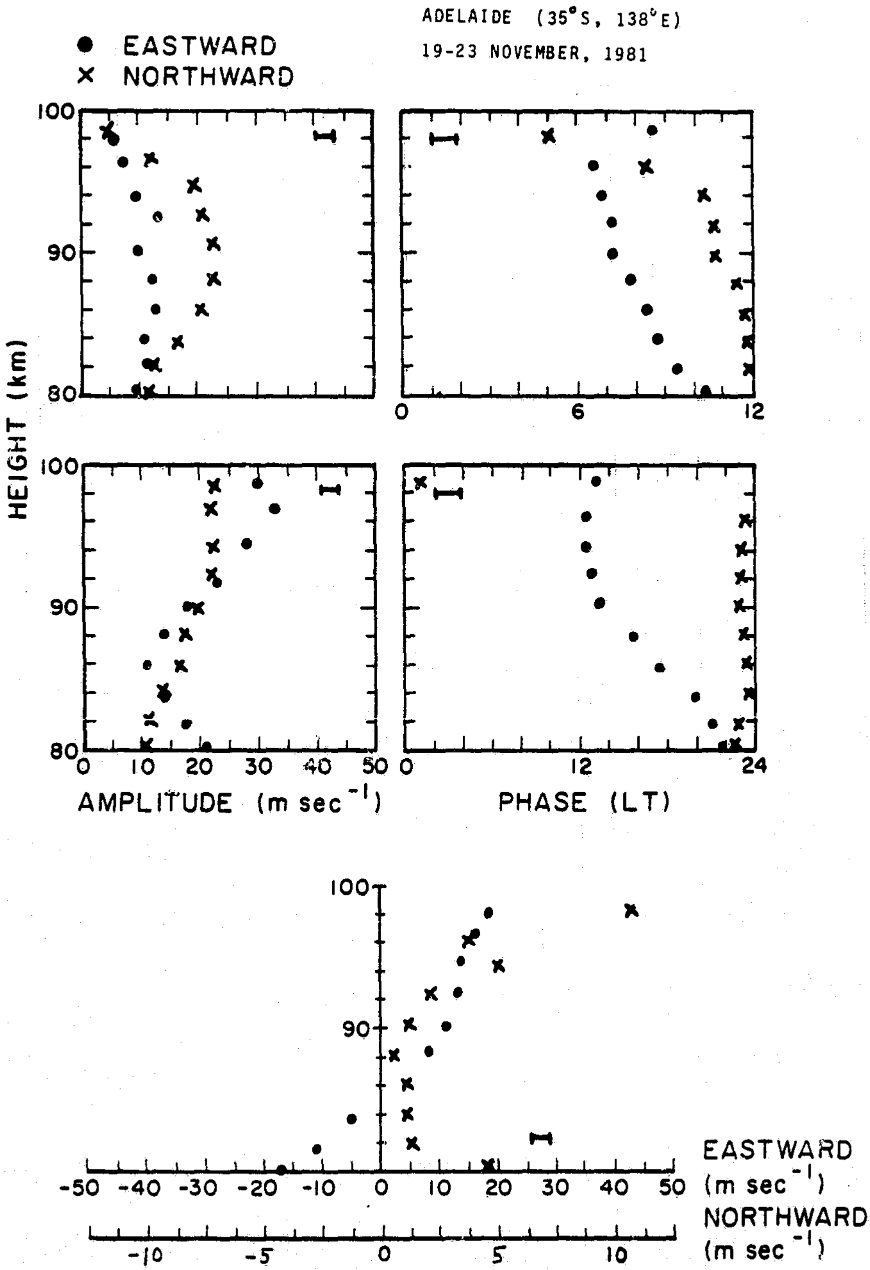
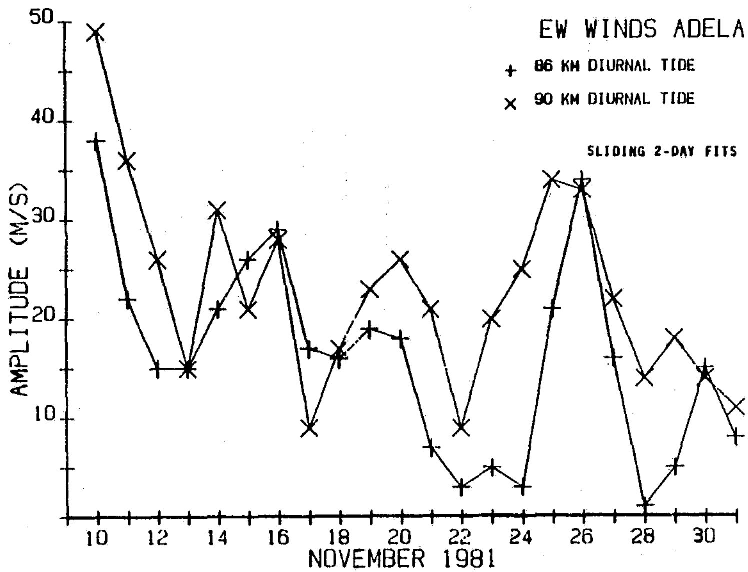

ADELAIDE (35°S, 138°E)
19-23 NOVEMBER, 1981
EASTWARD
NORTHWARD
HEIGHT (km)
100
90
80
0
6
12
0
10
20
30
40
50
0
12
24
AMPLITUDE (m sec^{-1})
PHASE (LT)
-50 -40 -30 -20 -10 0 10 20 30 40 50
EASTWARD
(m sec^{-1})
-10 -5 0 5 10
NORTHWARD
(m sec^{-1})

Figure 1.



EW WINDS ADELAIDE1
86 KM DIURNAL TIDE
90 KM DIURNAL TIDE
SLIDING 2-DAY FITS
AMPLITUDE (M/S)
50
40
30
20
10
10
12
14
16
18
20
22
24
26
28
30
NOVEMBER 1981

Figure 2.

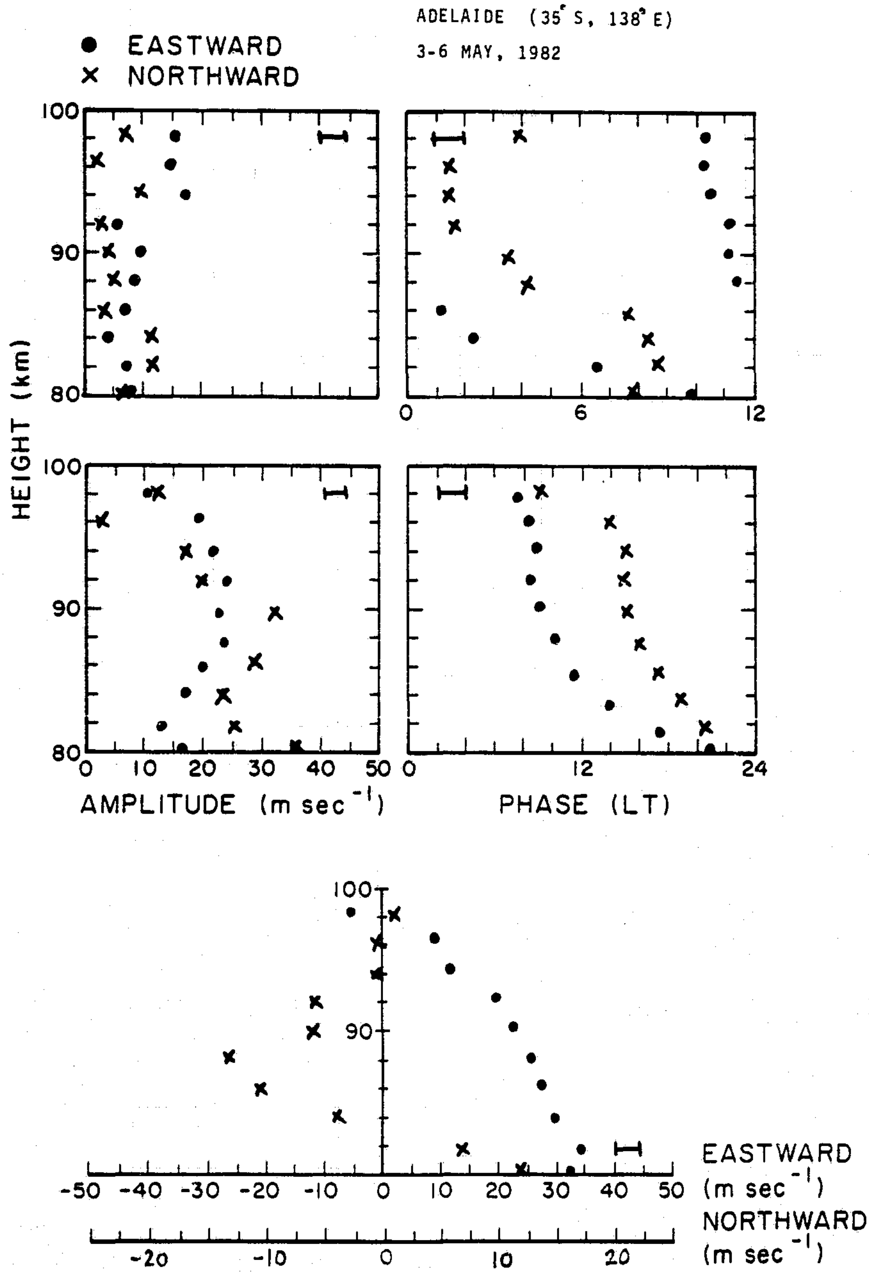

ADELAIDE (35° S, 138° E)
3-6 MAY, 1982
● EASTWARD
× NORTHWARD
HEIGHT (km)
AMPLITUDE (m sec⁻¹)
PHASE (LT)
EASTWARD (m sec⁻¹)
NORTHWARD (m sec⁻¹)

Figure 3.

N86-12851 D14

MIDDLE ATMOSPHERE TIDES AT CHRISTCHURCH (44°S, 17°E) IN NOVEMBER 1981 AND MAY 1982

G. J. Fraser

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Christchurch, New Zealand

Atmospheric tides at Christchurch (44°S) were measured at heights of 80 - 100 km, in 2.5 km intervals during the ATMAP campaigns of November 1981 and May 1982.

Average components for the 5-day periods, November 19-23 and May 3-7, have been extracted by making an equally weighted least squares fit to the hourly mean values, using the sum of mean, diurnal and semidiurnal terms. Refer to Figures 1 and 2.

Estimates of standard deviation from the least-squares fit tend to be less than the variability between successive 5-day samples, but 5-8 ms^{-1} and 2-3 h are typical. At altitudes below 83 km there may be gaps of up to 6 hours during the night which may generate a systematic error in the components.

Amplitude and phase characteristics are generally consistent with November 1980 and 1982 and May 1981, although the amplitude of the diurnal EW tide was low in November 1981, with consequent large phase fluctuations.

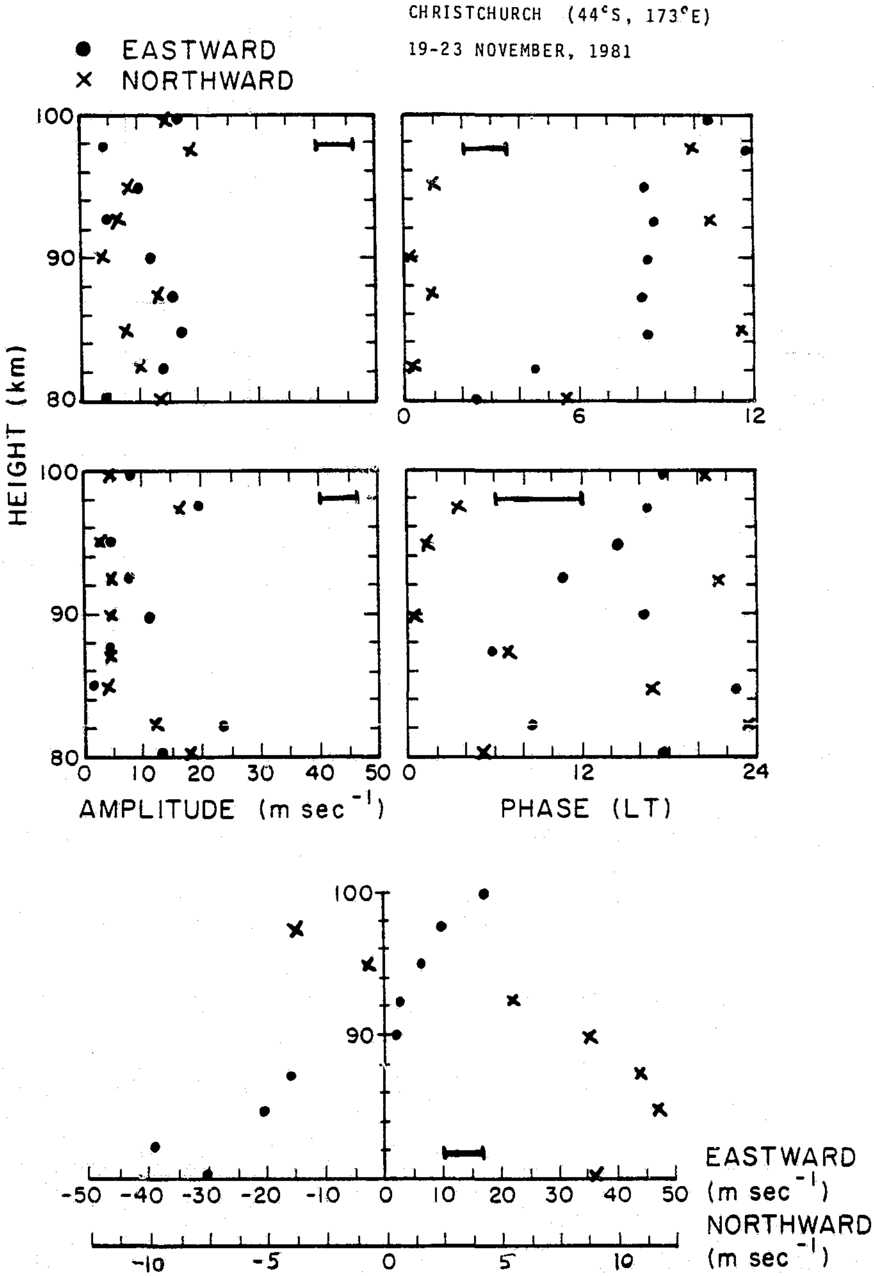
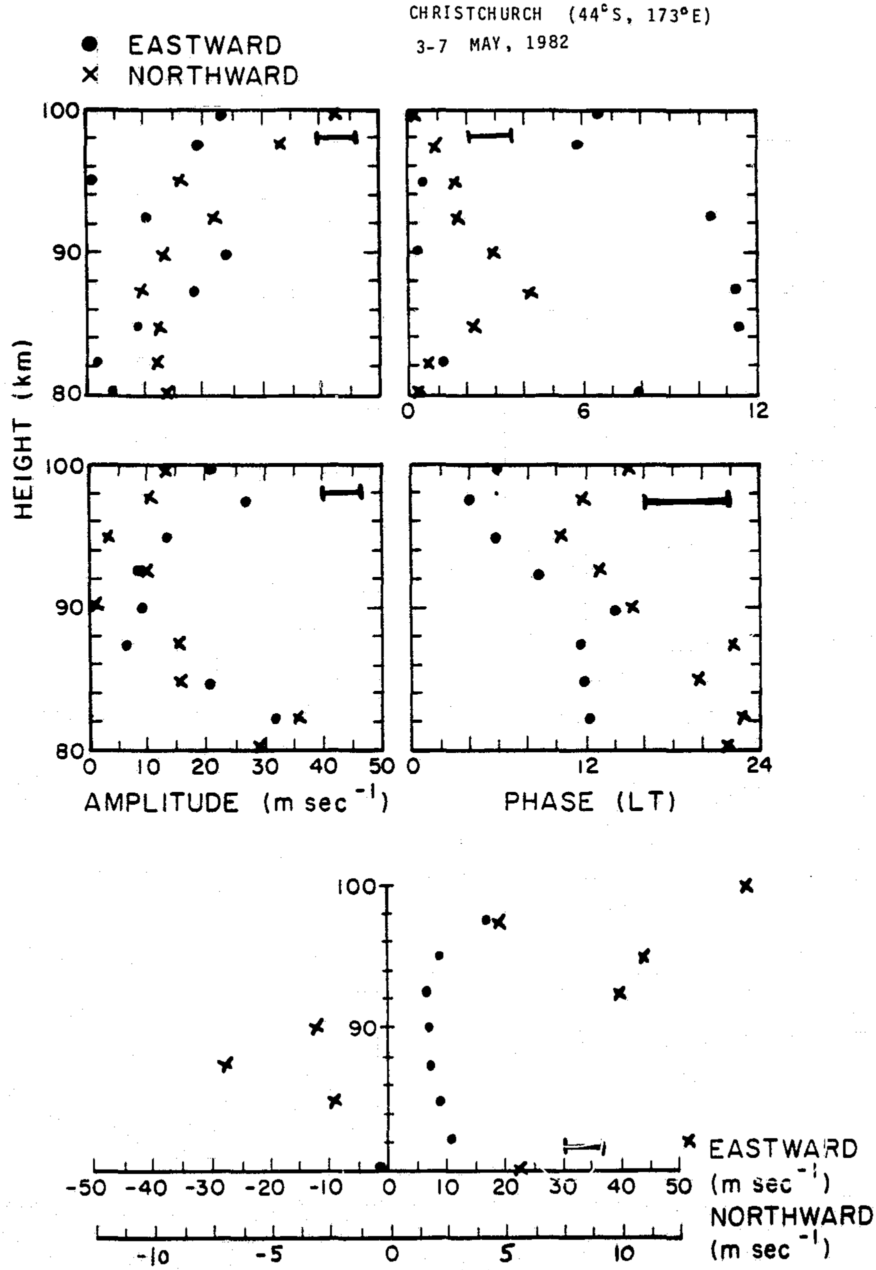

CHRISTCHURCH (44°S, 173°E)
19-23 NOVEMBER, 1981
EASTWARD
NORTHWARD
HEIGHT (km)
AMPLITUDE (m sec^{-1})
PHASE (LT)
EASTWARD (m sec^{-1})
NORTHWARD (m sec^{-1})

Figure 1.



CHRISTCHURCH (44°S, 173°E)
3-7 MAY, 1982
● EASTWARD
× NORTHWARD
HEIGHT (km)
100
90
80
0
6
12
10
20
30
40
50
24
AMPLITUDE (m sec⁻¹)
PHASE (LT)
-50 -40 -30 -20 -10 0 10 20 30 40 50
EASTWARD
(m sec⁻¹)
-10 -5 0 5 10
NORTHWARD
(m sec⁻¹)

Figure 2.

C-2

MAP/WINE EXPERIMENTERS MEETING AT BERLIN, JANUARY 3-4, 1985

U. von Zahn

On January 3-4, 1985 a MAP/WINE Experimenters Meeting took place at the Meteorology Institute of the Free University of Berlin. It was attended by 25 scientists. The two principal subjects of discussion during this meeting were:

(1) Reports by the 14 Working Groups on their activities including presentations of some selected data. Written reports of the Working Groups are given in Appendix I.

(2) The other important matter was the definition of topics (or titles) for presentations at the one-day MAP/WINE Session of the IAGA/ICMUA Assembly in Prague, August 1985. (Editor's note: See page 107 for a listing of topics.)

Other topics of the Experimenters Meeting were:

(3) A report of U. von Zahn concerning a workshop on Soviet MAP/WINE contributions, which took place December 13-14, 1984 in Moscow (see Appendix II).

(4) The next MAP/WINE Experimenters Meetings will take place

May 8, 1985 in Loen, Norway
during the 7th ESA Symposium on European Rocket
and Balloon Programmes and Related Research

and

August 14, 1985 in Prague, Czechoslovakia
during the Fifth Scientific Assembly of IAGA

Omit

APPENDIX I TO MAP/WINE REPORT

BRIEF REPORTS ON THE ACTIVITY OF MAP/WINE WORRKING GROUPS

(2nd half of 1984)

W. G. 1 on "Hemispheric Scale Analysis up to 60 km, Including Pressure, Temperature, Density, and Dynamics" (K. PETZOLD et al.)

The data which are available for the large scale analysis of the MAP/WINE winter up to now are shown in Table 1. Included are rocket soundings with temperature and wind data, satellite observations from the Stratospheric Soundings Unit (SSU with radiances in three stratospheric channels) and from the Solar Mesosphere Explorer (SME), and temperature profiles from the Lidar at the Observatoire de Haute Provence.

Our report is based on computations of data we received before December 84-that are the rocket soundings and the telefax maps of the SSU.

