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COORDINATION OF INTENSIVE BIOMETEOROLOGICAL STUDIES

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The objectives of the program were to (1) discuss meteorological models and techniques, (2) assign responsibilities for specific measurements, and (3) select the most desirable sensors that would be compatible with the existing data-logging equipment. The main idea of the intensive biometeorological studies is to determine the magnitude of the horizontal and vertical fluxes of sensible latent heat and momentum into and within a site.

The co-investigators, George Belt, Lloyd Gay, and Leo Fritschen, met on several occasions to discuss research. The site at Cedar River was chosen after aerial surveillance of Cedar River. The location is adjacent to the lysimeter tree location. The design would include use of an instrumented tower at the lysimeter location and another instrumented tower upwind from this location. These towers would be instrumented with sensors for air temperature, humidity, wind speed, and wind direction. Discussions were held 21 to 23 October 1970, 23 July to 3 August, 1971, and 13 and 15 September 1971. During the period 23 July to 3 August 1971, Lloyd Gay brought his instrumentation and data-logging equipment to the Cedar River site and instrumented the tower adjacent to the lysimeter tree for measurements of radiation exchange, wind speed, temperature, and water vapor concentration. This field test was to familiarize Lloyd Gay with the site location, systems available, and compatibility of systems.

As a result of the discussions, plans have been made to instrument the two towers and collect measurements for a month during the summer of 1972. Lloyd Gay would be responsible for instrumenting one of the towers and Leo Fritschen for the other tower. George Belt has the responsibility of the fast-response humidity sensors, and Leo Fritschen has the responsibility of the fast-response temperature and wind speed systems. The slow-response sensors would be divided according to availability between Gay and Fritschen. Both Gay and Fritschen would supply 100-channel data-logging equipment and necessary connection cables.

This project is cooperative among the University of Washington, Oregon State University, and the University of Idaho. Effort contributed by the University of Idaho has been in (a) the formulation of the joint proposal "Assessment of Sensible Heat, Latent Heat, Momentum, and Carbon Dioxide Fluxes by Meteorological Methods and their Evaluation" and (b) the review of literature and methodology concerning fast-response, vapor pressure sensors, and associated circuitry. Preparation of the proposal for the fiscal year 1972 required meetings in Corvallis and Seattle in October. The proposal was submitted in initial form in January; revision, because of fiscal constraints, is currently in progress.

Information on fast-response vapor pressure sensors (time constant of 1 second or less) has been obtained from three sources, meteorological literature, instrument manufacturers, and colleagues. Visits (no IBP funds) to Columbia, Missouri, and College Park, Maryland, permitted consultation on barium fluoride sensors reported by Jones and Wexler (1960) and Lyman-alpha humidometer manufactured by the Electromagnetic Research Corporation at College Park. Because of the complexity in making barium fluoride film sensors and their tendency to change calibration with time, they have been dropped from consideration. The Lyman-alpha humidometer appears suitable because of its small size and ability to sense fluctuations in excess of 5 khz; its purchase price of more than $2,900 is its principal drawback. Although this type of sensor is not economical for the proposed multiple-sensor sampling scheme, the availability of one such sensor to view the turbulent spectra of water vapor fluctuations would be extremely useful to the research effort. A colleague in Syracuse, New York, suggested an aluminum-oxide sensor manufactured by Panometrics, Inc., Waltham, Massachusetts. Manufacturers' specifications for this instrument suggest it is not suitable however, because of its time constant of several seconds.

Consideration also has been given to improving electronically the performance of a Cambridge Systems dewpoint hygrometer presently available at the University of Idaho. Although not fully resolved, this does not seem a likely prospect now.

Some preliminary laboratory work has been done with psychrometers in an effort to evolve suitable geometry in the sensor and enhance its time-response capability. Limited success has been achieved to date.

An inexpensive AMINCO sensor has been suggested and is now under consideration. At this writing, the most probable course of action appears to be adaptation of some type of psychrometer for the multisensor sampling scheme. Further consideration this fall will be given to various psychrometer designs, with emphasis on a simple, fast response sensor that provides reproducible results at minimum cost. When IBP funds become available in January, a more intense effort at psychrometer development is planned.

REFERENCE

Jones, F. E., and A. Wexler. 1960. A barium fluoride film hygrometer element. J. of Geophys. Res. 65:2087-2095.