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THE GLOBAL WEATHER EXPERIMENT

No. 11

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RESEARCH PROGRAM

INTRODUCTION

The initial issues of this newsletter described in general terms the FGGE observational systems. All systems have now been committed and the time is rapidly approaching for the observational portion of the Experiment to begin. During the next year or so, the bulk of the FGGE observations will have been taken and the Experiment will have begun a transition from the observational phase to the data management and research phase. Taking into account at least a six-month lag in the availability of Level II-b data from the time of observation, this is probably an appropriate time for individual and smaller research groups to begin to develop, in general terms, their research plans with respect to the Experiment. The specific aim of this newsletter is to provide some initial information to such groups or individuals for the planning of their subsequent research and to convey research opportunities available through NASA, NOAA and NSF.

OUTLINE OF U.S. FGGE RESEARCH AREAS

In FGGE NEWS No. 8, the Experiment's research goals, as perceived by the First FGGE Research Coordination Conference, were summarized. In slightly revised format, they were:

- (i) To obtain a better understanding of atmospheric motion for the development of more realistic models for weather prediction;
- (ii) To assess the ultimate limit of predictability of weather systems;
- (iii) To design an optimum composite meteorological observing system for routine numerical weather prediction of the larger-scale features of the general circulation;

(iv) To investigate, within the limitation of a one-year period of observation, the physical mechanisms underlying the fluctuations of climate in the time range of a few weeks to a few years and to develop and test appropriate climatic models.

The first three goals are in support of the first GARP objective, the last in support of the second GARP objective.

Research in support of the above goals can somewhat arbitrarily be subdivided into the following areas:

I. FIRST GARP OBJECTIVE

1. ANALYSIS AND THE OBSERVING SYSTEM

- a. Level III-a data sets
- b. Level III-b data sets
- c. Special data sets
- d. Observing system characteristics including error statistics of observing systems
- e. Objective analysis and initialization
- f. Data assimilation
- g. Satellite data studies
- h. Design of future WWW observing systems

2. PHENOMENOLOGICAL STUDIES AND STUDIES OF PHYSICAL PROCESSES

- a. Understanding of large-scale physical processes
- b. Understanding of large-scale circulation -- structure and dynamics
- c. Budget studies
- d. Parameterization

3. PREDICTION PROBLEMS AND GENERAL CIRCULATION STUDIES

- a. Medium-range deterministic forecast models (few days to a few weeks)
- b. Extended range forecast models (few weeks to a few months)

- c. General circulation studies
  - d. Numerical methods
  - e. Verification methods
  - f. Regional forecasting models and general circulation regional studies
4. OCEANOGRAPHY
- a. Large-scale air sea interaction
  - b. Physical description and dynamics of the mixed layer
5. PREDICTABILITY STUDIES
- a. Theory of predictability
  - b. Practical limits of predictability
  - c. Data, analysis, model impact studies

## II. SECOND GARP OBJECTIVE

- 1. DATA ACQUISITION
- 2. ANALYSIS
- 3. PARAMETERIZATION OF PHYSICAL PROCESSES
- 4. CLIMATE PROCESSES AND MODELING
- 5. CLIMATE MODELING

Three areas of immediate interest are 1d (Error statistics of FGGE Observing Systems), 1e (Objective analysis) and 1f (Data assimilation) associated with the first GARP objective. These areas are important in ensuring the best quality and utility of the observational results of the Experiment. To this end a series of informal meetings of experts on quality control were held in Madison, Wisconsin (January 10-12, 1978) and Boulder, Colorado (April 12-14, 1978) co-sponsored by the U.S. Committee for GARP and FPO. These meetings made several recommendations, but one recommendation is particularly pertinent; namely, "that research be initiated and the results distributed as soon as possible on error statistics, intercomparisons, and sampling errors of the collected FGGE data." Copies of these meeting reports are available upon request from FPO.

Naturally there are many more areas of research which are important to the Experiment. Some of these areas were discussed in a series of four FGGE workshops held from November 1975 through May 1976, under the auspices of the National Academy of Sciences' U.S. Committee for GARE. Workshop A (held November 1975 in Princeton, New Jersey) was devoted to global-scale problems in FGGE; Workshop B (May 1976, Scripps Institution of Oceanography) on oceanic problems; Workshop C (January 1976, NCAR) on mid-latitude regional problems and concurrently Workshop D on phenomenological studies. A summary of these workshops will be included in a National Academy of Sciences' document entitled "The Global Weather Experiment: Perspectives on its Implementation and Exploitation" due to be published this fall. In addition, further research opportunities were discussed in FGGE NEWS Nos. 8 and 9 as a result of the First FGGE Research Coordination Conference. Additional areas will be suggested in forthcoming newsletters as various topics are discussed or as meetings are reported upon. As an example, see FGGE NEWS No. 10 on sea surface temperatures.

