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South Pacific Convergence Zone and Global-Scale Circulations: NAS8-37127

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A. Significant Accomplishments (June 1989 - August 1990)

It is the feeling among our research group that the past year was our most exciting and productive one since our association with NASA began in 1983. This can be attributed to three factors. First, Dr. Vincent spent the period, 1 April - 14 November 1989 on research and sabbatical leave at the Institute for Oceanography in Kiel, West Germany (six weeks) and at the Institute for Geophysics and Meteorology in Cologne, West Germany (six months). This provided him with the opportunity to conduct full time research, primarily on our NASA objectives, and to interact with several German scientists and graduate students. Second, the personnel (i.e., graduate students) in our research group collectively have been the best that Dr. Vincent has had the opportunity to work with and supervise. These students are: Jim Hurrell (expected to complete Ph.D. degree in August 1990), Perry Ramsey (Ph.D. student), Keith North (Captain, USAF, completed M.S. degree in May 1990), and Ken-Chung Ko (expected to complete M.S. degree in August 1990). Third, thanks to the hard work and persistence of Jim Hurrell, together with very valuable assistance from personnel at GLA/NASA and the Purdue University Computer Center (PUCC), the GLA General Circulation Model (GCM) was ported successfully to PUCC and is running on the CYBER 205. This is becoming an integral part of our research program and will play an important role in our future plans. An itemized summary of our significant accomplishments is now given.

1. Dr. Vincent presented two papers (one by Pedigo and Vincent, the other by Hurrell and Vincent) at the International Association for Meteorology and Atmospheric Physics (IAMAP) symposium in Reading, England in August 1989.
2. Dr. Robertson, MSFC/NASA, visited Dr. Vincent at the University of Cologne in August 1989 and presented an invited seminar there.
3. Dr. Vincent presented an invited seminar at the Royal Institute of Meteorology for Belgium in Brussels on 6 October 1989.
4. Dr. Vincent presented an invited seminar at a joint meeting of the Institute for Geophysics and Meteorology and German Weather Service in Cologne on 26 October 1989.
5. Three manuscripts were accepted for publication in refereed journals and are listed in section D below.

6. Three additional manuscripts were submitted for publication in the Journal of Climate and are currently in the review process. These are: (a) "Intraseasonal Oscillation of Convective Activity in the Tropical Southern Hemisphere from May 1984 - April 1986" by Vincent and his German colleagues, Sperling, Fink, Zube and Speth; (b) "Precipitation Rate Computations in the Tropics by the Global Heat Budget Technique from June 1984 - May 1987" by North and Vincent; and (c) "On the Maintenance of Short-Term Subtropical Wind Maxima in the Southern Hemisphere during SOP-1, FGGE", by Hurrell and Vincent.

B. Focus of Current Research

Our current research is focused on four topics. First, Jim Hurrell is using the GLA GCM for a series of experiments to examine the relationship between tropical heating and subtropical westerly wind maxima. When this task is completed, we plan to submit the work for publication. Second, Ken-Chung Ko is finishing his M.S. thesis on "Barotropic and Baroclinic Energy Mechanisms Associated with Summertime Subtropical Wind Maxima in the Southern Hemisphere", and we plan to submit it for publication in the near future. Third, Dr. Vincent is using two years of ECMWF data and, together with his Germany colleagues (see A-6), is investigating tropical/extratropical interactions in the Southern Hemisphere summer circulation. We are focusing on the importance of the 30-60 day tropical oscillation as a cause of enhancing the subtropical westerly winds. Finally, Dr. Vincent is working with an undergraduate Honors student, Rob Velasco, whose B.S. thesis research focuses on a study of precipitation efficiency in the tropics. He has been comparing mean monthly distributions of precipitation over a three-year period (Keith North's work alluded to in A-6) to precipitable water and moisture convergence.

C. Plans for Next Year

In August 1990 we start a new research grant. Jim Hurrell and Keith North will have departed our program after completing their degrees, and will be sorely missed. However, we will have three continuing students: Perry Ramsey, Ken-Chung Ko (who will begin Ph.D. work) and Rob Velasco. In addition, a new Ph.D. student, Mark Bourassa, will join our research group in August. As mentioned in section B, manuscripts of the research by Messrs. Hurrell and Ko will be prepared to submit for publication. Also, we plan to submit a manuscript on the research being conducted by Dr. Vincent and his scientific collaborators in Germany (also noted in section B). Perry Ramsey will be taking his Ph.D. Preliminary Examination and Rob Velasco should complete his B.S. Honors research. We plan to make further applications of the GLA GCM, especially with regard to Mr. Ramsey's research on tropical convection and precipitation using ISCCP and other data. Finally, our plans for the coming year include a trip by Mr. Ramsey to present a paper at the Fifth Conference on Satellite Meteorology and Oceanography to be held at London, England in September 1990. Also, Dr. Vincent plans to attend the ECMWF Workshop on "Tropical/Extratropical Interactions of Low-Frequency Oscillations", at Reading, England in September 1990. In addition, we plan to present papers at the "Seventh AMS Symposium on Meteorological Observations and Instrumentation" in New Orleans in January 1991 and at the "Nineteenth Conference on Hurricanes and Tropical Meteorology" in Miami in March 1991.

D. Refereed Publications (June 1989 - August 1990)

1. Robertson, F.R., D.G. Vincent and D.M. Kann, 1989: The role of diabatic heating in maintaining the upper-tropospheric baroclinic zone in the South Pacific. Quart J. Roy. Meteor. Soc., 115, 1253-1271.
2. Pedigo, C.B. and D.G. Vincent, 1990: Tropical precipitation rates during SOP-1, FGGE, estimated from heat and moisture budgets. Mon. Wea. Rev., 118, 542-557.
3. Hurrell, J.W. and D.G. Vincent, 1990: Relationship between tropical heating and subtropical westerly maxima in the Southern Hemisphere during SOP-1, FGGE. J. Clim. (to appear in the June issue).