The large scale circulation up to 30 km for the MAP/WINE winter was shown already at the experimenters' meeting during the COSPAR XXV Plenary Meeting in Graz. The report is still available (Beilage SO 15/84 zur Berliner Wetterkarte). The 10-mbar temperatures at the North Pole show clearly several warm pulses from which the last brought a major final warming. In the upper stratosphere the first pulse shown by the SSU channel 27 at the pole was nearly as strong as the last one, but the large scale circulation was very different. The first warming shifted the polar vortex a bit to the Atlantic side, but the last pulse brought then a big anticyclone above the polar cap reaching south to 60°N. It seems to be clear that the dynamics in the large and meso-scale and perhaps even in the small local scale should be different during these two states.

To provide for the relevant research a detailed set of temperature profiles with hydrostatic and geostrophic circulation fields from 30 to 60 km for the Northern Hemisphere and the radiances of the SSU need a sophisticated treatment. The problem is to get from the integral values a solution for the temperature function with height. The wanted solution of the infinite sample should be fixed to the given rocket and radiosonde measurements, so that this solution is at least that which fits all known information.

The problem can be solved with the stratopause iteration method (published in Meteorologische Abhandlungen, Serie A, Band 2, Heft 2, 1980/PETZOLDT). The input for this method is the stratopause height; the assumption is that between 5-mbar and the stratopause and between the stratopause and 1 mbar the temperature is linear in lnp (that excludes small scale vertical wavelengths). With this assumption and the input an iterative solution for the temperature profile is possible. The condition is that the rocket measurements are compatible to the satellite observations; that means the computed radiances from the rocket temperatures must agree with the radiances simultaneously measured by the satellite experiment.

Computed rocket radiances for high temperatures are higher than the measured radiances. A change of the weighting function or an adjustment of the observed radiances is therefore necessary.

The second step is to find regressions between the rocket temperatures for 5 and 1-mbar and the SSU radiances to get a first guess field for these levels. Channel 26 represents very well the temperature in 5-mbar. The correlation in between 1-mbar and channel 27 is a little bit worse. But a screening for more

Table 1

Available data for the MAP/WINE Campaign
during December 1983 to March 1984.

AVAILABLE DATA FOR THE MAP/WINE CAMPAIGN DURING DECEMBER 1983 TO MARCH 1984.

METROCKETS			
Andoya	45 falling spheres 30 datasondes " "	magnetic tape from Meyer/Bonn FRG revised (Schmidlin)	 July 84 Dec. 84
Lista	7 rocob messages during campaign	punchcards	
USA	rocob messages during campaign	" "	
USSR	rocob messages during campaign	" "	
SSU	Radiances in channel 25, 26, 27 1 Nov. 83 - 1 Apr. 84	magnetic tape from Alan O'Neill Bracknell UK	 Dec. 84
SME	Temperature profiles on several orbits from R. Thomas (LASP) Boulder/USA	magnetic tape from Fricke/Bonn FRG	 on the way
LIDAR	Temperature 34 to 80 km above Haute Provence	printouts from Alain Hauchecorne CNRS/France	 Dec. 84

Regressions between all rocket soundings and satellite data have been computed.

Observed SSU channel 26 radiance against:
a) computed radiances from rocket soundings
b) rocket measured 5 mbar temperatures

Observed SSU channel 27 radiances against
a) computed radiances from rocket soundings
b) rocket measured 1 mbar temperature

parameters showed that a multiple regression including the information of our radiosonde analysis of the 10-mbar temperature will give a much better correlation. This will be the next step, so that afterwards first guess fields can be computed. With the stratopause height (to be analysed with the help of the SME data) a computer program will give the final solution of the large scale analysis for 30 to 60 km.

W. G. 2 on "Hemispheric Synoptic Analysis of Winds at Mesopause Heights" (K. LABITIZKE et al.)

Initial results, based on data obtained at middle Europe and Canada, have been published in "Beilage SO 15/84 zur Berliner Wetterkarte" (dated 7, June 1984). The analysis will be resumed as soon as the data obtained in Western Europe and the Soviet Union have been made available to us.

W. G. 3 on "Hemispheric Analysis ofo Ozone as an Indicator for Large-Scale Transport Processes in the Middle Atmosphere" (A. EBEL et al.)

After formation of the working group at the MAP/WINE experimenter's meeting in Graz (June/July 1984) various colleagues and/or groups involved in measuring ozone by means of different techniques have been invited to contribute to the data base for a hemispheric analysis of ozone covering the MAP/WINE period. Those who responded are listed in the attached Table 2. It is planned to generate a single tape (or set of tapes) containing all data for the large-scale analysis as soon as they are all made available for this purpose. It is certainly desirable to include an analysis of hemispheric or global ozone in the MAP/WINE presentations at the Prague meeting. Yet unfortunately, it is difficult to predict to what extent such an analysis can be carried out until the meeting.

W. G. 4 on "Metrocket Data: Processing and Analysis" (F. SCHMIDLIN et al.)

The reduction of falling spheres at Wallops Island is complete. Forty usable temperature profiles and 45 usable wind profiles are available at Bonn University for scientific use. Temperature reduction from the remaining spheres will be questionable. The wind reduction from "oscillating" spheres will be done at Bonn University. Wind reduction from datasondes has been completed. Due to poor S/N ratio of the telemetry analog tapes 9 launches require a second run and it is likely that part of these will have to be reduced manually.

W. G. 5 on "Total Density Measurements: Comparison of the Results of Different Measurement Techniques" (Ch. PUTZ et al.)

Within the campaign at Andoya and Kiruna, six different techniques have been used to measure total densities: 1) passive falling spheres, 2) data sondes, 3) active falling spheres, 4) mass spectrometers, 5) Na-Lidar, which measures the Rayleigh scattered signal in the stratosphere and converts it into densities, and 6) one experiment calculating total densities form the measured O_2 density aboard payload M-W2. In Table 3 the number of profiles which are already available or will be in the future are listed together which a rough height range where the experiments took density data. Brackets indicate future activities.

Up to now it can be concluded that by comparing different techniques the density profiles show only little deviations from which most are due to the atmospheric variability. Nevertheless, within the geomagnetic disturbed salvo D on January 31, 1984 the measurements show relatively great discrepancies especially in the height range above 90 km, which for example is not the case within the undisturbed salvo R1 launched on February 10.

Table 2

Hemispheric large-scale ozone analysis.

Experiment	Experimenter,... Project Scientist	Period of Observation/ Availability of Data	Tape	Tabul.
Satellite SME	R. J. Thomas (K. H. Fricke for MAP/WINE)	Nov. 1983 - March 1984	o	
Satellite Nimbus 7, SBUV and TOMS	A. J. Fleig	" "	o	
Balloon and ground-based, Hohenpeissenberg, FRG	W. Attmannspacher	" "		o
Balloon and ground-based, Potsdam, GDR	W. Bohme	" "		o
Balloon and ground-based, Zurich, Switzerland	H. U. Dutsch	" "		o
Ground-based, Thessaloniki, Greece	C. S. Zerefos	" "		o
Ground-based, Belsk, Poland	M. Degorska	" " (key days)		o
Ground-based, Volgograd, USSR	Z. Ts. Rapoport	" "		o
Rocket, Heiss Island, Volgograd, USSR	Z. Ts. Rapoport	Four series during MAP/WINE		o
Airborne	K. F. Kunzi, G. K. Hartmann			

Table 3

Total density measurements during the MAP/WINE Campaign.

Experimental Method	Number of Profiles	Rough Height Range
Passive Falling Sphere	40 (+5 ?)	90 - 40 km (18 profiles 90 - 70 km)
Data Sonde	Andoya: 17 (+7 ?) Lista: 5	70 - 25 km
Active Falling Sphere	(2)	110 - 65 km
Mass Spectro-meter	2	115 - 92 km
SOAP Payload	(1)	60 - 95 km
NA-Lidar	(21 nights)	45 - 20 km

Total Density from O_2 and Kr Measurements Aboard Payload M-W2:

The M-W2 had an experiment designed to measure the total density in the ambient atmosphere. One part consisted of the in-situ measurement of O_2 through differential absorption in air of 147 nm emission from an on-board light source. The absorption of O_2 at this wavelength is characterized by a large cross section which is also independent of temperature. The light from a a Xe low pressure lamp goes out to corner reflectors on booms and returns to detectors which measure the transmitted light. The two booms have different lengths and this differential absorption technique will eliminate light source instability as well as the increased density close to the rocket payload produced by the supersonic speed. The second part of the density probe employed on-board resonance fluorescence lamps to measure the noble gases Kr and Ar which are used in the mixed part of the atmosphere as monitors for the ambient density.

In the upleg part of the flight the angle of attack (i.e., the angle between the velocity vector and the rocket spin axis) is small and therefore only a slight modulation is found on the transmitted light for the two different pathways. The experiment is deployed at 66 km on the upleg and gives data from 68 km up to 90-95 km altitude for the differential absorption.

The resonance scattering of Kr gave data from 68 km to approximately 100 km. The noble gas density is calibrated through inflight comparison with the differential absorption.

The analysis has recently reached the point where relative O_2 and Kr profiles are available but there remains a problem with its absolute magnitude. A new approach is going to be tested to derive absolute density, using gas kinetic theory developed for the Bugatti payload which is expected to reduce the effect of the increased density around the payload.

W. G. 6 on "Temperature Structure above Andoya: Comparison of Techniques and Small Structure" (W. MEYER et al.)

A summary of all measurements which have been obtained above Andoya during the MAP/WINE Campaign is given in Table 4.

The OH*-measurements supply an almost complete time series of mesopause temperatures during the MAP/WINE winter. The evaluation of temperatures is complete as far as night averages are concerned. Temperature changes during the nights will be derived by R. Gerndt in the future.

A first comparison of OH*-temperatures with falling sphere data would lead to the conclusion that the starting temperature for the sphere density integration is generally too high (so far 235 K is used at an altitude of about 95 km).

Most of the lidar temperature measurements (Na resonance method) were made in late March and in the beginning of April 1984. In addition, temperatures can perhaps be derived for 2 nights in February.

Comparison between the first (preliminary) CNIRPS results and passive sphere measurements show fair agreement from about 60 km up to 80 km.

The two BUGATTI and Madame payloads which were each launched as parts of Salvo D (Jan. 31) and Salvo R 1 (Feb. 10) show considerable temperature structure. On January 31 during a period of enhanced geomagnetic activity a strong temperature disturbance, which seems to propagate downward, is indicated above 100 km.

An initial analysis of metrocket data is complete with respect to falling sphere temperatures. The latter should, however, be used with caution above 85 km and below 45 km. Datasonde temperature reduction is expected to be completed until March/April 1985.

W. G. 7 on "Mesospheric Temperatures: Temporal Variations Connected with Large Scale Dynamics" (A. HAUCHECORNE et al.)

The Working Group is to study temporal variations of mesospheric temperatures, in particular as related to the occurrence and propagation of planetary waves at different latitudes. Currently the following data about mesospheric temperatures during the period of the MAP/WINE Campaign are available:

Metrockets:	Datasondes	from Andoya	33
		from Lista	12
	Falling spheres	from Andoya	22
	USSR	Heiss Island	59
		Volgograd	62
Lidar:	O.H.P.		51 nights
	Skibotn		7 nights
OH*	Andenes:	quasi-continuous from November 24 to end of March	
	Lista:	November to January	
	Oslo:	January to April	

A temperature profile of the altitude range 25 to 70 km, was obtained by lidar above Skibotn.

Status: Jan 1, 1985

Table 4

Temperature measurements above Andoya during the MAP/WINE Campaign.

Experiment (Payload) designation	Instrument	Altitude range of available data	number of successful measurements	number of evaluat. measurements
OH-Spectrometer	ground based IR spectrometer	layer 86±4 km	~85 nights Nov 28 - end of Feb. add. meas. Mar/April	all night means (detailed struct. will be evaluated
LIDAR	ground based sodium hyperfine structure LIDAR	84 to 98 km	5 - (10)? nights Feb 10 ? (Salvo R 1) Feb 4 ?	4 profiles (April 1984)
	density integration	25 to 45 km	13 to end of Feb. 8	2 profiles
CNIRPS (M-T...)	CO2 IR-Photometer	60 to 90 km	7 (all M-T-Payloads besides M-T 1)	2 (preliminary)
BUGATTI (M-T...)	density integration	92 to 115 km	2 (Jan 31/Salvo D Feb 10/Salvo R 1)	2
Madame/active sphere (M-M...)	density integration	65 to 110 km	2 (Jan 31/Salvo D Feb 10/Salvo R 1)	2 (preliminary)
pass. sphere (M-F..)	density integration	35 to 85 km	40 (+ 4 ?)	40
Datasonde (M-D...)	thermistor	20 to 70 km	26	17

W. G. 8 on "Winds in the Mesosphere and Lower Thermosphere Above Andoya" (R. RUSTER et al.)

SOUSY MST Radar:

During the MAP/WINE campaign the mobile SOUSY VHF Radar was operated from November 1983 to February 1984 at Bleik (16° 16′N, 15° 58′E) near Andenes in Northern Norway. A list of the times of measurements is provided as Table 5.

The occurrence of radar echos from mesospheric structures is strongly associated with radio wave absorption events and therefore dependent on the electron content in the lower D region. The observed diurnal variation of the detected layers is connected with the production and loss rates of electrons controlled by the solar radiation. The generated structures consist of turbulence regions and thin laminated layers causing isotropic and anisotropic scattering of radio waves, respectively. The mesospheric radar returns, therefore, are intermittent in height and time and are mainly observed during winter within the altitude range between about 60 and 80 km.

The temporal and spatial variation of the received echo power often is characterized by several parallel echo structures occurring simultaneously at different heights. At these altitudes the observed winds show strong vertical shears, due to tidal or internal gravity waves. Velocity oscillations with periods of the order of 10 min are present at these heights of maximum shear, indicating that the observed oscillations are generated by Kelvin-Helmholtz instability (KHI). In the same altitude ranges strong quasi-periodic power bursts are superimposed on the increased radar echo power. It is concluded that these power bursts are produced by static instabilities which in turn are due to KHI-induced superadiabatic lapse rates.

From incoherently added power spectra of the received radar echoes, average height profiles of the zonal, meridional and vertical wind components have been deduced. In general, the resulting zonal mean wind is directed towards the east, the meridional wind mainly towards the north. Comparisons of the radar data with respective wind data derived from the falling spheres and EISCAT measurements reveal good agreement concerning the mean background wind. The small scale structures, however, are not reflected in the following sphere data.

The spectral energy density of atmospheric waves with periods between 5 min and 2 h has been calulated. The spectrum clearly reveals the -5/3 power law, indicating that internal gravity waves distribute their energy over a wide range of frequencies and scale sizes by a cascade process.

Activities of other groups:

A list of wind data derived from datasondes is available. It contains all flights, which have been evaluated by F. Schmidlin. A similar list of falling sphere data has been compiled by W. Meyer.

Winds derived from experiments aboard the M-M payloads are still being processed by R. Philbrick. Within February 1985 the data evaluation will be finished and the final results will be available.

The work on analysis of foil cloud experiments was concentrated on the evaluation of fine structures seen in the chaff data. It looks as if quite a number of events observed in the radar echo records are caused by laminar flow separation effects with imbedded turbulence, when the critical shear force is exceeded. At present it is attempted to produce radar images of the reflecting center of the cloud. The data will be used to produce a new corrected set of data, which has random radar tracking errors removed.

Table 5

Date	Internal tape-nr.	Time period of measurement	Time interval of echo occurrence	Height interval of echo occurrence
22.11.83	8301	12:47 - 15:11	12:37 - 14:14	64.2 - 81.0
23.11.83	02	9:37 - 11:52	9:45 - 11:37	64.6 - 77.2
			11:07 - 11:37	82.2 - 84.0
23.11.	03	18:16 - 19:53	-	-
24.11.	04	13:23 - 15:42	13:23 - 13:44	63.0 - 67.6
			13:23 - 14:03	72.0 - 73.5
			13:35 - 13:47	77.4 - 79.5
24.11.	05	15:45 - 17:01	15:49 - 16:42	67.8 - 72.8
26.11.	06	13:23 - 15:47	14:31 - 15:47	67.8 - 81.0
26.11.	07	17:48 - 19:58	19:25 - 19:44	75.0 - 78.0
28.11.	08	8:56 - 10:15	8:56 - 9:51	76.8 - 81.6
	09			
	10			
28.11.	11	14:11 - 16:35	-	-
28.11.	12	18:03 - 20:25	18:36 - 19:00	79.2 - 82.2
29.11.	13	16:51 - 19:19	18:47 - 19:00	72.8 - 76.8
			19:06 - 19:15	72.8 - 76.6
29.11.	14	19.24 - 21:14	-	-
29.11.	15	21:53 - 23:48	-	-
30.11.	16	11:52 - 15:05	11:52 - 12:08	61.2 - 75.0
			12:12 - 12:24	61.2 - 75.0
30.11.	17	15:10 - 17:51	15:16 - 15:32	74.4 - 75.6
			15:45 - 16:15	74.4 - [illegible]3.8
30.11.	18	18:12 - 20:39	-	-
30.11.	19	20:45 - 22:37	-	-
1.12.	20	16:21 - 18:22	-	-
1.12.	21	14:00 - 21:23	-	-
1.12.	22	21:28 - 22:59	-	-
	23			
2.12.	24	16:55 - 19:14	-	-
2.12.	25	19:16 - 20:50	20:27 - 20:40	84.6 - 85.2
3.12.	26	12:24 - 14:41	12:27 - 12:36	75.0 - 76.8
3.12.	27	16:01 - 17:49	-	-
3.12.	28	18:44 - 21:59	-	-
4.12.	29	11:30 - 13:54	11:36 - 11:51	70.2 - 72.0
			12:13 - 12:54	67.2 - 75.0
			13:07 - 13:53	68.4 - 75.0
4.12.	30	14:07 - 16:26	-	-
5.12.	31	10:52 - 13:21	10:52 - 13:21	61.8 - 80.4
5.12.	32	13:23 - 14:45	13:23 - 14:18	62.4 - 80.4
			14:31 - 14:45	74.4 - 76.2
5.12.	33	20:07 - 22:29	21:13 - 21:37	82.2 - 84.0
5.12.	34	22:31 - 23:00	22:40 - 23:00	78.6 - 80.4
6.12.	35	9:38 - 11:06	9:38 - 10:14	71.6 - 78.0
			10:15 - 11:06	66.0 - 81.0
6.12.	36	11:08 - 11:35	11:08 - 11:35	64.8 - 78.6
6.12.	37	11:37 - 11:49	11:37 - 11:49	63.6 - 78.6
6.12	38	11:51 - 14:15	11:51 - 14:04	59.4 - 81.0
6.12.	39	14:18 - 16:42	-	-
7.12.	40	9:52 - 12:15	9:52 - 10:47	69.0 - 80.4
			10:48 - 12:15	66.0 - 77.4
7.12.	41	12:26 - 14:44	12:26 - 14:09	63.0 - 76.8
7.12.	42	17:20 - 18:48	17:20 - 18:00	68.4 - 81.0
7.12.	43	18:50 - 19:14	18:50 - 19:40	75.6 - 78.0
7.12.	44	19:16 - 21:11	19:16 - 21:20	72.0 - 75.0

Table 5 continued

Date	Internal tape-nr.	Time period of measurement	Time interval of echo occurrence	Height interval of echo occurrence
7./8.12.83	8345	21:52 - 0:11	21:52 - 22:06	71.4 - 81.6
			22:20 - 22:33	78.6 - 79.8
			23:02 - 23:22	75.6 - 77.4
8.12.	46	10:46 - 13:09	10:46 - 11:42	62.4 - 80.4
			11:43 - 12:46	60.0 - 77.4
			12:48 - 13:09	67.8 - 78.0
8.12.	47	13:14 - 15:41	14:14 - 15:48	70.2 - 76.8
8.12.	48	15:44 - 16:23	15:44 - 16:23	71.4 - 80.4
8.12.	49	16:37 - 19.01	16:37 - 17:21	70.8 - 78.0
8.12.	50	20:58 - 22:19	20:58 - 21:28	76.8 - 79.2
10.12.	51	11:21 - 13:48	11:21 - 12:05	61.5 - 81.6
10.12.	52	14:02 - 16:25	-	-
10.12.	53	21:27 - 23:06	22:12 - 22:28	83.4 - 85.2
11.12.	54	13:30 - 15:51	14:25 - 14:35	66.0 - 75.0
			15:09 - 15:27	83.6 - 84.6
12.12.	55	7:19 - 9:46	7:19 - 7:39	87.0 - 87.6
			8:18 - 8:33	81.0 - 81.6
			8:46 - 9:45	76.8 - 86.4
12.12.	56	9:50 - 11:57	10:18 - 11:57	70.8 - 74.4
			11:18 - 11:57	78.0 - 81.0
12.12.	57	13:02 - 15:10	13:13 - 13:57	68.4 - 75.0
			13:40 - 13:52	78.0 - 81.6
12.12.	58	16:50 - 17:50	-	-
12.12.	59	20:30 - 21:45	-	-
13.12.	60	7:47 - 10:08	-	-
13.12.	61	10:15 - 13:01	12:32 - 12:42	67.8 - 68.4
			12:17 - 12:50	76.2 - 77.4
13.12.	62	13:07 - 14:38	-	-
			10:53 - 11:47	61.8 - 75.0
			11:47 - 12:20	62.4 - 63.6
			12:32 - 12:55	62.4 - 72
14.12.	65	13:01 - 14:48	13:01 - 13:45	63.0 - 72.3
15.12.	67	12:05 - 12:59	12:05 - 12:43	61.5 - 77.4
16.12	69	12:21 - 13:19	12:54 - 13:17	72.0 - 73.2
	8400	-	-	-
6.1.84	8401	15:07 - 17:26	-	-
6.1.	02	17:30 - 19:53	-	-
6.1.	03	19:56 - 22:20	-	-
6.1.	04	22:43 - 0:00	-	-
8.1.	05	14:59 - 17:24	-	-
8.1.	06	20:50 - 23:15	-	-
8.1.	07	23:20 - 1:45	-	-
9.1.	08	1:56 - 4:22	-	-
9.1..	09	4:25 - 6:50	-	-
9.1.	10	6:54 - 9:29	-	-
9.1..	11	9:31 - 11:56	-	-
9.1.	12	14:59 - 17:26	-	-
11.1.	13	14:43 - 17:06	14:50 - 15:32	79.2 - 82.8
			15:53 - 16:10	79.2 - 81.0
12.1.	15	17:44 - 20:08	-	-

Table 5 continued

Date	Internal tape-nr.	Time period of measurement	Time interval of echo occurrence	Height interval of echo occurrence
13.1.	17	19:40 - 20:01	-	-
13./14.1.	18	22:03 - 0:17	-	-
15.1.	20	10:55 - 13:19	10:55 - 13:19	61.8 - 82.2
15.1.	21	20:16 - 22:43	21:35 - 22:02	81.0 - 82.8
15./16.1.	22	22:53 - 0:10	22:53 - 23:54	78.0 - 80.4
16.1.	22	0:16 - 1:26	0:16 - 0:28	76.8 - 79.2
17.1.	23	20:43 - 22:02	-	-
19.1.	24	9:42 - 12:05	9:42 - 10:07	73.2 - 75.6
			9:42 - 10:11	83.4 - 85.2
			11:13 - 12:05	80.4 - 84.0
19.1.	25	12:14 - 14:35	13:13 - 13:39	80.4 - 82.2
			14:14 - 14:35	71.4 - 72.6
	26	-	-	-
20.1.	27	14:51 - 17:17	14:51 - 16:09	68.7 - 78.3
	28	-	-	-
21.1.	29	10.51 - 13:03	10:51 - 13:03	65.7 - 79.4
21.1.	30	13:05 - 15:09	13:05 - 15:09	66.0 - 78.0
	31	15:15 - 17:08	-	-
22.1.	32	13:36 - 16:01	13:36 - 14:10	60.3 - 73.5
			14:14 - 14:51	62.7 - 75.6
			14:52 - 15:43	69.0 - 76.2
22.1.	33	21:22 - 23:47	-	-
24.1.	34	12:37 - 15:09	12:58 - 15:09	69.6 - 73.8
24.1.	35	15:15 - 17:38	-	-
24.1.	36	18:50 - 20:15	-	-
25.1.	37	10:42 - 12:27	10:42 - 11:47	72.6 - 74.7
25.1.	38	16:29 - 18:51	-	-
25.1.	39	19:10 - 20:09	-	-
30.1.	40	12:16 - 14:35	12:16 - 12:29	77.1 - 78.6
			12:27 - 13:09	62.1 - 75.3
			13:23 - 13:50	62.6 - 75.0
			13:57 - 14:21	75.6 - 77.4
30.1.	41	14:54 - 17.14	-	-
30.1.	42	10:13 - 12:33	10:13 - 11:48	63.9 - 79.2
31.1.	43	14:58 - 17:18	14:58 - 15:25	59.7 - 68.7
31.1.	44	18:00 - 19:43	19:18 - 19:38	76.8 - 80.4
31.1.	45	19:48 - 21:10	-	-
1.2.84	8446	11:02 - 13:18	11:02 - 13:18	57.0 - 82.5
1.2.	47	13:26 - 15:53	13:26 - 15:53	57.6 - 78.9
2.2.	48	15:44 - 18:04	15:44 - 17:09	62.7 - 78.6
			17:30 - 18:04	72.0 - 74.5
2.2.	49	18:08 - 20:29	18:08 - 18:56	72.0 - 75.9
			19:27 - 19:49	72.9 - 76.5
3.2.	50	10:30 - 12:26	11:06 - 12:12	72.3 - 74.4
			12:00 - 12:15	64.2 - 69.6
4.2.	51	10:35 - 12:51	10:35 - 11:56	66.3 - 75.9
5.2.	52	11:07 - 13:26	11:07 - 13:26	63.3 - 79.5
5.2.	53	19:27 - 21:47	-	-
7.2.	54	12:11 - 14:30	12:11 - 13:58	69.6 - 75.9
7.2.	55	20:01 - 22:00	-	-
8.2.	56	12:33 - 14:02	-	-
9.2.	57	1:05 - 2:59	-	-
	58			

Table 5 continued

Date	Internal tape-nr.	Time period of measurement	Time interval of echo occurrence	Height interval of echo occurrence
10.2.	59	1:04 - 2:56	-	-
10.2.	60	3:04 - 5:01	-	-
10.2.	61	5:09 - 6:41	-	-
10.2.	62	16:25 - 18:43	-	-
10.2.	63	19:17 - 21:23	-	-
11.2.	64	13:28 - 15:45	13:28 - 13:43	63.0 - 72.6
12.2.	65	11:38 - 13:54	11:38 - 12:34	64.2 - 71.4
13.2.	66	10:54 - 13:14	10:54 - 13:14	57.0 - 73.2
13.2.	67	13:19 - 15:46	13:19 - 14:10	55.2 - 75.0
13.2.	68	16:04 - 17:54	16:04 - 16:16	68.4 - 72.0
14.2.	69	10:36 - 12:54	10:36 - 11:51	66.0 - 79.8
14.2.	70	13:24 - 15:41	13:24 - 14:02	52.2 - 79.8
			15:20 - 15:41	69.0 - 82.2
15.2.	71	11:27 - 13:46	12:19 - 13:40	72.0 - 83.4
15.2.	72	13:51 - 15:55	13:51 - 14:29	79.8 - 83.4
			15:39 - 15:55	70.6 - 85.2
16.2.	73	0:55 - 2:33	1:24 - 1:57	78.0 - 82.2
16.2.	74	2:40 - 3:59	-	-
	75			
	76			
	77			
17.2.	78	12:31 - 14:52	12:31 - 14:52	59.4 - 75.3
18.2.	79	1:20 - 3:39	-	-
	80			
	81			
19.2.	82	12:46 - 14:00	12:46 - 14:00	61.2 - 72.0

W. G. 9 on "Mesoscale Waves above Andoya: Tides, Gravity Waves and else" (von Zahn et al.)

Sources of Information:

In-situ measurements:	Institution	Measured	Range
1.1 Falling spheres (passive)	UB/AFGL/NASA	ρ , v	20 90
1.2 Datasondes	UB/AFGL/NASA	T, v	20 65
1.3 Foil clouds	MPIAe	v	65 85
1.4 Mass spectrometer	UB	ρ	92 120
1.5 Falling spheres (active)	AFGL	ρ , v	50 120
1.6 IR photometer (?)	GSHW	T	(60 120)

Remote-sensing measurements:

2.1 Partial reflection radar	U.Tr.	n_e	80 → 100
2.2 MST radar (SOUSY)	MPIAe	v, v	60 → 85
2.3 EISCAT	EISCAT	n_e, v	$\geq$ 80
2.4 OH*-airglow	GHSW	T	86 $\pm$ 4
2.5 Lidar	UB	ρ	20 → 45

Status of Data Processing:

Final data of measured parameter available from 1.4.

Prelimary data of measured parameter available 1.1, 1.2, 1.3, 1.5, 2.1, 2.2.
Preliminary data deduced from all remaining experiments.
Spectral analysis performed for a few selected profiles obtained by 1.1, 1.2, 1.4, 2.2, 2.3, 2.4.

Selected Results:

(a) Strong wave activity noticeable in almost all profiles.
(b) Downward phase propagation observed in most cases.
(c) Tidal wind components to be resolved only by EISCAT (e. g. 80 km).
(d) Both persistent and transient wave features have been observed.
(e) Some observations do not adapt well to a wave interpretation.

W. G. 10 on "Turbulence Phenomena" (E. THRANE et al.)

The following group members have been contributed to this report:

E. V. Thrane, T. A. Blix (NDRE):	Ion probe results
F. -J. Lubken, U. von Zahn (University of Bonn):	BUGATTI results
H. U. Widdel (MPIAe):	Chaff results
C. Hall, A. Brekke (University of Tromso):	PRE results
J. Rottger, C. Hall (EISCAT):	EISCAT results

We are still missing information from C. R. Philbrick, AFGL, from P. Schabbauer, GWH, and from the SOUSY group, MPIAe.

Status:

NDRE: The ion probe data from the rockets M-T5 and M-T6 have been fully analysed to yield turbulent intensities, spectral characteristics, eddy diffusion coefficients, and energy dissipation rates. The data from the other 5 M-T payloads have been prepared for such analysis, and about 1 month of work remains before completion.

UB: The M-T5 and M-T6 BUGATTI data have been fully analysed to yield turbulent intensities, spectral characteristics, eddy diffusion coefficients and energy dissipation rates. NDRE and UB have compared their results for heights above 90 km and found good agreement.

MPIAe: Detailed studies have been made of the behaviour of the chaff clouds, their trajectories and spatial extent. Preliminary wind profiles have been derived.

EISCAT: Successful attempts have been made during MAP/WINE to use EISCAT as an MST radar. EISCAT has also provided electron density profiles in the D and E region during MAP/WINE.

UT: The partial reflection experiment (PRE) has provided electron density profiles and echo amplitude recordings during all the M-T flights of MAP/WINE, and has in addition provided data for extended periods between the salvos. The results are available in different representations, such as Ne(h), Ne(h,t), $A_{x,o}(h)$ and $A_{xmo}(h,t)$.

W. G. 11 on "O, NO and Related Species" (P. H. G. DICKINSON et al.)

Useful progress has been achieved in some of the analyses required for this data set.

Analysis of the RAL atomic oxygen experiment in the M-W payloads was essentially complete at the time of the Graz meeting, and the results from Utah State University for M-I were also available, but awaiting trajectory confirmation. Airglow analysis has subsequently shown that a peak atom concentration of about 2×10^{11} cm^{-3} is reasonable, despite the lower values from the rocket in-situ measurements. The absolute values for [0] from M-W2 were based on descent data from the twin path absorption experiment. This appears to have been perturbed by precession, and, on the ascent, strong shock-wave effects. In view of these difficulties it is possible that the nonstatistical error could be sufficient to explain the difference from the airglow.

The RAL experiment also detected, emissions synchronised with the MISU Kr lamps. This emission was negligible at heights where [0] or background signals were significant but became large at lower altitudes, particularly on the descent, down to 40 km on M-W2. The altitude dependence is nearly proportional to atmospheric density as one might expect if direct resonant scattering by Kr was the mechanism giving rise to the signal. These signals are to be compared with the MISU results in which Kr radiation was also be measured.

Airglow evidence is for 35 R of green line in the E layer, but no 63 (Offermann) and no O_2 ($^1\Delta_g$) emission, from which it is concluded that the mesospheric O_3 was very low.

M-I:

Infrared measurements show $CO_2 + 0 \rightarrow CO_2{}^*$ to be normal up to 90 km (to about ± 30% then x3 lower than usual, which is consistent with x10 lower [0] . The NO + 0 emissions are the same in intensity as seen by Ulwick in the Energy Budget Campaign. If 0 is low that implies high NO for MAP/WINE (February 10).

Band intensities of CO_2, O_3, NO and H_2O have been measured but concentrations have not been deduced. Attitude data is need from DFVLR.

2 IOMAS flights (M-T2, 4) in January: M-T2 saw high NO^+ (6×10^{14}) at 110 km versus M-T4 with 6×10^{13} at same height.

W. G. 12 on "O-H-Chemistry and Related Species" (K. U. GROSSMANN et al.)

An overview of data expected from the IR-spectrometer aboard payload M-I1 and from the CNIRPS instruments aboard payloads M-T2 through M-T8 has been given on p. 22 of the minutes of the Experimenters Meeting at Graz. For the CNIRPS data processing Table 6 provides an update of this information.

Gyger et al., submitted a report on their airborne passive microwave measurements of middle atmosphere ozone and water vapor. On January 24 and 25, 1984 they performed successful measurements between 68° N and 75° N. O_3 profiles for altitudes from 20 to 68 km and H_2O profiles from 22 to 47 km were determined. The latter indicate 4 ± 1 ppm of water vapor throughout the polar stratosphere.

W. G. 13 on "Morphology of the Ionosphere during MAP/WINE (ground-based)" (E. R. WILLIAMS et al.)

Eight research groups are collaborating. The status of their work as at the end of 1984 is as follows:

EISCAT related data:

Dr. Rottger has defined the availability of zonal and meridional wind

Table 6

Messungen Uber Andoya (CNIRPS)

Flug	MT-2	MT-3	MT-4	MT-5	MT-6	MT-7	MT-8
F-Zahl	F 66	F 68	F 67	F 70	F 69	F 64	F 65
CNIRPS	8	9	4	7	6	1	3
Datum Uhrzeit (UT)	6.1.84 21:55:00	13.1.84 20:00:00	25.1.84 16:39:00	31.1.84 18:31:00	10.2.84 02:40:00	16.2.84 01:20:00	18.2.84 00:22:00
Strahlungs-Intensitat CO_2	105(U)-45.1(D)	101(U)-50(D)	99.7(U)-52.2(D)	97.9(U)-58(D)	99.1(U)-57(D)	115(D)-55(D)	96.5(U)-55(D)
Strahlungs-Intensitat H_2O	72-55 (D)	57-50 (D)	70-58 (D)	----	----	68-55 (D)	----
Strahlungs-Intensitat O_3	----	----	----	75-58 (D)	75-57 (D)	----	75-55 (D)
Temperatur Aus, CO_2-Messungen (Downleg)	80-45.1	80-50	80-58 (52.2)	80-58	80-57	80-55	80-55

components derived from EISCAT measurements. He is reducing these data to provide an overview of wind profiles for the Berlin meeting.

Chris Hall (Tromso) has tabulated the availability of partial reflection data from Ramfjordmoen for 1984 at times of rocket flights from Andoya. Data are currently in the form of O- and E-mode backscattered powers, but it is hoped to deduce D- and lower E-region electron density profiles.

Dr. Hargreaves (Lancaster) has EISCAT Special Programme data for 1984 from which electron concentrations and wind profiles can be deduced.

Absorption related data:

H. Ranta (Sodankyla) has provided riometer measurements for the Finnish chain of stations and John Hargreaves (Lancaster) has data for the EISCAT chain.

We (Williams-Aberystwyth) have collected f_{min} data for 36 Northern Hemisphere stations. In addition we have microsonde data (virtual height and absorption) for most days of major rocket launches in MAP/WINE.

Other data:

Dr. Schminder (Collm) has provided LF wind measurements around 95 km over Central Europe.

Soviet data:

Through Prof. von Zahn, Dr. Rapoport has provided details of Soviet measurements which include meteor winds and drifts, OH* -temperatures, D-region electron concentrations and winds, particle influxes and some absorption data. Eastern European colleagues are preparing two papers for IAGA on "Mid-latitude Lower Ionosphere in the MAP/WINE Winter".

Within the above data I have identified four topics which I consider worthy of reporting at IAGA. This is an addition to any requiremments which may arise to provide background data for specific groups of firings. Full discussion of these by the working group is proposed.

W. G. 14 on "Plasma Density and Composition (in-situ)" (M. FREIDRICH et al.)

Electron density profiles from Faraday rotation and differential absorption measurements are now available for the 7 successful M-T flights. No report has been received on the status of the analysis of the IOMAS data.

The results of the electric field probe of M-M2 are being analysed. Dr. Holtet has, however, encountered problems because of the large attitude variations of the probe. It may become a difficult and time consuming process to derive the real electric field variations.

Bonn, January 23, 1985

The above reports have been collected and slightly edited by U. von Zahn.

APPENDIX II TO MAP/WINE REPORT

SOVIET MAP/WINE CONTRIBUTIONS

On December 13/14, 1984 a workshop on contributions of Soviet scientists towards the international project MAP/WINE took place at the Soviet offices of the Soviet Geophysical Committee, Academy of Sciences of the USSR in Moscow.

I. PARTICIPANTS OF WORKSHOP

G. A. Kokin	Central Aerological Observatory
V. A. Nechitailenko	World Data Center-B2
Yu. I. Portnyagin	Institute of Experimental Meteorology
A. D. Powsner (part time)	Soviet Geophysical Committee
Z. Tz. Rapoport	Institute of Terrestrial Magnetism, Ionosphere, and Radio Wave Propagation
M. N. Shefov	Institute of Atmospheric Physics
V. V. Viscov (part time)	Soviet Geophysical Committee
V. A. Yushkov	Central Aerological Observatory
U. von Zahn (MAP/WINE project scientist)	Bonn University

II. SOVIET MAP/WINE MEASUREMENTS

Drs. Kokin, Portnyagin, Rapoport, Shevov, and Yushkov all took part in an indepth presentation of measurements taken in the USSR in the course of the project MAP/WINE. They also provided some initial analysis of these observations.

A. Temperature

A.1 by resistance thermometers aboard metrockets. From Nov. 1, 1983 until March 15, 1984 the following number of profiles have been obtained:

Heiss Island	(81°N; 28°E)	44
Volgograd	(48°N; 46°E)	39
Akhtopol	(42°N; 28°E)	25

Data are usually given from 75 km downward.

A.2 from OH^* emission at Zvenigorod (56°N; 37°E) for 20 nights between November 1, 1983 and March 15, 1984.

Note: No sounding rocket emperiments involving complex instrumentation have been performed in the USSR in connection with MAP/WINE.

B. Dynamics

B.1 Winds from metrockets:
above 60 km from chaff, below 60 km from parachute drift. Between Nov. 1, 1983 and March 15, 1984 the following numbr of profiles have been obtained:

Heiss Island	59
Volgograd	48
Akhtopol	27

B.2 Winds from meteor wind radar:

near continuous, hour-by-hour values from

Heiss Island	(81° N, 28° E)	a few days
Kasan	(56° N, 49° E)	(?)
Obninsk	(55° N, 38° E)	
Kharkov	(50° N, 36° E)	daily mean values from Dec. 9, 1983 to Feb. 7, 1984 and March 1-16, 1984
Volgograd	(48° N, 46° E)	Nov. 11, 1983 - March 7, 1984

B.3 Winds from spaced antenna drift method (wind near 95 km altitude):

Irkutsk	(52°N, 104°E)	near continuous hour-by-hour values from Nov. 1, 1983 to March 15, 1984

B.4 Rate of turbulent energy dissipation (ε) in the mesosphere: from the line-of-sight diameter of chaff clouds; measurements between about 65 and 80 km altitude; one mean value of ε for each flight:

Heiss Island	24 "values"
Volgograd	30 "values"

C. Neutral composition

C.1 Ozone

(a) on metrockets at
- Heiss Island: 3 profiles up to 50 km with chemiluminescent technique (Dec. 10, Dec. 20, Jan. 18)
- Volgograd: 3 profiles up to 58 km with optical absorption technique (Dec. 10, Jan. 23, Feb. 22)

(b) on balloons from
- Volgograd using electrochemical sondes

Dec. 10, 1983	0 to 35 km
Jan. 23, 1984	0 to 25 km
Feb. 1, 1984	0 to 30 km
Feb. 22, 1984	0 to 30 km

(c) ground-based measurements of O_3 column density from
- Volgograd on 13 days in the period Dec. 1983 and Jan. 1984.

C.2 Water vapor

with metrockets fromm coulometric method between 15 and 60 km altitude:
- Heiss Island: Dec. 9, Dec. 20 + 21, Jan. 18 +19, Feb. 22 + 23
- Volgograd: Dec. 9, Dec. 19, Jan. 18

D. Plasma parameters

D.1 Electron density	Heiss Isl.	Volgo.	Akhtop.
(a) from metrockets using d.c. probes; number of profiles:	37	15	7
(b) from metrockets using "Doppler phase technique" ($\Delta\Phi$ between 10 and 40 MHz):	-	7	-

(c) from ionosonde at Volgograd (continuous)

(d) from PRE radar at Gorki (at 2.95 MHz): 224 profiles on 80 days between Nov. 10 and March 14

D.2	Ion density from metrockets using aspiration ion traps:	2	8	-
D.3	Electrical conductivity of air from metrockets, by body-scattering techniques:	2	4	-
D.4	Electric field (3 components) from metrockets using rotating sensors:	2	6	-
D.5	Energetic electrons ($\geq$40 keV). from metrockets using gas-discharge counters:	-	3	-

D.6 Radio wave absorption (at 2.2 MHz)
Al method used at Volgograd continuously from Nov. 11, 1983 through March 7. 1984.

D.7 Solar wind particles
The satellite PROGNOZ 9 measured:
- electron flow within the 40 keV to 2 MeV range
- proton flow within the 500 keV to 100 MeV range
- X-rays within the 100 keV to 2 MeV range

III. WEST EUROPEAN AND AMERICAN MAP/WINE MEASUREMENTS

Dr. U. von Zahn gave an overview about MAP/WINE measurements performed by West European and American scientists.

IV. SOME SPECIFIC WISHES FOR COOPERATION

A. Dr. Yu. I. Portnyagin likes to join the Prague paper of MAP/WINE W. G. 2.

B. Dr. G. A. Kokin wants collaboration on the question of the creation of baroclinic instability and production of turbulence by planetary waves.

C. Drs. Z. Ts. Rapoport and S. V. Pakhomov are looking for cooperation on the connections between D-region phenomena and neutral atmosphere meteorology.

D. Dr. M. N. Shevov likes to join the Prague paper of MAP/WINE W. G. 7.

E. As MAP/WINE project scientists, Dr. U. von Zahn has transmitted to the Soviet MAP/WINE delegate, Dr. Z. Ts. Rapoport, a number of requests of West-European scientists for MAP/WINE data taken by Soviet scientists.

V. ITEMS OF DATA EXCHANGE AND COOPERATION

After considerable discussion all participants agreed on the following procedure for future MAP/WINE data exchanges between the USSR and western countries:

A. All MAP/WINE data intended for exchange between the above noted countries should be passed through the World Data Center-B2.

B. Those data obtained from western countries should be passed to WDC-B2 through Dr. U. von Zahn.

C. WDC-B2 should transform, if so requested, the data into a computer-readable form for either side.

D. Participants of the project commit themselves not to use in their papers MAP/WINE results submitted for exchange without consent of the owners of data.

Concerning the IAGA Assembly at Prague in August 1985 it was agreed that preference should be given to collaborative papers by groups of scientists. This appears to be most effective way to highlight the essential results of the project MAP/WINE during the one-day MAP/WINE session of the IAGA Assembly.

U. von Zahn

REPORT ON THE MAP/WINE EXPERIMENTERS MEETING AT LOEN, NORWAY, MAY 8, L985

U. von Zahn

On May 8, 1985 a MAP/WINE Experimenters Meeting took place at Hotel Alexandra, Loen, Norway. The agenda of the meeting is enclosed as Appendix I, the attendance list as Appendix II. A brief report on some of the topics discussed during the meeting (using the numbering of the agenda) follows:

(1). Trajectories for payloads M-T2, M-T3, M-T4, and M-T6 were available independently from slant range tracking and radar. Unfortunately, there were differences between those trajectories which amounted on the downleg to as much as 500 m. Mr. E. Haugen from NTNF has in the meantime made an indepth study of the details entering these calculations. He has introduced a number of improvements, both for the slant range as well as the radar method. He presented at the Experimenters Meeting "revised final trajectories" of M-T3 and M-T4 which now should have everywhere an accuracy of better than 100 m. Currently he is analyzing M-T2 and M-T6 for which the differences, however, never amount to much more than 200 m. Mr. Haugen will soon write a report on his analysis which will contain "revised final trajectories" for all 4 payloads.

(2). During the "7th ESA Symposium on European Rocket and Balloon Programmes and Related Research" at Loen many papers were presented with new MAP/WINE results. Hence, during the Experimenters Meeting only 4 progress reports of MAP/WINE Experimenters were given:

a. K. Petzoldt (F. U. Berlin) reported on details of her work on the large scale structure of the middle atmosphere during the MAP/WINE winter.

b. A. Zuber (MISU Stockholm) reported on early results of the M-W2 experiments using resonance scattering and absorption of O, O_2, Ar, and Kr.

c. D. Murtagh (MISU Stockholm) reported on the early results of photometer experiments aboard the same payload.

d. E. R. Williams (U. C. Wales) reported about his progress in studies of the absorption characteristics at "all" European ionospheric stations.

(3). W. Meyer (U. Bonn) reported on the status of processing of metrocket data from experiments performed at Andoya and Lista. This processing has now been completed and the data are available from this Institute.

(4). Three items were discussed under the heading of "Future Activities":

a. The next MAP/WINE Experimenters Meeting will take place on August 14, 1985 in Prague, Czechoslovakia. The meeting place will be announced at the IAGA Conference Bureau.

b. Next year's Symposium on Solar-Terrestrial Physics will take place June 23-27, 1986 in Toulouse, France. This symposium will provide for 24 hours of MAP results. It may be a good place to present future MAP/WINE results.

c. The Norwegian NTNF jointly with the Univ. of Bonn is now constructing an observatory building close to the Andoya Rocket Range (69°N, 16°E) to permanently house a major LIDAR experiment and OH-spectrometer. We envision that the zenith-looking, 1-m Cassegrain telescope of the LIDAR experiment can possibly be used also for other airglow observations. Anyone interested in such cooperative effort of middle atmosphere studies should contact U. von Zahn.

(5). The program of a session on "Results from the MAP/WINE Project" at the IAGA Meeting in Prague was discussed and a few minor changes suggested. The program, as it stands today, is attached as Appendix III.

(6). The question of a joint publication of MAP/WINE results was discussed extensively and there was general agreement that publication of the Prague papers is yet somewhat too early. The following procedure was agreed to:

a. U. von Zahn was to inquire with the editor of the "Journal of Atmosphereic and Terrestrial Physics" whether we could have 1 or 2 special issues of this journal for cooperative papers on MAP/WINE results. It was felt that Spring 1986 would be an appropriate time to have final manuscripts available for submittal to J.A.T.P.

b. The editor of J.A.T.P., Sir Granville Beynon, has agreed to our proposal.

c. We also suggested to use the MAP/WINE Experimenters Meeting in Prague to finalize titles and authorship of the papers for J.A.T.P. The latter are not necessarily identical to the papers presented at Prague. If you are unable to attend the meeting in Prague, but want to make an input to the J.A.T.P. publications, please inform U. von Zahn in advance.

(7). Splinter group meetings dealing with the joint papers at Prague took place during the afternoon of May 8, 1985 for:

Paper No. 10, chaired by W. Meyer

Paper No. 15, chaired by F. -J. Lubken

Paper No. 22, chaired by E. R. Williams

Paper No. 24, chaired by E. Thrane
(as Dr. Friedrich could not attend)

Many more splinter group meetings took place in an informal way throughout the 7th ESA Symposium on Eruopean Rocket and Balloon Programmes at Loen.

APPENDIX I

AGENDA

For MAP/WINE Experimenters Meeting

Hotel Alexandra; Loen, Norway; Wednesday, May 8, 1985

(1).	Comparison of radar trajectories vs. slant range	E. Haugen
(2).	New results from the MAP/WINE campaign	K. Petzoldt A. Zuber D. Murtagh E. Williams
(3).	Distribution of metrocket data	W. Meyer
(4).	Future activities	U. von Zahn
(5).	Final program of session of IAGA/IAMAP Assembly at Prague	U. von Zahn
(6).	Joint publication of MAP/WINE results	U. von Zahn
(7).	Splinter group meetings on joint papers at Prague	(all)

APPENDIX II

ATTENDEES

of the MAP/WINE Experimenters Meeting

Loen, Norway; May 8, 1985

Name	Institution
U. von Zahn	Univ. of Bonn
Ch. Putz	Univ. of Bonn
F. -J. Lubken	Univ. of Bonn
T. A. Blix	NDRE
C. M. Hall	Univ. Of. Tromso
D. Offermann	Univ. of Wuppertal
K. Petzoldt	F. U. of Berlin
H. Hass	Univ. of Koln
K. Pfeilsticker	MPI Heidelberg
V. Klein	Univ. of Bonn
O. Andreassen	NDRE
G. Witt	MISU Stockholm
A. Zuber	MISU Stockholm
D. Murtagh	MISU Stockholm
A. Lundin	MISU Stockholm
G. Brasseur	Institut d' Aeronomie
W. Meyer	Univ. of Bonn
E. Thrane	NDRE
O. Rohrig	DFVLR
R. Klein	DFVLR
E. Haugen	NTNF
J. Troim	NDRE
K. Bohle	NDRE
X. M. Kalteis	DFVL WT-DA-MA
R. Bjurstrom	NTNF
F. Dahl	DFVLR
Bertin	CRPE
F. Schmidlin	NASA
J. C. Ulwick	Utah State Univ.
K. U. Grossmann	Univ. of Wuppertal
K. Lundahl	SSC
E. R. Williams	UCW Aberystwyth
W. Michel	NASA
J. R. Katan	NUSC
A. Gundersen	NTNF

APPENDIX III

5th Assembly of IAGA, with IAMAP

Results from the MAP/WINE Project (Status: June 15, 1985)

Morning session, Chairman: U. von Zahn

(1).	The Project MAP/WINE (30 min.)	v. Zahn
(2).	Large scale structure of the stratosphere and lower mesosphere over the Northern Hemisphere during the MAP/WINE campaign	Petzoldt et al.
(3).	Hemispheric synoptic analysis of mesospheric winds during the winter of 1983/84	Labiitzke et al.
(4).	Simulation of the winter circulation in the middle atmosphere of higher latitudes	Bischof et al.
(5).	Main features of synoptic processes and their energy characteristics in the stratosphere and mesosphere during the MAP/WINE period	Tarasenko et al.
(6).	Comparison of density and temperature measurements using different techniques during salvos D and R1 including short time variability	Philbrick et al.
(7).	Thermodynamics and electrodynamics of the auroral E-region during and around the D-salvo	Schlegel and Rottger
(8).	Long-term temperature variations in the mesosphere above Northern Scandinavia during the MAP/WINE campaign	Offermann et al.
(9).	Large-scale coherence of the mesospheric and upper stratospheric temperature fluctuations	Hauchecorne et al.
(10).	Comparison of mesospheric wind measurements by foil clouds, meteorological rockets, sounding rockets, and VHF-MST radar	Meyer et al.
(11).	Summary of ground-based observations of tides and mean winds in the upper mesosphere and lower thermosphere during MAP/WINE	Rottger et al.
(12).	Complex experiment on MAP/WINE program and some peculiarities of middle atmosphere processes during the experiment	Kokin et al.

Afternoon session, Chairman: Z. Ts. Rapoport

(13).	Vertical wave number spectra of middle atmosphere winds	Hass et al.
(14).	Wind corners in the high latitude winter mesosphere	v. Zahn et al.
(15).	Small scale turbulence measurements in the mesosphere and lower thermosphere during MAP/WINE	Lubken et al.
(16).	Geomagnetic activity effect in the middle atmosphere derived from MAP/WINE data	Neumann and Blum
(17).	Possible mechanisms for the creation of turbulent layers in the mesosphere and their relation to radio wave scattering	Thrane et al.
(18).	Spatial extent and persistence of mesospheric turbulent layers	Schmidt et al.
(19).	Rocket-borne measurements of oxygen and related species during a minor stratospheric warming	Dickinson et al.
(20).	Water vapor concentrations in the middle atmosphere during MAP/WINE	Grossmann et al.
(21).	Some results of ozone and water vapor concentration in winter experiments of 1983/84	Grasnik et al.
(22).	Morphology of the ionosphere during MAP/WINE	Williams et al.
(23).	The relations of lower ionosphere processes with middle atmosphere dynamics during MAP/WINE	Pakhomov et al.
(24).	In-situ measurements of plasma density, structure, and composition	Friedrich et al.
(25).	Mid-latitude lower ionosphere in the MAP/WINE winter of 1983/84	Lastovicka et al.

THE PENETRATION OF ULTRAVIOLET SOLAR RADIATION INTO THE MIDDLE ATMOSPHERE:

CONCLUSIONS AND RECOMMENDATIONS OF MAP STUDY GROUP 7

J. E. Frederick (Chairman)

Members: A. J. Blake, D. E. Freeman, R. W. Nicholls, T. Ogawa, and P. C. Simon

On August 22, 1983, several members of MSG-7 met, together with other interested scientists, during the UIGG General Assembly in Hamburg, FRG. The objective of the meeting was to review the conslusions of the MSG-7 document that appeared in Volume 8 of the Handbook for MAP (July 1983) and to assemble a set of recommendations for future studies that could improve our understanding of the penetration of ultraviolet solar radiation into the middle atmosphere. The major concern of MSG-7 has been the assessment of available cross section data for molecular oxygen, and to a lesser extent ozone, in the wavelength region greater than 165 nm plus Lyman Alpha.

Laboratory measurements of the O_2 absorption cross section in the vicinity of the hydrogen Lyman Alpha line (121. 6nm) show relatively minor disagreements among themselves. It is now widely recognized that data of high spectral resolution are needed to allow for convolution of the solar line profile with the variable cross section over a wavelength interval of approximately 0.15 nm. Additional data would be useful in confirming details of the cross section shape and magnitude at temperatures typical of the upper mesosphere; however, this is not identified here as a major need.

Solar radiation in the Schumann-Runge continuum of O_2, at wavelengths less than 175 nm, is responsible for the large atomic oxygen concentrations above the mesopause which can influence lower altitudes via transport. Comparison of the available laboratory cross section data in the 165-175 nm spectral region shows excellent agreement among different workers. Additional measurements here are therefore not a high priority need for middle atmospheric research. At wavelengths longer than 175 nm absorption by excited vibrational states occurs in the continuum and this effectively fills in the window regions between the Schumann-Runge bands in the 175 to 180 or 185 nm region. Knowledge of this temperature sensitive continuum is necessary for accurate calculations of solar energy penetration into the upper mesosphere; however, most laboratory measurements have not explicitly addressed these excited state transitions and their temperature dependence. Additional data on absorption by vibrationally excited states would be valuable here.

Several independent sets of laboratory absorption data for the Schumann-Runge bands of O_2, 175-205 nm, have been published in the last five years. There is now general agreement that the rotational linewidths are greater than believed on the basis of earlier measurements, although the discrepancies among different oscillator strengths and especially linewidth results are still larger than desirable for some bands. Measurements with sufficient spectral resolution to yield linewidths directly are preferred here since indirect inferences, as have been necessary in most experiments, can produce results with substantial error bars. Additional determinations of the spectroscopic constants for the upper electronic state of the Schumann-Runge transition are required to resolve the discrepancies that now exist among different linewidth results. We identify this as the major current need in this region of the spectrum. In addition, the "hot bands" with $v''=1$ are not negligible at typical stratopause temperatures. When these absorption features lie in the window regions between the $v''=0$ bands they can make a significant contribution to atmospheric opacity. The lack of laboratory values for the Schumann-Runge v"=1 oscillator strengths is identified as a significant deficiency in the available data base.

A major need identified at the Hamburg meeting is for the development of a standard format for treating the transmission of solar radiation in the Schumann-Runge bands and incorporating this information into photochemical models. The primary issue here is that the data deduced in most experiments, being band oscillator strengths and rotational linewidths, are not immediately useful for atmospheric modeling applications. However, even if the complete cross section as a function of wavelength were available, it would not be feasible to include the necessary level of detail in practical calculations. It is therefore recommended that standardized parameterizations which are convenient for use in photochemical models be designed and implemented. These parameterizations should include temperature dependence and allow straightforward calculations of the transmission of the 175-205 nm solar radiation through the atmosphere and of the molecular oxygen photodissociation rate for any solar zenith angle. Although several parameterizations have been reported in the past, they have not utilized the most recent laboratory data which are now available. These parameterizations should be developed in association with experienced atmospheric modelers to assure a convenient format for meshing with photochemical calculations.

The Herzberg continuum lies beneath the Schumann-Runge bands, and at wavelengths longer than 200 to 205 nm is responsible for the dissociation of molecular oxygen which leads to formation of the stratospheric ozone layer. The spread among the available laboratory results is unacceptably large and reflects the difficulty in deducing the zero-pressure limit of a cross section which is on the order of 10^{-24}-10^{-23} cm^2. Inferences based on in-situ measurements of the attenuated solar irradiance imply smaller cross sections than have most laboratory results. However, recent laboratory determinations which accurately correct for the pressure dependence are now producing cross sections that are near the in-situ values. A definitive laboratory determination of the Herzberg continuum cross between 200 and 240 nm is here identified as a major need for atmospheric calculations. This measurement should be done independently by two or more groups. The laboratory results should then be checked under atmospheric conditions by at least one balloon-borne measurement of the attenuated solar irradiance in the middle stratosphere.

Measurements of the ultraviolet absorption cross section of ozone have two major roles in atmospheric studies. The first concerns their use in photochemical model calculations and the second involves atmospheric ozone measurements. It is the latter of these that places the most stringent accuracy requirements on our knowledge of the cross section. Most available data give only relative cross sections since few absolute measurements have been performed. Furthermore, there are significant unresolved discrepancies among the absolute cross sections that now exist, being in the vicinity of 6% for wavelengths greater than 300 nm. In addition to the absolute values, it is critical to establish the temperature dependence of the cross section over the entire wavelength range of relevance to atmospheric studies. Although work of this type is currently underway, definitive results are not yet available in the literature. Because the detection of very small changes in atmospheric ozone is a high priority task, it is essential that we be able to separate the effects of temperature variations from true ozone changes. Emphasis to date has focused on the spectral region longward of 300 nm where the temperature dependence is most pronounced. However, for the purpose of unambiguous detection of ozone profile variations, it is necessary to have temperature dependent absolute cross sections over the entire spectral range 250-340 nm. This is identified as a major need for interpretation of satellite-based ozone observations to be conducted throughout the 1980s and 1990s. At least two independent research groups should obtain definitive cross section results at the same set of two or more temperatures that span the range of atmospheric variability. In addition, cross section measurements extending shortward to at least 200 nm and preferably to 175 nm would be valuable for resolving discrepancies that exist among previous data sets in this spectral region. These short wavelength measurements are necessary for proper interpretation of the attenuated solar radiation field at stratospheric altitudes.

Laboratory studies of the absorption cross sections of O_2 and O_3 provide the capability to predict the solar ultraviolet radiation field in the stratosphere and mesosphere. It is recommended that such predictions be tested by new in situ measurements of the attenuated solar irradiance from balloons and rockets. Additional atmospheric measurements designed specifically to examine ultraviolet penetration would be useful in both the Herzberg continuum and Schumann-Runge bands of O_2. We here note that such measurements done in the past first indicated that the Herzberg continuum cross sections were smaller than generally believed based on laboratory results. Furthermore, near 200 nm in wavelength, we also require an accurate knowledge of the cross section for Rayleigh scattering.

Atmospheric studies of the Herzberg continuum absorption of O_2 are best carried out from balloons since attenuation of solar radiation in the vicinity of 200-22- nm does not become significant until altitudes less than 40 km for typical midday solar zenith angles. A complete payload should include pressure sensors to define the O_2 column content above the observation point and high accuracy ozone monitors to determine the abundance and scale height during balloon ascent and descent. A solar pointed ultraviolet spectrometer should scan the direct solar beam over the entire wavelength range 185-300 nm. Although only the shorter wavelengths, 185-240 nm, are of concern for O_2 absorption, the remaining portion of the spectrum is needed for deriving the ozone column abundance above the balloon spectral resolution in the vicinity of 0.1-1.0 nm is adequate for this work.

For the Schumann-Runge bands, atmospheric measurements are required over the spectral range 175-205 nm supplemented by the same supporting data discussed above. Observation of photons at wavelengths shorter than 185 nm requires ascent to altitudes near and above the stratopause, thereby necessitateing the use of rockets. An altitude of at least 60 km should be attained in this work, and greater spectral resolution is desirable than was the case at longer wavelengths. Although it is not feasible to observe all band structure that exists in the spectrum, a resolution in the range 0.01-0.10 nm is advised.