However, FGGE research does not necessarily have to be limited to using only FGGE data. For example, the study of sea surface temperatures may use data sets collected during the operational year which are not a part of the "FGGE" II-b data sets, and some theoretical investigations may not use data at all. The key to supporting such research, outside of the quality of the proposal, is that the effort is oriented towards the FGGE research goals outlined previously.

#### PROCEDURES FOR PROPOSAL SUBMISSIONS

Within the Federal structure, NOAA has the programmatic responsibility for the U.S. GARP activities. The U.S. FGGE Project Office (FPO), an interagency office within NOAA, has been established as part of its responsibility to coordinate the FGGE research effort.

As noted in the last newsletter, very limited research funds in support of FGGE are expected to be available from NSF and NOAA in 1979. A significant increase in funds is expected in 1980 with the bulk of research funds in both agencies to be available in fiscal years 1981 through 1985. Note that the Federal fiscal years begin in the preceding October (i.e., FY 1980 begins October 1979).

University or industry scientists requesting support from the above agencies should forward their proposals to NSF (Climate Dynamics Research Section - GARP, Room 644, National Science Foundation, Washington, D.C. 20550, c/o Dr. Richard Greenfield or Dr. Jay Fein, telephone (202) 634-1538). In some cases, proposals may be funded in whole or in part by NOAA in collaboration with NSF. It is expected that the majority of university proposals will be funded by NSF, but exceptions may occur depending on the nature of the research effort.

Government agency scientists should send their proposals to U.S. FGGE Project Office directly (address on masthead) c/o Dr. Rex Fleming or Dr. Wayne McGovern, telephone (301) 443-8861. The same external peer review process as used by NSF will be used for such government proposals.

A lead time of at least six (6) months is needed to review all proposals. A selected number of proposals of the type noted previously (i.e., error statistics, objective analysis and data assimilation) will be funded as early as FY 1980 (such proposals should be submitted by March 1979) with the majority of awards being given out in 1981 and subsequently.

In addition to the above program, NASA is also planning a vigorous FGGE research program, emphasizing the application of satellite data to the forecasting problem. It is currently anticipated that the funding mechanism for this effort will be an Announcement of Opportunity (A.O.) similar to the procedure used for the Data Systems Tests. The possibility of NASA's participating with NOAA and NSF in a joint program such as the one described above is also being explored. In any event, the first funding increment for the NASA research program will not occur before FY 1980. Readers wishing further information or to receive a copy of the A.O. when issued should forward their request to Mr. James R. Greaves, Goddard Space Flight Center, Greenbelt, Maryland 20771, telephone (301) 982-2624. The FGGE NEWS will call attention to any such future A.O. The NASA research program will be coordinated with NOAA and NSF regardless of the funding mechanism employed.

#### QUESTIONNAIRE

Periodically, information is requested from the U.S. FGGE Project Office (FPO) on the intentions of the U.S. scientific community in carrying out research associated with the FGGE data set. Such information is needed for a variety of reasons, including assessing the nature and scope of such research efforts as well as the level of support necessary to carry out the GARP objectives.

To assess the level of U.S. research efforts, the FPO is requesting that scientists who have not done so already and who are contemplating using FGGE data or doing FGGE research, complete the attached one page questionnaire outlining in broad terms their intended research activities once they have formulated their plans. The questionnaire may be returned to the FPO c/o the address on the newsletter masthead. Naturally, such information will be treated confidentially. To assist in the development of research plans, a brief interim guide to the FGGE data is attached.

#### Telephone Change

Please note that the FGGE NEWS has a new telephone number; namely (301) 443-8861.

FGGE RESEARCH QUESTIONNAIRE

Title of Activity:

Principal Area(s) of Research (from newsletter list):

Fundamental Purpose of the Research (a couple of sentences):

FGGE Data Used:

Time Period During which Work will be Carried Out:

Effort Expected to be Expended (total, yearly in man years):

Facilities to be Used:

Research Organization(s) Involved:

Name and Affiliation: