SOIL AND ATMOSPHERIC SCIENCES

Chair: Eldon L. Hood
Department of Agronomy
Purdue University
West Lafayette, IN 47907
(317) 494-4788
SUVON +755-44788

Chair-elect: Ronald W. Przyoylinski
National Weather Service
Forecast Office
Indianapolis International Airport
P.O. Box 51526
Indianapolis, IN 46251
(317) 248-4035

ABSTRACTS

A World Soils and Terrain Digital Database. M. F. Baumgardner, Purdue University, West Lafayette, Indiana 47907.—Throughout the world land resource managers are constrained in their decision-making because of a critical lack of information about their soils resources. The International Society of Soil Science is beginning a project to improve the mapping and monitoring of world soils and terrain resources and to develop an information system capable of delivery of accurate, useful, and timely information about soils and terrain resources to decision-makers and policy-makers. The major tasks of the project are 1) creation of a "universal" legend for a world soils and terrain survey at a scale of 1:1M; 2) definition of parameters for entry into the database; 3) selection and scheduling of land areas to be added sequentially to the database; 4) acquisition and input of all data essential for inclusion in the database; 5) implementation of updating and overlay capabilities; 6) development of capability to extract interpretive information from the database; and 7) transfer of the technology to the user community.

A Comparative Study of Economical Rain Gauges. Shawn B. Harley and John T. Snow, Department of Earth and Atmospheric Sciences, Purdue University, West Lafayette, Indiana 47907.—Schools, hobbyists, and farmers interested in measuring rainfall often use small, inexpensive rain gauges. During 1986-1987, the testing and evaluation of several models of inexpensive rain gauges was carried out at the Cherry Lane Meteorological Observational Facility on the campus of Purdue University in West Lafayette. The catch of the small orifice rain gauges was compared to the catch of a standard National Weather Service eight inch dipstick rain gauge.

The tested rain gauges will be described, and the advantages and disadvantages of the different models presented. The results of the comparison tests, and the appropriateness of using small orifice rain gauges will be discussed.

Contribution of Organic Fractions to Soil Spectral Reflectance. T.L. Henderson, M.F. Baumgardner and D.E. Scott. Department of Agronomy and USDA-ARS, Purdue University, West Lafayette, Indiana 47907.—In recent years, high-altitude remote sensing has emerged as extremely important technology for monitoring the earth's agricultural resources. A thorough understanding of factors influencing soil

spectral reflectance is essential if satellite-generated remotely sensed data are to be applied successfully to soil survey. While it is well known that increased soil organic matter content causes an overall decrease in soil reflectance, the effect of individual soil organic fractions on reflectance at specific wavelength bands has not been investigated. This study attempts to identify the contributions of the humic and fulvic acid fractions to soil reflectance. Organic matter from four Indiana soils is extracted and then fractionated, purified and freeze-dried. Reflectance is measured in 10 nm bandwidths over a wavelength range of 0.52-2.32 μm with an Exotech 20C spectroradiometer. The reflectance curve for each organic fraction will be compared to that of the unalterd soil sample. It is expected that specific diagnostic features may be found in the reflectance curves for humic and fulvic acid which may be useful for soil characterization using remotely sensed data. Preliminary results will be discussed.

The DNA PHETS Dust Devil Census. Thomas M. McClelland and John T. Snow, Department of Earth and Atmospheric Sciences, Purdue University, West Lafayette, Indiana, 47907.—In June, 1985 a large dust devil damaged a critical piece of instrumentation during an experiment funded by the Defense Nuclear Agency at White Sands Missile Range (WSMR), New Mexico. To help prevent such accidents in the future, a dust devil study was conducted in the northern part of WSMR from mid-May through August, 1986 and again through April and May, 1987. The central part of the study was a census to determine the spatial and temporal distributions of dust devils in the area. Along with the dust devil occurrence data taken by observers, there are data available from a 10-meter meteorological tower located near the center of activity. Combining and analyzing these data sets have aided in determining the meteorological conditions favorable for dust devil formation. An overview of the census, some of the results, and some speculations on dust devil behavior will be presented.

Some Astrophysical Aspects of Drought. Gayther L. Plummer, Office of the State Climatologist. University of Georgia. Athens, Georgia.—Dry-weather patterns, often associated with 22-year sunspot cycles, recently with 18.6-yr lunar cycles, and with the planets historically, have frustrated forecasters because recurrences varied imprecisely. Relations to remote astrophysical factors are controversial, but such studies globally have been revived recently. Rainfall especially during April is distinctly patternistic; perhaps cyclic in both Indiana and Georgia. Dry-weather and droughts are related clearly to heliocentric positions and to geocentric distances of the planet Jupiter. Cause-effects are believed to be astromagnetic; that is, magnetic properties within the solar system seem to respond to the dynamo properties of this planet as well as some others. Also, cycles may vary in response, synergistically sometimes and antagonistically otherwise, to astromagnetic interferences. Future dry-weather periods are expected according to the patterns and cycles that appeared; that is, moderate droughts about 1997-1999 and extreme ones about 2010-2015.

Results of a Mass Balloon Launch over Indiana. John T. Snow, Mark D. Conner, Michelle A. Akridge, Thomas M. McClelland and Shawn B. Harley, Department of Earth and Atmospheric Sciences, Purdue University, West Lafayette, Indiana 47907.—On the morning of Saturday 18 July 1987 ninety-eight sets of small balloons, each with a return post card, were launched from the campus of Purdue University, West Lafayette, Indiana. This mass launch was carried out as part of the Purdue University Atmospheric Science Education Project, a summer program for middle school science teachers. As of the time of submission of this abstract, 11 post cards had been recovered, all from the general vicinity of Rochester, Indiana. This paper

describes the launch operations, the collateral experiments conducted to determine the properties of the balloon set, and the results obtained. Particular attention is given to relating the locations from which post cards were returned to likely balloon performance and a plausible trajectory model based on the upper winds observed at Salem, Illinois at 1200 GMT (7:00 AM EST) 18 July 1987. It appears likely that the balloons remained aloft about 3 to 4 hours, reached an altitude of around 18,000 feet, and descended due to diffusion of helium through the latex.

Use of Remote Sensing to Study the Soils of Hungary. A. Szilagyi and M. Baumgardner, Purdue University, West Lafayette, Indiana 47907.—Seventy-three percent of Hungary's 90,030 km^2 is cultivated. The soils of Hungary have been mapped at a scale of 1:10,000 for use in crop management, soil conservation, and land reclamation. Currently three soils research projects are being conducted by the Remote Sensing Centre established in 1981. The objective of one project is to develop an effective methodology of photointerpretation for large scale soil mapping. The objective of a second project is to prepare a manual of photointerpetation for soil and water conservation engineering, particularly in waterlogged areas. The third project involves the comparison of multispectral and multitemporal Landsat thematic mapper and SPOT data for soil and crop mapping in a test area of the Hungarian Plain. Preliminary results indicate that many anomalies related to crop conditions, waterlogging, alkalization and soil erosion can be delineated by computer-implemented spectral analysis of high resolution data.