Although O_2 and O_3 are the major gases that attenuate the solar radiation field, several other trace species can be significant in selected spectral regions and merit further investigation. Prominent among these is the absorption by SO_2 near and longward of 300 nm. Particularly after volcanic activity the absorption bands of SO_2 can have a substantial impact on solar transmission in the wavelength range used for ground-based ozone measurements. New laboratory measurements of the cross section including its temperature dependence should be performed to allow correction for this contamination. Similar absorption bands of NO_2 exist in the 305-340 nm region and under polluted atmospheric conditions might impact ozone determinations. Improved cross section data would be of value here.

The isotopes of O_2, $O^{16}O^{18}$ and $O^{18}O^{18}$, have atmospheric abundances similar to many chemically active trace species. Dissociation of these isotopes in their Schumann-Runge band systems constitutes an odd oxygen source of poorly known magnitude. This process also produces stratospheric heavy ozone which has been observed by balloon-borne mass spectrometers. Experimental studies to define the positions of the isotope rotational lines and the absorption cross sections would contribute to our understanding of this issue.

CZECHOSLOVAK ACTIVITY IN MAP

J. Lastovicka

The Czechoslovak national MAP program now consists of 8 scientific subprograms:

I. Disturbances of the Atmosphere at Heights of 120 to 40 km by Penetration of Meteoroids of Metre and Decimetre Dimensions, Dr. Ceplecha, Astronomical Institute, Czechoslovak, Academy of Science, Ondrejov:

Systematic photographic observations of fireballs were performed at 18 stations in Czechoslovakia, 22 stations in the FRG and 2 stations in Austria, and yielded multistation records of 33 fireballs during the year 1983. Results on the most significant 8 fireballs have already been published in SEAN Bulletin. Five fireballs penetrated the whole middle atmosphere, 3 of them down to the Earth's surface.

A possible connection of noctilucent clouds with fireballs as their initiators was studied and negative results obtained.

II. Meteor Radar Observations, Dr. Simek, Astronomical Institute, Czechoslovak Academy of Science, Ondrejov:

Coordinated observations (Ondrejov, Dushanbe, Lund, Ottawa) of Perseides, Geminides and Quadrantides were performed.

A complex method was developed for determining the transverse structure of meteor showers observed by a number of radars at various latitudes and longitudes. Long-period observations provide a basis for determining the dependence of physical processes at meteoric ionization heights (80-110 km) on various indices of solar activity. This study for the Perseides (Swedish, Soviet, Canadian and Czechoslovak data) will be concluded in 1986.

These two subprograms belong to GLOBMET.

III. Winter Anomaly, Dr. Lastovicka, Geophysical Institute, Czechoslovak, Academy of Science, Prague:

The winter of 1983/84 has been studied within the framework of the WINE and SWAMP projects. The winter anomaly is well developed and the development of radio-wave absorption in Central Europe appears to be typical (non-irregular) during this winter, as shown by comparison with 23 years of observations at the Panska Ves Observatory.

The winter of 1972/73 was found to be a good example of a quite different correlation of radio-wave absorption with local stratospheric temperature and with major stratospheric warmings taken as global events.

IV. Aeronomic Studies with the Use of Ground-Based Measurements of Radio Wave Propagation, Dr. Lastovicka, Geophysical Institute, Czechoslovak Academy Science Prague:

Nitric oxide concentration in the upper D region was estimated by comparing empirically derived ratios of Lyman-alpha and X-ray contributions to the total radio-wave absorption at 1539kHz (A3 method; summers 1978-1980; Panska Ves, Czechoslovakia) with model ratios. Representative NO concentrations are about $1.8 \times 10^{13} m^{-3}$ (forenoon) and $4.2 \times 10^{13} m^{-3}$ (afternoon) at 88 km, $3.1 \times 10^{13} m^{-3}$ (forenoon) and $6.8 \times 10^{13} m^{-3}$ (afternoon) at 76 km.

These values are relatively high but within the broad range of experimental values. Some asymmetry in NO is required to explain the observed large diurnal asymmetry of absorption in summer.

V. The Interplanetary Magnetic Field Effects in the Ionosphere and Atmosphere, Dr. Lastovicka, Geophysical Institute, Czechoslovak Academy of Science, Prague:

The effect of the difference between "pro-" and "anti-" sectors, which is of principal importance in the high latitude ionosphere, was found to be negligible at midlatitudes in winter.

Morphological models of the IMF sector structure effects have been proposed for the midlatitude ionosphere and atmosphere (vertical structure of the effect) in winter and for the winter ionosphere (latitudinal structure of the effect). The tropospheric type effect is observed in the ionosphere only in winter at middle and low latitudes (except the geomagnetic equator region).

VI. The Geomagnetic Activity Influence on the Troposphere, Climate and Weather, Prof. Bucha, Geophysical Institute, Czechoslovak Academy of Science, Prague:

In order to prove whether the geomagnetic pole as a centre of the auroral oval plays any role in the long-term climate changes, a mechanism causing short-term changes in climate and weather was suggested in order to enable the solution of both mutually related problems.

Under high geomagnetic activity, zonal flow intensifies; temperatures in Europe and eastern North America become higher than the long-term averages. There is a relative absence of atmospherical blocking in the Atlantic and Pacific regions; sudden stratospheric warmings are frequent. In the Pacific region cold winters occur and rainfall increases in the Sahel in the African zone. When the corpuscular (geomagnetic) activity displays a marked decrease, atmospheric blocking develops mainly in the Atlantic; invasions of Artic air into Europe and North America can be observed, which is then reflected in an abrupt and pronounced drop in temperature, practically in the same areas which were subject to Quaternary glaciation.

VII. Airglow Variations, Dr. Rybansky, Astronomical Institute, Slovak Academy of Science, Tatranska Lomnica:

A photometer is operating under laboratory conditions. No significant progress has been achieved due to technical problems.

VIII. The Dynamics of Penetration of Convective Clouds into the Stratosphere, Dr. Podhorsky, Slovak Hydrometeorological Institute, Bratislava:

A system for the receipt of primary digital data of geostationary and orbiting meteorological satellites began to operate in September 1983.

Computer programs necessary for evaluating radar and satellite data at the top boundaries of convective clouds, penetrating through the tropopause into the stratosphere, have been developed.

MAP ACTIVITIES IN FRANCE

M.-L. Chanin

The years 1983-84 have been marked by an intense participation of the French community to the MAP Campaigns WINE (winter 1983-1984) and GLOBUS (September 1983) as well as to the Balloon intercomparison campaigns BIC which took place around the same time in the US. Participants to these campaigns have been very active in the relevant workshops and are working towards the interpretation and presentation of their results. A new GLOBUS campaign is being planned for 1985 to get a better understanding of the problem of NO, and it should take place in France at Aire sur l'Adour and will be placed under the direction of Jean-Pierre Pommereau.

A major event in that period was the flight of the first SPACELAB mission in which 5 French experiments relevant to the study of the atmosphere were successfully conducted.

On a regular basis, data have been acquired from the geophysical station of the Observatoire de Haute Provence (44° N, 6° E) using both active and passive instruments: Survey of Ozone (total content and vertical profile) and neutral temperature are performed on a routine basis, while minor constituents are measured sporadically during campaigns.

Participation in workshops related to dynamics of the middle atmosphere: GRATMAP, ATMAP, are to be mentioned.

In order to have a more global survey of the French activities in the field of Middle Atmosphere, and to prepare the programs of the years to come, a colloquium is being organised for all this community in June 1985 at the Observatory of Haute Provence.

MAP ACTIVITIES IN HUNGARY

P. Bencze

In the past period, research activity continued according to the program. This program consists of six points, which include both measurements and research work relevant to MAP. In the different areas the following results were obtained:

I. STRUCTURE OF THE STRATOSPHERE

Balloon measurements were carried out regularly at the stations of the Hungarian Meteorological Service for the investigation of the structure of the stratosphere. The measurements included the determination of temperature, pressure and humidity, as well as the direction and intensity of winds. The data were processed and are used for the study of structure changes of the stratosphere.

II. OZONE CLIMATOLOGY

The determination of the total ozone content was continued in the Central Institute for Atmospheric Physics, Budapest. The study of the ozone data is a part of the complex investigation of radiation conditions in the troposphere and mesosphere. In this research work,data of satellite radiation measurements are also included.

III. STRATOSPHERIC DYNAMICS

Data of ground-based and balloon measurements were used for the study of dynamical processes in the stratosphere, especially in the period of stratospheric warmings and of seasonal changes of the wind conditions hamper the propagation of atmospheric gravity waves.

IV. ELECTRODYNAMICS OF THE MIDDLE ATMOSPHERE

The atmospheric electric potential gradient and the vertical air-earth current were recorded at the Geophysical Observatory Nagycenk of the Geodetic and Geophysical Research Institute, Sopron, Hungarian Academy of Sciences. The aim of the study of the data is the investigation of the global atmospheric electric circuit. Former studies have shown that the global atmospheric circuit shows variations due to ionization changes in the mesosphere. These results are controlled now and additional investigations carried out. The vertical air-earth current, which is least disturbed by local effects, seems especially suitable for the monitoring of changes in the global atmospheric electric circuit.

V. CHANGES OF SOLAR AND METEOROLOGICAL ORIGIN IN THE MESOSPHERE AND LOWER THERMOSPHERE

Based on ground-based measurements, changes in the mesosphere and lower thermosphere after solar flares have been studied. It has been found that significant reduction of the ionization in the mesosphere appears due to galactic cosmic ray (Forbush) decreases, if the plasma cloud ejected by the sun does not hit the magnetosphere. Otherwise, the effect decreases, as the intensity of the geomagnetic activity increases; i.e., in the disturbed magnetosphere the cutoff rigidity decreases and thus the cosmic ray flux entering the atmosphere increases. The storm after effect, following in time the effect due to the Forbush decreases, can be reduced and shifted in time by the Forbush effect. These results are proved both by superposed epoch studies and by the investigation of individual events. The analysis of the post storm effect has shown that this effect seems to be related to the interplanetary magnetic field.Preliminary results indicate that positive direction of the interplanetary magnetic field is favourable for the production of plasma waves and thus, for the precipitation of high energy particles trapped in the magnetosphere.

The measurement of the absorption and phase height of radio waves obliquely incident in the ionosphere was continued in the Geophysical Observatory Nagycenk of the Geodetic and Geophysical Institute, Sopron. The data are processed and used in the investigations mentioned above.

VI. TURBULENCE

The mehtod based on the parameters of the sporadic E layers of the ionosphere, as well as on models of the ionosphere and the neutral atmosphere has been used in the Geodetic and Geophysical Research Institute, Sopron for the determination of turbulent parameters in the lower thermosphere. It has been found that the seasonal variation of turbulent diffusivity indicates rather a minimum in summer and a maximum in winter, although the the data show large variability. The diurnal variation shows decreased values in daytime as compared to nighttime values. Investigations have revealed a decrease of the turbulent diffusivity during circulation disturbances in the mesosphere connected with stratospheric warmings. The development of this effect is dependent on solar activity, because the effect is obscured by increases of the turbulent diffusivity due to the rise of geomagnetic activity.

MAP ACTIVITIES IN INDIA

Y. V. Somayajulu

I. INTRODUCTION: The activities coordinated by the various working groups are summarised below:

A. Radiation WG:

Under the Radiation WG activities, the first phase of aerosol campaign was attempted. Two RH-300 rockets with PRL and NPL payloads consisting of UV and visible/IR scatter experiments and ion-probes for measuring total extinction, aerosol scattering characteristics, aerosol height profile and ion densities in the stratosphere/mesosphere, were flown from Thumba. However no useful scientific data could be obtained from these two rocket flights due to some problems in the performance of the rockets. Some more flights are planned for 1985.

One balloon flight consisting of UV-scatter experiment and conductivity probe conducted from Hyderabad has provided useful data. The UV-scatter data is being analysed for deriving aerosol parameters in the troposphere and stratosphere. Additional balloons carrying UV-scatter and IR/visible scatter payloads are planned to be launched under this campaign in near future.

A pulsed Ruby LIDAR system is presently operating at VSSC, Trivandrum and aerosol data are being obtained up to 25 km altitude. Five units of multi-wavelength radiometers of VSSC and BUV radiometers of NPL are being fabricated and planned to be deployed by the middle of 1985 for regular observations of aerosol characteristics and surface erythemal doses of solar UV-radiation.

Radiometersonde balloons have been launched from eight stations every fortnight by IMD, and the data is available for IMAP studies.

Airglow observations for 5577A and 5893A emissions have been continued at Pune for parameters such as amplitude, polarisation, extinction, etc. interreferometric technique is under development which will be used to monitor dynamical parameters of the mesosphere such as temperatures, winds, etc.

B. WG on Minor Constituents and Atmospheric Chemistry

The WG had planned for measurements of a large number of minor constituents on which data were meagre, except for ozone up to the stratosphere and to a limited extent in the mesosphere. A major effort was planned on organising various new techniques and in encouraging atomic and molecular collision groups in the country to take up laboratory investigations of reactions relevant to the middle atmosphere.

The ozone measurements have been consolidated and are in fairly good shape. The India Meteorological Department measurements by the Dobson and Umkehr techniques and chemical balloon-sonde have been intensified, and ozone intercomparison campaign with rocket, balloon-borne and ground-based measurements (with USSR rocket payload participation) has been successfully conducted.

A few problems on ozone variability and ozone profile shapes have come up as a result of studies made with past profiles and also in the intercomparison experiments. They include possible variations with lightning activity and weather patterns in the upper troposphere, lower stratosphere levels, day-to-day ozone variability and day-night variation of ozone profiles in the upper stratosphere. A campaign related to them to be carried out in the remaining period of IMAP is being worked out by the WG.

A campaign on aerosol measurements is planned jointly with WG on Radiaion. Some pre-campaign mode measurements have been carried out.

O_2 (1 Δ g) measurement using balloon and rocket payloads for getting its vertical profile is planned jointly by PRL and Poona University in view of its interrelation with ozone. A trial rocket flight has been made by PRL. An NO rocket measurement has been carried out by NPL. NO payloads are also planned by PRLF in 1985.

A laser heterodyne system using a tunable CO_2 laser in the 9-11 micron band has been developed by NPL for measurement of height profile of a large number of minor constituents through observations on line broadening patterns in the absorption of the atmospheric constituents in the solar spectrum. Current measurements are concentrating on ozone and water vapour.

Other efforts of the WG are in organising measurements with a balloon-borne quadrupole mass spectrometer, which may materialise during the MAC period. Efforts continue in organising suitable laboratory reaction rate studies.

C. WG on Atmospheric Dynamics:

Originally this working group planned to study the mean background winds, long term variations in terms of quasi-biennial, semi-annual and annual oscillations, equatorial waves and stratospheric warming phenomenon at low latitudes. One campaign was carried out during May-June 1984, and preliminary results were presented during the IMAP Workshop held in Nov. 1984. Another campaign may be carried out during the remaining IMAP period. A campaign on stratospheric warming is planned to be carried out during the winter of 1985-86. Details of these campaigns are being finalised by the WG.

Regular high altitude radiosonde balloon ascents would be continued thrice a week from three stations up to the end of IMAP. The spatial and temporal coverage of these ascents may be allowed suitably during the two specific campaigns mentioned above.

The meteor wind radar at VSSC, Trivandrum is operational and is collecting regular data on mesospheric winds. Another meteor wind radar at Waltair is expected to become operational soon. The HF phased-array radar set up by Kerala University, Trivandrum, is already taking observations on E-region winds. These observations will be continued during the MAP period.

D. Working Group on Ionisation and Electrodynamics:

As part of the activity of WG on Ionisation and Electrodynamics, D-region ionisation campaign was planned during February, 1984 but had to be postponed due to problems in the RH-300 rocket performance. This campaign is meant for intercomparison of measurement of D-region electron and ion densities using different techniques such as LP, Propagation experiment, Spherical probe and Gerdien condenser. These rocket launches are now planned for second half of 1985. Following its successful completion it is proposed to launch an identical set of experiments from Thumba and Shar to study the latitudinal variation of D-region electron and ion densities.

Positive and negative ion conductivities have been measured in a balloon flight and ion densities in another, under conductivity campaign. The data has been analysed. Another flight with LP, Gerdien condenser and spherical probe has been successfully carried out in February 1985 for measurement of ion densities and for inter-comparison of techniques, and the data analysis is in progress.

ore balloon launches with ion conductivity and electric field probes are lanned to take place as part of this campaign in the near future.

Multi-frequency Al absorption experiments are being operated at Gujrat, 'daipur and Calcutta Universities to collect observational data on the D-region ıorphology. Data analysis, particularly with this aspect in view, is in ›rogress.

E. WG on modeling:

Efforts have been made to model various atmospheric parameters and phenomena and reference analytical models based on either post observation or theoretical considerations are generated for the following:

1. Wind structures over Thumba and Hyderabad up to the balloon altitude.
2. Solar irradiance in the wavelength region 116-850 nm at all altitudes from ground to 120 km. Different conditions of solar activity, season and aerosol loads have been considered.
3. Eddy diffusion coefficient and distribution of source gases.
4. Fractional abundances of active minor constituents of OX,HOx and clx groups.
5. Ion production rates.
6. D-region electron density profile over Indian stations.
7. References ozonosphere over India.

One-dimensional model on ion composition and average annual height distribution of minor constituent over low latitude will be completed shortly.

II SUMMARY OF RESULTS OF CAMPAIGNS

A. The Ozonesonde Intercomparison Experiment at Thumba:

An ozonesonde intercomparison experiment was conducted at Thumba during March-April 1983 under an agreement between the State Committee for Hydrometeorology and Control of Natural Environment (SCHCNE) of USSR, the Indian Space Research Organisation (ISRO) and the India Meteorological Department (IMD). The experiment involved near simultaneous measurements of the vertical profile of the ozone concentration over the tropical site, Thumba, using the different rocket ozonesondes currently in use in India and the Soviet Union, the Indian balloon ozonesonde and ground-based measurements of total ozone as well as Umkehr observations using the Dobson spectrophotometer, surface ozone measurements as well as filter photometer observations. The rocket flights were made during morning and afternoon hours as well as during the night. All the observations were made at the Thumba Equatorial Rocket Launching Station (8.5°N, 76.9°E). The following techniques and instrumentation were tried:

1. SCHCNE, USSR - Filter photometer, chemical and chemiluminescent rocket-borne sensors.
2. I. M. D., India - Dobson and Umkehr measurements, balloon-borne chemical-sonde, surface ozone measurements.
3. PRL, India - Rocket-borne UV filter photometers for daytime and nighttime (moon light) measurements.
4. NPL, India - Rocket-borne UV filter photometer.
5. IITM Pune, India - ground-based filter photometer in visible range (chappuis band).

The results can be summarised as follows:

1. In the 20-25 km range balloon, ozonesondes yield somewhat larger ozone densities than with rocket ozone-sonde and with Umkehr estimates.

2. The rocket ozonesondes show shallower troughs in the tropopause region than with the balloon measurements.

3. The UV photometers of USSR, PRL and NPL show good agreement below 45 km, and diverge at higher heights.

4. At altitudes below 25 km, there were significant differences from sensor to sensor and from one measurement to another that were beyond the random errors in measurement. Further studies are needed to infer if they are genuine ozone variations or variations in instrument behaviour.

5. USSR chemiluminescent ozonemeter shows consistently larger values than with the daytime rocket sensors at heights above 30 km. Whether this is a genuine day-night variation in ozone needs to be investigated further.

6. Day-to-day variations were shown by all rocket sensors in the region 30-50 km.

7. The Umkehr estimates are in better agreement with rocket data than with the balloon data, except in the region of ozone maximum where the reverse is true. Umkehr data fall off more rapidly than the rocket data above the ozone maximum.

8. The IITM filter photometer estimates of the total ozone were less than the Dobson values by about 40 D.U.

9. During the intercomparison period Dobson measurements were carried out simultaneously over Kodaikanal and Thumba. Thumba values were consistently larger than the Kodaikanal values by about 4 D.U.

B. Equatorial Wave Campaign

It was planned to study the equatorial waves, namely, Kelvin waves and mixed Rossby gravity waves to study in detail the equatorial troposphere-stratosphere dynamical features. For this a comprehensive program was undertaken during May 23-June 12, 1984, a period favourable for the detection of Kelvin waves, because of presence of easterly winds. The following experiments were carried out:

1. In the altitude region 20-60 km - radar tracking of rocket (RH-200)k released chaff from three rocket ranges - TERLS, SHAR and Balasore.

2. In the troposphere - radar tracking of balloons from Trivandrum, Madras, Bhubaneswar, SHAR and Balasore.

3. In the mesophere - Meteor Trail radar at Trivandrum.

The latitudinal spread of the location from which the experiments have been carried out provides adequate coverage to study the latitudinal variation of the characteristics of the wave disturbance.

The rocket (RH-200) launchings were made from the three rocket ranges near simultaneously on alternate days within the launch window from 1800 hr to

1945 hr. IST, starting from May 23, 1984 and ending on June 12, 1984, thus covering the expected period range of Kelvin waves.

At SHAR, the rocket released chaff was tracked by three radars (one S-Band and two C-Band) to enable evaluation of the errors in the winds deduced from radar track data.

The balloon launchings from Triavandrum, Madras and Bbubaneswar were made (by IMG) on each day of the campaign period. The balloon launchings from SHAR and Balasore were made on the same days as the rocket flights. The Meteor Trail radar was operated at Trivandrum in the morning 0800 to 1200 hrs IST.

The radar chaff track data of range, azimuth and elevation for all the rocket flights from TERLS and SHAR as well as balloon flight data from Balasore and SHAR has been processed to obtain meridional winds (all the three radars data). The raw data from Balasore is being processed. The wind data is being analysed by applying correlation and power spectral methods to obtain the characteristics of the wave disturbances. Preliminary results indicate the presence of structure in the altitude profiles of zonal wind of 8 km at Trivandrum and SHAR which is a typical characteristics of the equatorial Kelvin wave. The SHAR and Balasore data indicate the presence of 4 km structures corresponding to the expected characteristics of the mixed Rossby gravity wave.

Further analysis is in progress to delineate the characteristics of the wave disturbances.

III. IONISATION AND CONDUCTIVITY CAMPAIGN

A. Balloon-borne Langmuir Probe Measurement of Stratospheric Ions in low Latitude

A balloon carrying a Langmuir probe payload developed by NPL for measuring the positive and negative ion densities in the stratosphere was flown around midnight IST on March 23rd, 1982 from the National Balloon Facility at Hyderabad, a low latitude station.

The current due to the positive ions collected by the probe was converted to the ion density with the help of simple mobility theory. For comparison, both the observed and the one calculated theoretically under steady state conditions were normalised to their values at 18.5 km. It is observed that the measured ion density profile falls off more steeply than the theoretical profile almost by a factor of two at 30 km. Moreover there are considerable structures in the measured profile in the altitude range of 18 to 26 km. The steeper fall and the structure in the measured profile have been interpreted in terms of presence of aerosols layer. It is concluded that the stratospheric ion density measurement provide a powerful way of monitoring aerosol layer.

B. Balloon-borne measurements of electrical conductivity in Stratosphere from Hyderabad.

A balloon probe known as Relaxation Time measuring (conductivity) spherical probe was developed at PRL. The probe is mounted on a boom and projected outside the main frame of balloon gondola. The technique involves the measurement of time constant of a certain applied voltage to the sensor, which in turn is a measure of atmospheric conductivity.

The conductivity payload along with the aerosol payload developed by PRL was launched from Hyderabad on a balloon on April 18th, 1984 at 0600 hrs IST. The value of conductivity measured at 36 km at around 0930 hrs was

2.2×10^{-11} mhos/m, which is about two times more compared to Laramie (USA) value.

The important finding of this experiment is that during ceiling altitude within 20-40 minutes variation in conductivity was observed.

C. Middle Atmospheric Positive Ion Density and Mobility Profiles over Thumba:

A rocket-borne mobility spectrometer was flown on an M-100 rocket from Thumba, Trivandrum at 1609 hrs on February 9th, 1984. This instrument was exposed from about 50 km altitude. Positive ion density was obtained from 52 km to 70 km, and mobility from 52 km to 60 km. The ion density was found to decrease from 52 km up to about 60 km, where it reached a minimum value. Beyond 60 km, the ion density increased up to 70 km. The data beyond 70 km was found to be disturbed, possibly because of photoelectric emission from the electrodes. The mobility values increased exponentially with altitude. Both the ion density and mobility data agreed well with the results from the previous flight conducted on November 29th, 1982.

IV AEROSOL CAMPAIGN

A. Observations During Aerosol Campaign in February 1984.

The aerosol campaign of IMAP was planned and carried out from February 7th to 9th, 1984 from Thumba. The following experiments were included:

1. Observation of atmospheric back scatter at 694.3 mm using ruby lidar at VSSC at night. The presence of the clouds, however, caused saturation of the signal and hence no useful information could be obtained.

2. Radiometric observations on three wavelengths viz 420 nm, 620 nm and 700 nm to deduce extinction coefficient of aerosol. The aerosol extraction showed a weak wavelength dependence. The aerosol size index (inverse power law) was obtained as 3.1 indicating significant presence of large particles.

B. Atmospheric Scattering Measurements and Aerosol Studies Using Balloon-borne Multi-channel Photometers.

The balloon experiment consists of a sun tracking multi-channel photometer of PRL, Ahmedabad. The instrument tracks the sun in elevation and rotates the photometers to scan in azimuth so as to enable the measurement of the angular distribution of the scattered radiation.

The balloon instrument was first flown on October 20th, 1983 at 608 hrs. IST and subsequently on April 18th, 1984 at 0600 hrs. IST. The experiments worked all right except for intermittent loss of scientifically useful data due to pendulum motion of the balloon.

V. MST RADAR

The spot frequently of 53 MHz with a bandwidth of 1 MHz has been allocated for MST radar. The location for the MST radar will be around 13 north latitude. Preparations for the fabrication of the radar according to specificaton arrived at by a large number of user scientists will be made shortly. The radar, when developed, will be ran as a national facility and will have an organisational structure for optimising research in atmospheric physics.

VI. FIRST WORKSHOP ON IMAP RESULTS.

The workshop, jointly sponsored by the Indian National Science Academy, National Physical Laboratory and Indian Middle Atmosphere Programme was held at Bangalore during November 14-16, 1984. This was attended by over 100 scientists from all over India who are actively participating in IMAP.

The main objectives of the workshop were (a) to discuss preliminary results obtained from various experiments, investigations and studies carried out so far under IMAP, (b) to assess the status of various experiments, observations and data analyses as compared to what was planned to be implemented in the beginning of IMAP, and (c) to work out a plan of action for the remaining period of IMAP up to March 31st, 1986.

The workshop comprised of six scientific sessions of atmospheric dynamics, radiation studies, minor constituents and atmospheric chemistry, ionisation and electrodynamics, modelling of the middle atmosphere and MST radar, followed by a concluding session on recommendations. Each scientific session started with the presentation of a detailed position paper by the respective coordinators of the IMAP Working Groups. These presentations included statement of primary objectives, experiments/investigations planned and implemented so far highlighting the difficulties encountered in conducting the experiments, data analysis and interpretation. These lead papers were followed by presentation of preliminary results of few campaigns already conducted and individual efforts on various experiments/investigations within the overall framework of IMAP. A total of 70 presentations were made during the workshop. The focus of the proceedings was mainly on discussing the scientific output and recommendations for its further enrichment.

In the concluding sessions, the WG coordinators presented the overall original objective, work accomplished and future plans of their respective groups. Six IMAP reports consolidating the past data on aspects of ionisation, solar radiation, photo-chemical cross sections, reaction rate constants, ozone densities and zonal/meridional winds, have been published and another two are ready for publication.

MAP ACTIVITIES IN JAPAN

S. Kato

Various programs of MAP have been going well in Japan since the beginning of 1982. Observations are producing data, some of which are found very important, obtained by novel observational facilities. Intensity ideas are being presented, based on data analysis of these new findings. What follows will be brief reports of the main projects of MAP in Japan.

I. EXOS-C SATELLITE

This satellite was successfully launched February 14th, 1984 and has since been in its polar orbit carrying out various middle-atmosphere optical observations on board, i.e., on distribution of ozone, other minor constituents and aerosols. Certain preliminary results of these observations was presented at the International MAP Symposium in Kyoto, November 1984.

II. ANTARCTIC OBSERVATION

This is an internationally approved MAP project known as AMA which is coordinated by Dr. Hirasawa, National Institute of Polar Research, Japan. Observations relative to AMA have been extensively in progress in Antarctica, at Showa Station, by the Japanese group and at other points by other groups (See
SCAR Workshop Abstracts, September 25-28, 1984 Congress Center, Bremerhaven F. R. G.). Among other things, as shown in Figure 1, the ground-based lidar observation found that aerosols are fluctuating very widely between local summer and winter, say, by 100% or more, a new result which is consistent with that by satellite observations McCORMICK et al. (1982).

III. THE MU RADAR

The MU radar system has just attained its complete status. The Ribbon Cutting Ceremony for the MU radar was held November 24, 1984. Now, the facility, in full power, is able to observe dynamics from 3 km in height to 90 km, and also able to detect incoherent scatter echoes from the ionosphere up to 600 km. Comparative studies with conventional rawinsonde observations for the stratosphere and meteorological rocket observations for the mesosphere confirm, as in Figure 2, the MU radar reliability. A study using the partial system has recently been published by KATO et al. (1984).

REFERENCES

Kato, S. et al. (1984), Radio Sci., 19, 1475-1484.
McCormick, M. P. et al. (1982), J. Atmos. Sci., 39, 1387-1397.

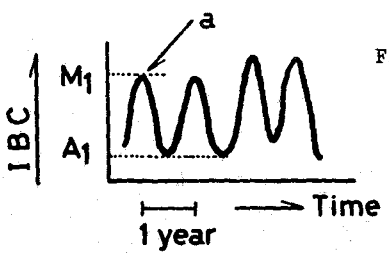
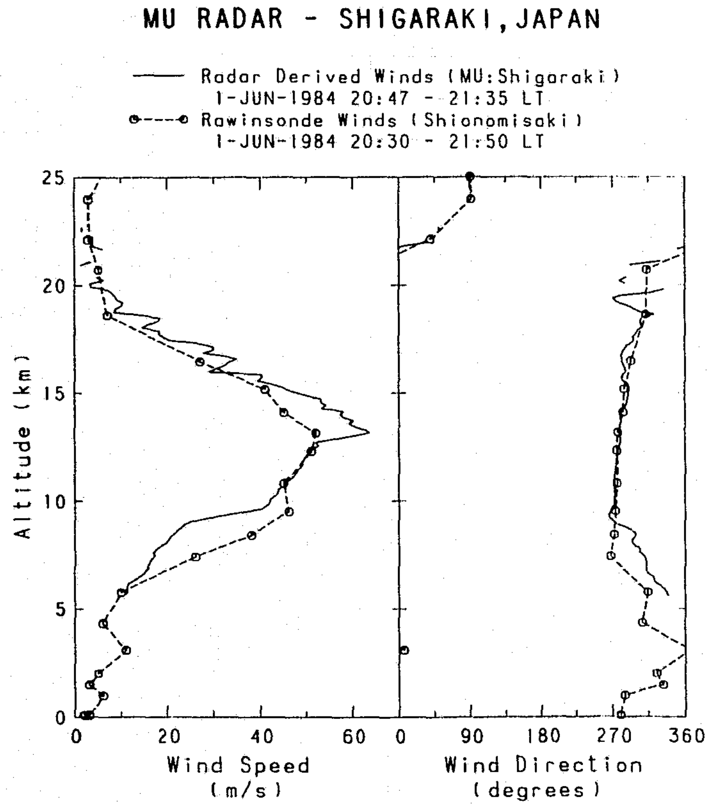


Figure 1. Aerosols varying widely between summer and winter: the arrow shows a winter maximum which amounts to M_1 above the minimum level of A_1. M_1 is much larger than those maxima ($M_1 \simeq 10\ AB_1$) which occur due to volcanic eruptions in the middle atmosphere. IBC (vertically integrated backscatter coefficient) gives aerosol concentration per column.



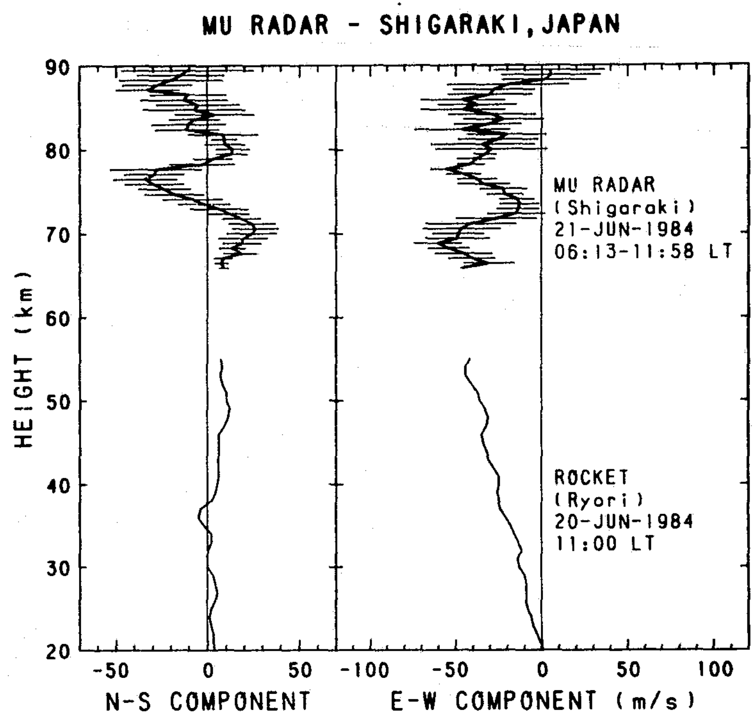


Figure 2. Winds observed by the MU radar and meteorological methods:
(a) stratosphere (b) mesosphere, horizontal bars give deviation during the observation period.

MAP ACTIVITIES IN NEW ZEALAND

G. J. Fraser

I. PHYSICS AND ENGINEERING LABORATORY ATMOSPHERIC STATION, LAUDER

A. VHF Backscatter Radar: A doppler radar operates at Slope Point (46.7°S, 169.0°E). Studies include the following:

(1) Comparison of pulsation data with STARE Scandinavian system to observe the effects of spatial separation (about 10 hours in MLT).

(2) Comparison of ULF pulsations at the two sites to deduce magnetospheric plasma densities.

(3) Analysis of gravity wave induced effects in ionospheric sporaddic-E layers.

(4) Study of height-dependent effects observed in the backscatter power spectra.

B. Stratospheric Trace Gas Studies:

(1) Study of twilight stratospheric NO_2 and O_3 using differential absorption spectroscopy at Lauder (45.0°S, 169.7°E), Campbell Island (52.6°S, 169.2°E), and Arrival Heights (77.8°S, 166.7°E). An extension of activities to other latitudes is planned. The technique involves grating spectrometer scans of scattered sunlight in the zenith. Day-to-day and seasonal variability of stratospheric NO_2 are being analysed in terms of the interwoven effects of chemistry and transport, particularly at high latitudes; and the results are being examined in conjunction with ground-based and satellite meteorological data.

(2) Direct moon observations of NO_2 using DAS techniques as above. The measurements have been introduced at Arrival Heights, Antarctica, to extend our knowledge of the behaviour of NO_2 during the polar night, and its relationship with particle influx to the mesosphere.

(3) Comparison of NO_2, O_3, data from ground-based experiments as above with SAGE satellite data (in conjunction with NASA.

(4) Direct sun measurements of HNO_3, HCl and other species using Michelson Fourier Transform Spectroscopy techniques (in cooperation with University of Denver).

(5) Direct moon observations to assess the column abundance of NO_3 are being planned.

(6) A portable ground-based system to measure column NO_2 will be operated in Europe in conjunction with GLOBUS ´85.

C. Tropospheric Trace Gas Studies:

Analysis of the sources, sinks and variability of certain species which are of importance in the stratospheric studies:

(1) Long path measurements of NO_2 and NO_3 using DAS techniques

with grating spectrographs and viewing distant light sources. Problems such as the rejection of atmospheric flicker have been overcome to give measurements with a detection threshold for NO_2 approaching 10 ppt.

(2) Long path measurements as above for NO_3 using MFTS techniques in the red.

(3) In situ-sampling of O_3 (in cooperation with New Zealand Meteorological Service) and NO/NO_x using chemiluminescent techniques (with University of Nagoya).

II. NEW ZEALAND METEOROLOGICAL SERVICE, WELLINGTON

The New Zealand Meteorological Service obtains meteorological soundings of the lower stratosphere in New Zealand and certain Pacific Island sites as part of its routine forecasting operations. Column ozone amounts are obtained with a Dobson instrument at Invercargill, and a small sun-photometer network is also maintained.

III. UNIVERSITY OF CANTERBURY PHYSICS DEPARTMENT

A. Mesospheric Winds

MF atmospheric radars using the spaced-antenna-drifts technique are in continuous operation at Birdlings Flat (44S, 172E) and Scott Base (78S, 167E). Tidal observations are contributed to the ATMAP programme. Current research projects include investigations of gravity wave breaking, characteristics of the "4-day" and "5-day" waves, and the measurement of vertical wind velocities.

B. Column Ozone Amounts and Aerosol Scattering

A multi-wavelength filter photometer has been constructed for direct-sun and sky-scanning measurements. Initial measurements are being made at a low altitude coastal site in N. Z. Future plans include measurements at a high-altitude site in N. Z., a comparison with the N. Z. Meteorological Service Dobson instrument at Invercargill and measurements at Arrival Heights (78S, 167E).

C. Mesospheric Electron Densities

New equipment for the synoptic measurement of electron densities in the mesosphere is now operating at Birdlings Flat. The differential absorption technique is used. Comparison with simultaneous wind measurements will yield information on the influence of neutral winds on D-region ionisation and the winter anomaly.

MAP ACTIVITIES IN NORWAY

E. V. Thrane

The Norwegian activities in MAP have been concentrated on the participation in the MAP/WINE campaign, which was carried out from north Scandinavia during the period December 1983 to March 1984. The most important events of MAP/WINE were the launches of 7 "salvoes" comprising a total of 12 instrumented sounding rockets and a large number of meteorological rockets. Nine of the sounding rocket payloads were electrically and mechanically integrated in Norway: German, Austrian, Norwegian and US scientists had instruments on board. These payloads were launched from Andoya Rocket Range on Nike/Orion motor configurations to altitudes of about 120 km. Their purpose was to make in-situ measurements in the mesosphere and lower thermosphere during a stratospheric warming and during undisturbed winter conditions.

The Norwegian instruments were:

1. Positive ion probes designed to measure irregular/turbulent structures in the mesosphere and lower thermosphere (Thrane et al. 1985).
2. Geiger-Muller counters designed to measure energetic electron precipitation (E > 40 KeV).
3. Electric field probes.

The rocket salvoes were supported by ground based HF radar measurements in Tromso.

A short summary of the organizational structure and scientific aims of MA WINE together with a description of the rocket payloads which carried the Norwegian experiments aloft is given below.

MIDDLE ATMOSPHERE PROGRAM/WINTER in NORTHERN EUROPE-MAP/WINE

The Middle Atmosphere Programme (MAP) is an international scientific cooperative programme under the aegis of the Scientific Committee on Solar-Terrestrial Physics (SCOSTEP). It commenced on January 1, 1982, and will end on December 31st, 1985. MAP aims to organize coordinated global studies of the structure of the stratosphere and mesosphere (height range 10 km to 100 km). One of MAP's many projects is WINE.

The aim of the WINE campaign is to increase our understanding of the structure and dynamics of the high latitude middle atmosphere during winter conditions, by means of coordinated high altitude research rockets and by ground-based and satellite observations.

ORGANIZATION

Scientific planning and management:	MAP/WINE Working Group
Headquarters 1 November 1983-15 March 1984:	NTNF, Andoya Rocket Range
Project scientist:	Ulf von Zahn, Univ. Bonn, FRG
Deputy project scientist:	Eivind V. Thrane, NDRE

SCIENTIFIC AIM

At high latitudes during winter the structural parameters and dynamic processes of the middle atmosphere display strong variability, much of which is due to an enhanced level of wave activity on a very wide range of spatial and temporal scales. A well-known example is the sudden occurrences of stratospheric warmings. Little is known of the causes of this enhanced wave activity, however, and observational data on conditions in the winter mesosphere are insufficient. Detailed studies of the middle atmosphere during a stratospheric warming are of particular interest during the MAP/WINE campaign. The causes and effects of this winter variability will be better understood if the structural parameters of the middle atmosphere (pressure, temperature) and the dynamical processes of global scales (planetary waves, tides), misoscales (gravity waves, jet streams) and small scales (turbulence) are measured as completely as possible.

A coordinated, international study of the structure, motions, and composition of the middle atmosphere between about 40 and 80 northern latitudes was therefore carried out during a full winter season.

Payloads:

BUGATTI III and IOMAS

Project scientist:	Ulf von Zahn, Univ Bonn, FRG
Deputy project scientist:	Eivind V. Thrane, NDRE
Payload designation:	
IOMAS	F64-67
BUGATTI III	F68-71
Payload integration:	
Mechanical construction/integration:	CMI
Electrical integration:	NDRE
Rocket and payload hardware:	DFVLR-WT-DA-MA
Launch site/dates:	Andoya, December 1983-February, 1984

Payload instrumentation (responsible organization):

BUGATTI III: Mass spectrometer (Univ., Bonn, FRG), infrared photometer (Univ., Wuppertal, FRG), Electrostatic ion probe, Geiger-Muller counter (NDRE), Electron density probe (Techn. Univ., Graz, Austria).

IOMAS: Mass spectrometer (Max-Planck-Institut fur Kernphysik, Heidelberg, FRG), Infrared photometer (Univ., Wuppertal, FRG), Electrostatic ion probe, Geiger-Muller counter (NDRE), Electron density probe (Techn. Univ., Graz, Austria).

MADAME (Middle Atmosphere Dynamics and Mesospheric Electrification)

Project scientist:	Jan A. Holtet, UiO

Payload designation: F72-73
Payload integration

Mechanical construction/integration: CMI and AFGL

Electrical integration: UIO and AFGL

Launch site/date: Andoya, January-February 1984

Payload instrumentation (responsible organization):

Daughter 1: Falling Sphere - accelerometers (AFGL, USA).

Daughter 2: 3E - DC electric field experiment (UiO), AC electric field experiment (UiO), Conductivity probe (Pennsylvania State University, USA), asymmetrical DC electric field experiment (Pennsylvania State University, USA).

EXPECTED RESULTS

This has been the most comprehensive campaign ever in Europe with launchings of instrumented and meteorological rockets, coordination of satellite information and ground-based observation in eleven countries. It is too early to summarize the major scientific results from MAP/WINE, particularly those pertaining to the large scale features of the middle atmosphere in winter. Nevertheless, judging from the raw data collected during the campaign in northern Scandinavia, some highlights of observations pertaining to small scale features or local phenomena can be mentioned:

Detailed information on shear and turbulent layers in the winter mesosphere was provided through simultaneous measurements by the SOUSY MST radar, Tromso PRE radar, EISCAT radars, meteorological rocket payloads (chaff clouds, datasondes, and falling spheres), and sounding rocket experiments. These data will enable us to study the spatial and temporal coherence of the turbulent layers and to identify the meteorological and aeronomic processes leading to the SOUSY and PRE echoes.

High quality data were obtained on the rate of occurrence and spectral distribution of waves with vertical wavelengths from about 0.1 to 20 km in the middle atmosphere.

The temperature and wind fields during the initial phases of a major final stratospheric warming were very well documented up to mesopause heights. Thirty-four meteorological and 6 instrumented payloads were launched from Andoya Rocket Range and ESRANGE in the time period 5 through 23rd of February 1984, all of them completely successful.

The temperatures near 85 km altitude were measured in unprecedented detail by ground-based IR spectrometers (via the OH-emissions) at Andoya Rocket Range, Kjeller and Lista, Norway and Kiruna, Sweden.

The sodium density profile between 80 and 100 km altitude above Andoya was measured by ground-based lidar on many occasions with 0.5 km altitude resolution and 10-minute time resolution.

On January 25, 1984 mesospheric water vapour abundances were measured simultaneously by an airborne microwave spectrometer and rocket-borne IR photometer. Simultaneous positive ion composition measurements in the lower thermosphere and upper mesosphere will provide additional information on the water vapour content of these atmospheric regions.

This is but the beginning of a list of important MAP/WINE observations. It is expected it will become much longer in the near future as more data from individual experiments and observatories become available.

In addition to participate in the MAP/WINE campaign, Norwegian scientists have been involved in the following projects during MAP:

OZONE OBSERVATIONS

In cooperation with the Satellite Ozone Analysis Center (SOAC) and the National Earth Satellite Service (NESS), both in the US, and Atmospheric Environment Service (AES), Canada, UiO is engaged in a programme globally monitoring atmospheric ozone. Measurements using modified Dobson spectrometers are being performed on a routine basis at Blindern, Oslo.

MESOPAUSE TEMPERATURE MEASUREMENT

In cooperation with a group from University of Wuppertal, FRG, NDRE is taking part in a longterm study of the temperature of the mesopause using infrared spectrometers. This programme comprises measurements from two stations: Wuppertal, FRG and Kjeller, Norway. During MAP/WINE these instruments were operated at Marka Range, Lista and Andoya Rocket Range.

EISCAT

Further investigations of ion-temperature distribution in the auroral ionosphere are taking place together with studies of rapid electron temperature variations during electron precipitation events. Data are now being collected in order to find out the geophysical conditions most favourable for the creation of these irregular temperature effects. Particularly interesting problems are the relationship between electric field and ion-temperature distribution and between the electron flux spectrum and electron temperature behaviour.

The substantial heat input taking place in the auroral E-region during auroral disturbance and its effect on the upper atmosphere are of great importance to the global dynamics of the upper atmosphere as a whole. One of the best instruments for these studies is EISCAT.

The physics group at the Auroral Observatory is also working on an EISCAT related project studying the effects of the polar wind. With the present UHF system at EISCAT this is difficult, but it is hoped that the EISCAT VHF system will make such studies possible.

EISCAT was successfully used during MAP/WINE to study winds and electron densities in the upper mesosphere and low thermosphere.

MAP ACTIVITIES IN THE UNITED KINGDOM

L. Thomas

UK activities in MAP have continued in the three areas: stratospheric composition, mesospheric and low ionospheric structure, and dynamics. These activities have been reviewed periodically by three Working Groups, the present report being based on meetings carried out in the first half of 1984. The sections for all three areas are largely concerned with specific studies carried out by individual groups, but since the UK small-rocket programme was discontinued in 1982, it is considered appropriate to refer briefly in Section II(B) to all campaigns involving UK rocket groups since 1980.

I. STRATOSPHERIC COMPOSITION

A. Satellite-borne experiments

The Stratospheric and Mesospheric Sounder (SAMS) on Nimbus 7 has produced a great deal of data on stratospheric and mesospheric composition. In the case of CH_4 and N_2O, three years of data in the form of monthly zonal mean cross-sections now exist which show very interesting dynamical features indicating the movement of these species upward and poleward with a maximum in the local autumn season. The results also seem to indicate that transport poleward is limited to <35° latitude until the winter pole transport regime sets in. The two constituents show similar trends, and data from the two years 1979 and 1980 show great similarities. Infrared emission at 7-8 μm and scattered sunlight at 2.7 μm observed by SAMS have shown enhanced concentrations of aerosols resulting from the El Chichon volcanic eruption.

Data from the Limb Infrared Monitor of the Stratosphere (LIMS) experiment on Nimbus 7 have been analysed at the Rutherford Appleton Laboratory. In particular, a novel technique has been developed whereby measurements of NO_2 and HNO_3 have been used to derive global maps of the hydroxyl radical OH. The technique assumes photochemical equilibrium and also requires that the time constants for photochemical change are short. Despite some limitations, the results obtained seemed to agree very well indeed with the limited measurements that are available for individual sites.

B. Balloon-borne Experiments

Flights of a balloon-borne Fabry-Perot interferometer have been carried out by University College, London, from Texas in October 1983. The experiment observed scattered light at a number of wavelengths, including 592 and 688 nm, for measurements of H_2O and O_2 in the mesosphere and stratosphere. Preliminary analyses of the measurements have given a clear indication of the potential of the techniques for observations of winds and of the mixing ratio of H_2O in the middle stratosphere.

The National Physical Laboratory group have been very heavily involved in the international Balloon Intercomparison Campaign (BIC) sponsored by NASA and involving some 16 international groups. Twenty different instruments were launched on several gondolas as close in time as possible during the Autumn 1982 and Spring 1983 campaigns. Coordinated measurements of a wide range of stratospheric constituents, temperature and solar UV flux were made and are currently being analysed. Data from the NPL cryogenic grating spectrometer have been analysed for O_3, HNO_3, NO_2, N_2O, CF11, CF12 and CH_4; the values of the ratio of HNO_3/NO_2 concentration show very good agreement with the predictions of 1-D models.

A number of flights of the Oxford Balloon Pressure Modulator Radiometer have been made in recent years. A great deal of data on NO and NO_2 have been obtained, including exciting new results on the diurnal cycles, together with an impressive indirect measurement of N_2O_5 which agrees very well with theory. The results have indicated that the conversion of NO to NO_2 and the reversal process are not quite consistent with predictions by models of stratospheric chemistry. An interesting result was the very clear observation in 1982 of infrared emission from the El Chichon aerosol layer in the lower stratosphere.

The Harwell programme of cryogenic sampling on balloon flights has continued, and a number of new results have been obtained. One notable feature is the very large differences between observations of the vertical profiles of gases such as $CFCl_3$, CCL_4 and CH_3CCl_3 and predictions of 1-D models above about 20 km. Speculation has been voiced about the correct value of the oxygen cross-section used to calculate the solar flux; a smaller value causes a more rapid decay of many gases with height. Data on COS show a marked post El Chichon enhancement, and there is much evidence for the formation of distinct layers of this compound in the stratosphere.

C. Ground-based Experiments

Lidar observations carried out at the University College of Wales, Aberystwyth, since November 1982 have shown that for heights up to about 30 km the backscattered signals have been dominated by returns from enhanced aerosol concentrations. These have been attributed to material injected by the eruption of the El Chichon volcano in Southern Mexico during the period March 28th to April 4th, 1982. The aerosol layer has displayed pronounced night-to-night and shorter term variability and considerable small scale vertical structure, particularly in the early months of observation.

D. Modeling Studies

Modeling studies at the Meteorological Office have used a Lagrangian framework to examine trajectories of air parcels over Europe, supported by Nimbus 7 data. A study of the 10-day period starting on February 21st, 1979 showed that the isobaric and isentropic trajectories were in good agreement for the first 5 days but then diverged, the difference between the two trajectories being most striking in the meridional plane. The work has demonstrated the importance of taking radiation into account in defining a coordinate system for photochemical studies. The model results for O_3 and SBUV data showed similar variations at 42 km over a 10-day period but for 30 km the variations shown by the experimental data were not reproduced by the model.

The plans to relate model results to data from the Upper Atmosphere Research Satellite (UARS) at the Meteorological Office are based on the development of a data analysis scheme, an extension of existing models, and observational studies directed towards climatology. The analysis scheme, to be based on that used for SSU data, will be finalised by 1986 and fully tested prior to the launch of UARS. The stratosphere/mesosphere model involved will make use of a variable number of levels, up to 32. In the analysis of UARS data it is intended to use a method of assimilation by repeated insertion, as used in operational models.

Modeling studies carried out at the British Antarctic Survey have been based on the one-dimensional approach developed at the Physical Chemistry Department, Cambridge University, suitably modified for the Antarctic environment, as with the inclusion of a large albedo. Particular attention has been paid to the influence of vertical velocity on the calculated O_3 distribution.

It has been shown that in the absence of such velocities, the ozone concentration decreases much too rapidly with time during summer; vertical velocities of up to 70 m/day have been found to be necessary for the South Pole and 45 m/day for Halley Bay. These studies also showed that the N_2O_5 concentrations are reduced to very low values during the prolonged periods of photolysis during summer; the NO_3, which leads to N_2O_5, is not produced at such times.

A joint study of the Rutherford Appleton Laboratory and Oxford University makes use of a two-dimensional model for examining the distributions of CH_4 and N_2O at heights corresponding to pressures of 40 mb to 0.3 mb and compares the results with SAMS data for 1979. The gross features predicted for both CH_4 and N_2O (i.e., low latitude, low stratosphere maxima) are observed in the data, although there are differences in detail; for example, the double maxima observed in the latitude variations of both CH_4 and N_2O are not reproduced by the model. The predicted CH_4 concentrations agree well with observations but the predicted N_2O tends to drop off less rapidly with height than the observations. In attempting to understand the difference between the CH_4 and N_2O results, it has been realised that chemistry plays a greater role in the latter constituent. Particular attention has been paid to the possible influence of errors in solar UV fluxes and in the O_2 absorption cross-sections near 200 nm. Although some improvement is affected by adopting smaller values of cross-section, the discrepancies between model and experimental results are not resolved. Errors due to modeling the transport cannot be ruled out.

E. Laboratory Investigations

In the Department of Physical Chemistry, Cambridge, very high resolution Fourier transform and diode alser spectroscopy are being used to study relevant atmospheric species. Using FTR it has recently been possible to reassign the band of SO_3 at 1391 cm^{-1}, and to improve the positions and detecting anomalies in intensity caused by perturbations. The diode laser spectroscopic measurements have recently shown that the band strength of the ν_3 band of HO_2 at 1100 cm^{-1} is 1.1×10^{-18} cm molecule $^{-1}$, a factor of seven smaller than the calculated value.

II. MESOPHERIC AND LOWER IONOSPHERE STRUCTURE AND COMPOSITON

A. Thermal Structure

Temperature sounding made by the Oxford University Stratospheric and Mesospheric Sounder (SAMS) on the Nimbus 7 satellite have been analysed and have revealed a number of interesting results. Particular attention has been given to the effects of winter sudden warming events, and the analysis of wave motions propagating vertically and zonally in the stratosphere and mesosphere. As part of a workshop held at Oxford in April 1983 in connection with Pre-MAP project, a significant effort has been made to compare SAMS temperatures with those from other instruments on Nimbus 7, on the TIROS satellites, and from the meteorological networks; generally, agreement was remarkably good, and the most significant differences so far seem mainly attributable to differences in spatial and temporal resolution between the various observation techniques.

The height variation of molecular density, derived from lidar observations of Rayleigh scatter from heights above 35 km, have been used at University College of Wales, Aberystwyth, to derive the height variation of temperature in the middle stratosphere and lower mesosphere. Comparisons with temperatures derived from Nimbus 7 and TIROS satellite measurements have shown a greater degree of vertical structure in the ground-based measurements. Comparison of data obtained within given nights and on different nights have shown large changes in temperature at mid-stratospheric heights during winter.

B. Collaborative Rocket Campaigns

Since 1980, U. K. groups have been involved in five campaigns, four of which were international and based at Kiruna and/or Andoya. The Energy Budget campaign (Kiruna and Andoya, November/December 1980) was a very intensive collaborative enterprise involving rocket, balloon and ground-based experiments from 15 countries directed towards the energetics of the mesosphere and thermosphere under quiet and disturbed conditions; Project Oxygen (Kiruna, February 1981) was a Swedish campaign concerned with the photochemistry of oxygen in an aurorally disturbed lower thermosphere; Project CAMP (Kiruna, August 1982) was directed towards the formation of noctilucent clouds in the polar summer mesosphere; Project MAP/WINE (Kiruna and Andoya, January/February 1984) was aimed at examining stratospheric warmings and associated mesospheric effects over Northern Europe.

An ambitious national campaign, Project ETON, carried out at South Uist on March 23rd, 1982 was directed towards a study of the excitation processes for oxygen and hydroxyl airglow emissions at mesospheric and lower mesospheric heights. This involved experiments from Queen's University of Belfast, Rutherford Appleton Laboratory and the University College of Wales, Aberystwyth, the Meteorological Institute of Stockholm University and the University of Saskatoon. A total of seven rockets were successfully launched in a period of 2 1/2 hours, and the high quality photometer and atomic oxygen measurements have already produced new results concerning the excitation of atomic and molecular oxygen states.

C. Ground-based Measurements

The low-light level television system of Southampton University incorporating a red-extended photocathode and having a system pass band of 700-850nm have recorded curved OH airglow structures from the Gornegratt Observatory. The centres of curvature of these structures seem to be associated with thunder storm centres as identified by vlf direction finders at Bonn University. Collaborative measurements with the Michelson interferometer of Utah State University in the summer of 1983 were used to examine the nature of dark and bright bands observed in the OH airglow. Temperature differences of about 10 K were observed between dark and bright bands, the bright bands being associated with high temperatures.

The incorporation of a Commodore Pet minicomputer as control of an Al radio wave absorption experiment has provided a versatile multifrequency ionosonde at University College of Wales, Aberystwyth. The instrument is being used to derive electron density profiles from inversion of absorption and virtual height measurements, to study wave-like motions in the E and F regions and the details of sporadic-E ionization.

D. Modeling Studies

A one-dimensional model has been used to examine the main features of the height distribution of sodium in the mesosphere in a joint project of the University of Wales, Aberystwyth, and the Rutherford Appleton Laboratory. This has involved time-dependent solutions of the diffusion and continuity equation for oxygen-hydrogen and sodium constituents, with account being taken of up-to-date rate coefficient data. An important input was the recent measurement for the three-body recombination of sodium atoms and oxygen molecules measured in the Department of Physical Chemistry at Cambridge University. Particular attention has been paid in the model studies to the processes which determine the peak altitude of the sodium layer, the slope of the distribution above the peak, the diurnal variation of the layer and to the characteristics of the sodium nightglow layer.

The details of the D-region changes giving rise to the observed presunrise increases of electron densities is the subject of another modeling study being carried out jointly by University College of Wales, Aberystwyth and the Rutherford Appleton Laboratory. Account is taken of the changes in primary ionization between day and night, including the effect of Lyman-α scattered in the geocorona, but the greatest attention is paid to various electron detachment processes from negative ions. The role of NO_3, previously considered to be a terminal negative ion, has been considered in some detail.

III. MIDDLE ATMOSPHERE DYNAMICS

A. Satellite-borne Experiments

As part of the workshop held at Oxford University in connection with Pre-MAP Project 1, comparisons were made of quantities, such as geostrophic wind, momentum and heat fluxes, derived from the temperature fields obtained from different experiments on Nimbus 7 and TIROS satellites, as well as from meteorological networks. Studies of sudden warmings in relation to planetary wave propagation have been carried out at Oxford using data from the Nimbus 5 Selective Chopper Radiometer, Nimbus 7 SAMS experiment and the TIROS-N Stratospheric Sounder Units. Sudden warmings also form part of the Middle Atmosphere collaborative programme of Oxford University and the Meteorological Office. Daily analyses of data from the SSUs on the TIROS series of satellites have formed the basis for a wide range of diagnostic calculations at the Meteorological Office, and in addition to case studies of stratospheric warmings and other phenomena, dynamical differences between the two hemispheres have been investigated.

B. Ground-based Experiments

Following the automation of the system, meteor radar wind measurements have been carried out at Sheffield University for extended periods during important MAP and Pre-MAP events, notably SWAMP, CAMP and MAP/WINE. Continuous data for the 80-100 km altitude region are now available for three successive winters, including 1983/1984, in which attention has been concentrated on the effects of stratwarms on the mesospheric circulation. Significant changes in the zonal flow have been observed while warmings occurred at stratospheric heights, and at times there was a complete reversal of the seasonal circulation. A study of the Sheffield data, in conjunction with those from other sites, suggest that the coupling from below is provided by vertically propagating planetary waves. Regular meteor wind recordings were also made in the summer of 1982 and 1983 in order to resolve atmospheric tides and zonally travelling planetary waves of quasi 2-day period. During the summer of 1982 the new bistatic meteor radar, inspired by working group discussions, was successfully operated for the first time with the cooperation of the University of Aberdeen. The new data provide a significant improvement in spatial resolution of wind structure compared with that from single station operations, but the potential of the system will not be realised until an automatic recording system has been installed at Aberdeen. A new interferometer, which has operated at Sheffield since the summer of 1983, is capable of resolving the small-scale structure in the wind associated with gravity waves, and also the vertical profiles of tides and planetary waves.

The Doppler shift imposed on OH airglow emissions near 85 km, as observed at Spitzbergen using interferometric methods by Ulster College of Technology, has also provided wind measurements at about 78°N in the winters of 1982-83 and 1983-84.

At lower heights, between about 35 km and 70 km, observations of molecular density fluctuations derived from lidar measurements of Rayleigh scatter at University College of Wales, Aberystwyth, have been used for studies of gravity waves. Oscillations of vertical wavelength and downward phase propagation characteristic of such waves have been observed.

C. Modeling Studies

The dynamical studies of the circulation of the middle atmosphere at the Meteorological Office are based on a three-dimensional numerical model which has been extended to stratospheric heights (1 mb). The height of the lower surface is supplied as a time-dependent boundary condition using either observational data to simulate events or an idealised field designed to test aspects of dynamical theory. The position of this lower boundary can be chosen to suit the application, and the spatial resolution of the model can be readily varied; in one version resolutions of 5° in latitude and longitude, and 2 km in the vertical, are adopted. These model calculations are carried out in association with the studies of data analyses, using assimilation into the numerical model, mentioned in connection with the preparation of UARS-based studies, Section I(D), and the diagnostic studies of dynamical processes using observational data, outlined in Section III (A).

MAP ACTIVITIES IN THE UNITED STATES OF AMERICA

D. L. Hartmann, Chairman
Panel on the Middle Atmosphere Program

R. T. Watson, Chairman
Interagency Coordinating Committee for MAP

I. INTRODUCTION

The U.S. has an extensive program of research of the middle atmosphere and U.S. Scientists are participating in many of the MAP projects. It is anticipated that this commitment to middle atmosphere research will continue in the future. Coordination of MAP activities among the agencies which fund MAP-related research in the U.S. is provided by the Interagency Coordinating Committee for MAP. Scientific guidance is provided by the Panel on the Middle Atmosphere Program under the Committee on Solar Terrestrial Research of the Board on Atmospheric Sciences and Climate, National Research Council. The U.S. MAP Panel has provided two documents on U.S. participation in MAP. An early plan for U.S. participation in MAP, "The Middle Atmosphere Program: Prospects for U.S. Participation" appeared in Volume 1 of the MAP Handbook. Recently, a small volume entitled "Research Recommendations for Increased U.S. Participation in the Middle Atmosphere Program" was published by the National Academy Press and reprinted in Volume 11 of the MAP Handbook. Specific proposals for the implementations of these recommendations are now being considered.

A substantial fraction of middle atmosphere research in the U.S. is motivated by a desire to understand atmospheric ozone. In this report attention is focused on the current status and future plans for U.S. research into the ozone problem. While this does not include every aspect of middle atmosphere research being pursued in the U.S., it is believed that a fairly detailed account of U.S. efforts on this multifaceted problem would be of interest.

II. OZONE LAYER RESEARCH AND MONITORING PROGRAM IN THE U.S.

The USA has a comprehensive program of research, monitoring and technology development for the study of atmospheric ozone. The goals of the program are:

1. To improve our scientific understanding of the physical and chemical processes which control the concentration of atmospheric ozone;
2. To assess quantitatively possible perturbations to the ozone layer caused by natural phenomena and man's activities; and
3. To assess the consequences of a change in either the total column content or the vertical distribution of ozone on weather and climate, human health, and terrestrial and aquatic ecosystems.

III. CURRENT PROGRAM

The atmospheric research program is a comprehensive balanced program of field measurements (in-situ and remote-sensing techniques using ground-based, aircraft, balloon and rocket platforms), laboratory studies (kinetics, photochemistry, spectroscopy and the development of calibration standards), theory (1D, 2D, and 3D models), data analysis (including large satellite data sets), Space Shuttle experiments, satellite systems, technology development and advanced satellite definition studies addressing the key areas of atmospheric research.

The program has the following specific objectives:

1. Understand and quantify the flux strengths and mechanisms for transport of source gases in the HO_x (H_2O), NO_x (N_2O), ClO_x ($CFCl_3$, CF_2Cl_2, CCl_4, CH_3Cl, CH_3CCl_3, etc.), carbon (CH_4, CO_2, CO, NMHC) and sulfur (SO_2, CS_2, COS, DMS, etc.) families from the troposphere to the stratosphere;
2. Understand the formation and destruction processes of tropospheric ozone;
3. Understand the chemical transformation processes within the ozone layer, i.e., the coupling between the different chemical families and the partitioning between radical, reservoir and sink species within each family;
4. Understand upper atmospheric dynamics and transport;
5. Obtain global climatologies of ozone (column content and vertical distribution) and key hydrogen, nitrogen and chlorine species in the upper atmosphere;
6. Acquire a quantitative understanding of the seasonal and long-term changes in quantities such as incoming solar flux (wavelength resolved) and atmospheric temperature;
7. Determine the interaction mechanisms among the radiation, chemistry and dynamics of the upper atmosphere;
8. Develop improved photochemical models;
9. Develop a fully interactive general circulation model, GCM.

IV. RECENT ACCOMPLISHMENTS

A. Total Ozone Monitoring

Ground-based and satellite measurements indicate a 5-7% decrease of total ozone (Angell-Korshover technique) in North America, Europe and Asia in late 1982, resulting in record low (since 1958) total-ozone values in North America and the north temperate zone in early 1983. Total-ozone values appear to be returning to normal later in 1983. Umkehr and ozonesonde-derived estimates of layer-mean ozone in the north temperature zone indicate that this decrease of total ozone was mostly due to large (10-15%) ozone decreases in the low stratosphere, though the contribution of the high stratosphere thereto is not easily determined because of the bias introduced into Umkehr observations by the stratospheric dust from El Chichon. It is concluded that the decrease in total ozone in late 1982 was more likely due to anomalies in atmospheric circulation than anomalies in the photochemistry of the high stratosphere.

B. Field Measurements

The major accomplishments include:

1. A continued expansion of the atmospheric data base for the concentrations of key stratospheric species in all chemical families;
2. The successful demonstration of several balloon-borne techniques, including: lidar measurements of OH and O_3; far-infrared FTIR measurements of OH; improved resonance fluorescence measurements of atoms and radicals; the reel up/down mechanism for repeated in-situ measurements from a single flight; an in-situ laser-induced fluorescence system for OH and HO_2; and in-situ infrared sampling system for NO, NO_2 and H_2O species; c.
3. The design, fabrication and laboratory testing has been completed for several balloon-borne instruments, including: a high speed interferometer (2-16 microns, 0.005 cm^{-1} resolution); an improved microwave limb sounder for ClO and O_3; and an improved total chlorine/bromine sampling

system;

4. Three series of international trace constituents balloon intercomparison flights have been completed and the results are being evaluated; (1) two campaigns each with four in situ and three remote sensing instruments were used to measure water vapor; (2) 13 and 17 remote sensing instruments (including grating spectrometers, radiometers, and Fourier transform interferometers) were used in two separate campaigns to measure a wide variety of atmospheric constituents (HCl, HF, HNO_3, NO_2, NO, O_3, H_2O, CH_4, OH, etc.). These sensors utilized the visible, infrared, far infrared and microwave regions of the electromagnetic spectrum in both the absorption and emission mode; and (3) several research instruments and sondes were used to measure O_3 in three campaigns;
5. Ground-based microwave measurements of ClO (including diurnal behaviour) and HO_2;
6. Continued monitoring of the increases in the tropospheric concentrations of CH_4, CO, N_2, F-11, F-12, CCl4 and CH_3CCl_3:
7. Continued to obtain global data sets of O_3 (column content and vertical distribution), H_2O, CH_4, n_2O and temperature through the continued operation of the SBUV/TOMS and SAMS instruments on the Nimbus 7 satellite;
8. The ROCOZ (rocket ozone) system has been redesigned and tested, resulting in improved precision and reliability;
9. A midlatitude stratosphere-troposphere multi-aircraft experiment observed a major folding event.
10. Automated Umkehr Ozone Profiling. Work begun in 1982 to automate six Dobson spectrophotometers for Umkehr observations was completed in 1984. This project was funded by the EPA, the Chemical Manufacturers Association, NOAA, and WMO. Five automated Dobson sites were operational in 1984; Perth, Australia; Haute Provence, France; Boulder, Poker Flat and Mauna Loa, USA.

C. Laboratory Studies

The major recent accomplishments include:

1. Continued overall improvement in the kinetics and photochemical data base;
2. Key new HO_x rate constant data (i.e., for the $HO+HO_2$, $O+HO_2$, $H+HO_2$, HI_2+HO_2, $OH+HNO_3$, $OH+HO_2NO_2$, and HO_2+NO_2+M reactions) which improve our understanding of the lower stratosphere;
3. Minor modifications to the O+ClO and OH+HCl rate constants;
4. New data on O_2 and O_3 absorption cross-sections;
5. An improved understanding of the reactivity of $ClONO_2$ and the photodissociation mechanism of $ClONO_2$,
6. Refined spectroscopic data for the interpretation of atmospheric field measurements data;
7. Development of new instruments, viz: a rapid response dual-beam UV-absorption instrument for balloon-borne measurements of atmospheric ozone.

D. Theoretical Studies

The major recent accomplishments include:

1. By utilizing one-and two-dimensional photochemical models there is now an increased awareness of the nonlinear coupling in the chemical systems, i.e. multiple solutions, O_3 loss as a function of ClX (both at low and high levels of ClX), the response of O_3 to the simultaneous increase in the atmospheric concentrations of CFC's, CH_4, N_2O, and CO_2 (multiple scenario perturbations);
2. Significant initial progress in coupling chemistry in a noninteractive manner into a 3D model. Progress has also been made in the development of

general circulation models (GCM) which include detailed treatment of radiative-dynamical-chemical coupling; and

E. Satellite Data Analysis

The major recent accomplishments include:

1. Final processing of Nimbus 7 (LIMS, SBUV/TOMS, and SAMS), SAGE and DMSP satellite data have been completed and the data have been archived at the NSSDC. This provides global data sets for temperature, O_3, H_2O, HNO_3, N_2O, NO_2, CH_4 and aerosols;
2. A large number of research groups have been selected to interpret upper atmospheric data from the Nimbus 4, 6, 7, SAGE and DMSP satellites;
3. Aerosol and sulfur dioxide clouds emitted by El Chichon have been detected and tracked by SME and SBUV/TOMS on Nimbus 7;
4. Continued analysis of Nimbus 4 BUV and Nimbus 7 SBUV/TOMS data for possible trends in O_3; and
5. SME is providing excellent data on solar flux and O_3.
6. Satellite data have been used to study the surf zone effect involved in stratospheric warnings and its consequent effects on ozone distributions.
7. SME and Nimbus 7 have been used to determine the time dependence of NO_2 increases as air parcels emerge from polar night. This work supports the explanation that the polar NO_y reservoir responsible for the Noxon cliff is N_2O_5.

F. UV-B Radiation Simulation

A solar UV-B radiation computer-developed almanac was completed. The almanac contains data on solar UV-B radiation fluxes at the earth's surface for combinations of radiation wavelengths, total-column ozone, latitude, season, and time of day. The almanac's intended users are researchers, such as biologists studying health, terrestrial or aquatic effects of UV-B radiation, who need to simulate the solar UV-B radiation fluxes as they correlate to various amounts of total-column ozone change at their laboratory locations.

V. FUTURE PROGRAM

The balanced research program of field measurements, laboratory studies, theoretic studies and data interpretation will continue at the same level in the near future. Specific thrusts will include:

1. Continuation of the balanced program of in-situ and remote measurements of atmospheric constituents from balloon-borne platforms with an increased emphasis on using multi-sensor platforms in order to perform intercomparisons and to obtain comprehensive data sets;
2. studies of the chemical composition of the lower stratosphere, with increased effort to measure the reservoir species ($ClONO_2$, HO_2O_2, N_2O_5, etc.);
3. An accurate assessment of the budget and partitioning of NO_x;
4. An enhanced ground-based program to measure tropospheric source gas concentrations;
5. Flux studies of source gases from key ecosystems;
6. Application of lidar to stratospheric ozone determination;
7. A series of experiments in the tropics and extra-tropics with multiple instrumented aircraft to understand stratospheric/tropospheric exchange mechanisms (Stratosphere-Troposphere Exchange Program (STEP)).
8. Utilization of MST radar systems to study the dynamical processes in the stratosphere;
9. A second SAGE which will measure global distributions of aerosols, O_3 and

NO_2 will be launched in 1984;

10. The high resolution infrared interferometer (ATMOS) will be flown in Shuttle in 1984/1985;
11. Passive and active remote sensor development for future satellite (e.g., the proposed Upper Atmosphere Research Satellite program) and Space Shuttle application;
12. Development of an SBUV instrument for flight on a Space Shuttle to calibrate satellite SBUV instruments;
13. Increased emphasis on analysis and interpretation of existing satellite data sets;
14. Enhanced development of 2D models for assessment studies;
15. Pursuit of multiple approaches to the interactive 3-dimensional modeling of coupled chemical, radiative, and dynamic processes;
16. Improved data interpretation and comparison with model results for data from major balloon and aircraft measurement campaigns;
17. The Solar Backscatter Ultraviolet Ozone Monitor (SBUV) operational program will instrument the next USA polar orbiter in an afternoon polar orbit, (This will provide near-global coverage).
18. A ground-based program of regular Dobson and automated Umkehr Dobson measurements, together with a three-station balloon-based sampling program, will be operated for a satellite ground truth program.

MAP ACTIVITIES IN THE USSR

A. D. Danilov, E. S. Kazimirovsky, V. V. Viskov

A report on the USSR plans for MAP, prepared by the Soviet National Commission on MAP, sponsored by the Soviet Geophysical Committee, was widely disseminated in the summer of 1981 (HANDBOOK FOR MAP, Vol. 1). It foresaw activities in seven subprojects:

1. The structure and dynamics of the lower thermosphere.
2. Energy sources at high latitudes and their effects on the dynamics and structure of the upper atmosphere and ionosphere.
3. Climate elements of the stratosphere and mesosphere; the role of various energetic sources in its formation.
4. Winter variability in the lower ionosphere.
5. The wave processes in the formation of the middle atmosphere structure and dynamics.
6. Climatology, dynamics and origin of noctilucent clouds.
7. Dynamics of the ozone layer.

The USSR scientific institutions of the USSR Academy of Sciences, State Committee on Hydrometeorology and the Ministry of Higher Education have participated in MAP since 1980. The USSR participates in some appropriate MAP projects - DYNAMICS, MAP/WINE, ATMAP, GRATMAP, GLOBUS, CAMP, AMA, GLOBMET.

The middle atmospheric dynamics studies are to be based on current wind and wave observations carried out by rockets and aerological, optical and radio-physical techniques.

It is very important for meteorologists to have long-term statistical summaries for all available data for comparison with and development of theoretical models. We have now some maps of vertical wind profiles along meridians 0° and 90° E, 180° and 90° W, based on rocket and satellite data, published in the USA and the USSR. The profiles of monthly averaged zonal and meridional winds up to 80 km show significant discrepancies from CIRA-72.

There are some discrepancies between thermal and dynamical structures of the stratosphere and mesosphere for the Northern and Southern Hemispheres. The Central Aerological Observatory compiled reference temperature and wind models of the atmosphere in the Southern Hemisphere for the 25-80 km altitude range for each month. On this basis, interhemispheric differences in the values of the meteorological parameters in the upper atmosphere, latitudinal distribution and season variations are reviewed.

The generalization of meteor radar and ionospheric drift data at the Institute of Experimental Meteorology provides monthly mean zonal and meridional cross sections for all seasons. It is well known that the interaction of meteorological and ionospheric fields is most dramatic in the extratropical winter regime. It is evident that the meridional winter wind field at 80-110 km is an extension of the wind field in the stratosphere and mesosphere. Seasonal reverses of the zonal circulation in the meteor zone (80-100 km) generally occur 3-4 weeks before those in the stratosphere. An empirical model of the mean zonal circulation at middle latitudes, as observed by rockets, meteor radars and ionospheric drift measurements was constructed.

It was revealed that the variance of values, connected with the longitude difference, is about 5-7 ms^{-1}, comparable with year-to-year variations of the velocities.

On the basis of harmonic analysis of data on seasonal variations of wind derived from systematic radiometeor and ionospheric observations at various latitudes, mean (averaged for many years) values of amplitudes and phases of annual and semiannual oscillations of zonal wind velocities at 70-110 km altitudes, were determined. Altitude-latitude sections of seasonal oscillation parameters constructed from these values, demonstrate a considerable regularity in the change of all parameters with respect to altitude and latitude.

The longitudinal effect in D-region dynamics was revealed on the basis of simultaneous wind measurements at two or more sites. First of all, the longitudinal effect is important for the variability of the semidiurnal tide. This variability is mainly related to interaction of the tide with the irregularities and the winds in the middle atmosphere and variations observed at any point are the integrated effect of the variations of the middle atmosphere. For so short a time-scale variability the longitudinal effect may be as important as the latitudinal one. Simultaneous wind measurements by meteor radar were carried out at Khabarovsk and Kharkov, Obninsk and Khabarovsk. There are some perturbations of tides which are not correlated for different sites. The prevailing zonal wind over Siberia and the Far East was, as a rule, larger than that over the European part of the USSR.

The results of simultaneous ionospheric drift measurements in the low-frequency range obtained over Central Europe and East Siberia show distinct differences in the wind field of the upper mesopause region which point to a longitudinal effect. The moments of seasonal reverses of circulation and response of the D-region wind field to stratospheric warmings depend on longitude. This may be interpreted as an ionosphere dependence on meteorological regime, different for Central Europe and East Siberia.

In addition to empirical models of general circulation in the middle atmosphere there are semiempirical models for 70-160 km (Siberian Institute of Terrestrial Magnetism, Ionosphere and Radio Wave Propagation, Irkutsk), numerical models (Novosibirsk University), and theoretical three-dimensional models of general atmospheric-ionospheric circulations (Geophysical Institute, Tbilisi).

A large number of experimental data are being accumulated on the manifestation of planetary waves in the wind field in the D region. There is observational evidence of a broad spectrum of planetary waves. There are seasonal differences of the wave periods. Fluctuation intensities of most of them were greatest during winter and smallest during summer, in agreement with the ideas of forcing of instability from below. Theoretical investigations of planetary waves are being carried out at the Central Aerological Observatory, the Main Geophysical Observatory, and the Institute of Ionosphere, Alma-Ata.

The most interesting circulation anomalies in the stratosphere are the midwinter warmings, forced by planetary waves from the troposphere. We are interested in the response of D-region dynamics to stratospheric warmings. We have collected several years' data in a routine monitoring program, and as a rule, we have mesospheric and lower thermospheric zonal wind reversals from westerly to easterly up to at least 100 km, increases of southward wind or even reverses of meridional wind, and increases of semidiurnal tide amplitude. The response of the wind field is 1-2 days after the temperature maximum in the stratosphere.

Over the past few years there has been considerable theoretical study of middle atmosphere tides (Leningrad University, Central Aerological Laboratory, Institute of Experimental Meteorology). There are numerical two-dimensional models for the real wind and temperature stratification, viscosity and electrodynamical forces (Institute of Experimental Meteorology), a self-consistent model of diurnal variations in the thermosphere, taking into account the effects of electrostatic fields (Central Aerological Laboratory).

The day-to-day variability of wind probably is associated with internal gravity waves and turbulence. Theoretical and experimental studies have been made of how gravity wave activity depends on altitude, season, latitude and nature of the underlying surface, with speed and jet stream structure.

Experimental investigations of internal gravity waves are being carried out by meteor radar (Institute of Experimental Meteorology), through atmospheric emmission measurements (Institute of Atmospheric Physics, Moscow) and drift measurements (Siberian Institute of Terrestrial Magnetism, Ionosphere and Radio Wave Propagation, Irkutsk).

A relationship was found between gravity waves observed at 80-100 km and meteorological sources (fronts, jet streams). The wave energy input from below dissipates at a level of about 100 km. The amplitude of gravity waves in the meteor zone is greatest in winter. There is some evidence for the acoustic-gravity resonance waves in the auroral lower atmosphere, generated by pressure variations in the auroral ionosphere (Moscow University).

The turbulence was evaluated in the rocket experiments with artificial clouds (Institute of Experimental Meteorology). The turbulent eddy diffusion coefficient varies from 1 to 15 $m^2 s^{-1}$ in the stratosphere and mesosphere and from 10^3 to 2×10^4 $m^2 s^{-1}$ in the lower thermosphere.

The winter anomaly of radio wave absorption is the best known manifestation of a meteorological influence upon the D region of the ionosphere. The major mechanisms are the redistribution of nitric oxide and temperature dependence of cluster ion formation rates. Simultaneous measurements of electron concentration, temperature, wind, etc. during the MAP/WINE campaign by rockets and ground-based techniques show that all mechanisms may be regarded as effects of middle atmosphere circulation and D-region dynamics (Institute of Terrestrial Magnetism, Ionosphere and Radio Propagation, Moscow; Central Aerological Observatory; Radiophysical Institute, Gorky; Institute of Applied Geophysics).

Results of middle atmosphere research have been presented at the Middle Atmosphere Dynamics Symposium at Urbana, 1980; the IAGA and IAMAP Scientific Assembly at Edinburgh and Hamburg, 1981; the Solar-Terrestrial Physics Symposium at Ottawa, 1982; International Symposium on Ground-Based Studies of the Middle Atmosphere, Schwerin, 1983; Middle Atmosphere Science Symposium, Hamburg, 1983, and at some National Symposia.

In summary it may be said that all USSR MAP sub-projects are under way and making good progress.

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