

SOIL AND ATMOSPHERIC SCIENCES

Chairman: FRANK W. SANDERS, Soil Conservation Service
5610 Crawfordsville Road, Indianapolis, Indiana 46224

HARRY M. GALLOWAY, Department of Agronomy
Purdue University, Lafayette, Indiana 47907
was elected Chairman for 1976

ABSTRACTS

Procedures and Techniques Developed at the Soil Characterization Laboratory at Purdue University. GARY C. STEINHARDT and DONALD P. FRANZMEIER, Agronomy Department, Purdue University, West Lafayette, Indiana 47907.—A Soil Characterization Laboratory has been established in the Agronomy Department of Purdue University as part of the accelerated soil survey program for Indiana. The purpose of this laboratory is to analyze soils submitted by field soil scientists to assist in the classification and mapping of the soils. The analyses that are required on each sample include: particle size distribution, pH, cation exchange capacity, exchangeable bases, extractable acidity, percent base saturation, and organic carbon. Each of the analyses performed by the laboratory follows a standard method but in serving the needs of a large field staff rapid techniques to analyze large numbers of samples were developed. These techniques allowed the laboratory to reach production goals for one trained analyst of 30 particle size analyses per day or 32 extractable acidity, 32 exchangeable bases per day, and 30 organic carbon analyses per day. An important element in the laboratory operation has been the use of the MIRACLE computer project to calculate data. It does in a matter of a few minutes what would take hours using conventional calculators.

Time-Lapse Techniques for Everyone. C. R. CHURCH, Geosciences Department, Purdue University, West Lafayette, Indiana 47906.—Meteorological and agricultural events have a common feature in that they occur on a time scale which is long compared with that of human activity. Time-lapse photography is a valuable aid in gaining a clearer perception of the physical development or behavior of such phenomena. Sophisticated time-lapse systems are available at sometimes prohibitive cost. This paper, on the other hand, outlines how time-lapse sequences can be made reliably through simple modifications to different inexpensive movie cameras. Various time-lapse techniques are reviewed, together with criteria for determining which to use. General details of how each may be implemented are presented. Procedures for selection of lenses, uses of filters, and determination of exposure settings are provided. Time-lapse film sequences of convective clouds are shown to demonstrate the quality of the end product.

The Classification of the Soil Formed from the Kope Formation of Ordovician Age Soft Calcareous Shales and Limestone in Southeastern Indiana. L. D. NORTON and A. L. ZACHARY, Purdue University, Lafayette,

Indiana 47907.—This study presents field and laboratory data to characterize the soils formed from the Kope formation of Ordovician Age soft calcareous shales and limestone in Dearborn and Ohio counties. The problem was to determine if a new soil series should be established for these soils. There were two areas of concern about the classification: first, the amount of coarse fragments—whether these soils contained enough coarse fragments to be placed into a skeletal family, and second the kind of clay minerals in the clay fraction. It was determined that these soils contained less than 35% by volume of coarse fragments in the control section so they are not in a skeletal family. There was no one dominant clay mineral present in the clay fraction. These soils would therefore classify as members of the fine, mixed, mesic family of Typic Hapludalfs in Soil Taxonomy and are being mapped as the Pate Series.

Comparison of Soils and Residues with Soybeans in Pots Using Subirrigation. RUSSELL K. STIVERS, Department of Agronomy, Purdue University, West Lafayette, Indiana 47907.—Sampled portions of the plow horizon of eight high yielding soils, each with and without incorporated ground corn (*Zea mays* L.) stover residues were compared in growing soybeans (*Glycine max* L.) outside in clay pots during June, July, and August 1975. Six randomized replications were used. Water was supplied by subirrigation when necessary. Above-ground portions of the soybean plants were measured for height, harvested, and dried when the first pods began to form. Plants grown on Brookston, Ragsdale, and Iva soils had more dry matter than those grown on Crosby, Reesville, and Zipp soils. The same trend was evident in the height measurements. Incorporated corn stover residues produced shorter plants with lower dry matter yields than did the no residue treatment. Leaf composition data and root studies suggested that high soil moisture accompanying subirrigation may have limited root nodule effectiveness in supplying nitrogen.

Soils and Their Interpretations. H. RAYMOND SINCLAIR, United States Department of Agriculture, Soil Conservation Service, Indianapolis, Indiana 46224.—Soils as they are to the users of soil surveys consist of taxonomic units and mapping units. Taxonomic units are for the sole purpose of being useful. Mapping units are based upon the principle that certain soils are more similar than others and therefore respond the same to similar use and management. Interpretations of soils reflect the knowledge acquired through observations, studies, and research.

Denitrification in Indiana Lake, Pond, and Reservoir Sediments. RICHARD E. TERRY and DARRELL W. NELSON.—Denitrification is a microbial transformation of nitrogen which converts nitrate to nitrogen gas. In view of the problems associated with the increased fertility and subsequent eutrophication of surface water it is important that more be known about the capacities of lake, pond, and reservoir sediments for denitrification. The denitrification rates of sediments from 12 Indiana lakes, ponds, and reservoirs were determined in the laboratory. Denitrification rates of 51 to 171 $\mu\text{g NO}_3^-$ —N per g of sediment per day were

observed in 5 lake sediments, whereas, denitrification rates of from 28 to 71 $\mu\text{g NO}_3^-$ -N per g of sediment per day were observed in 7 pond and reservoir sediments.

The chemical properties of the 12 sediments were determined and compared with the denitrification rates of the sediments. Simple correlation techniques revealed that only the calcium carbonate content of sediments was related to denitrification rate. The 12 sediments exhibited large capacities for nitrate removal by denitrification. The findings show that denitrification in sediments may be an important factor in the nitrogen budget of lakes, ponds, and reservoirs. The levels of nitrate in surface waters may be limited naturally by denitrification in the sediments.

Computation of Potential Evaporation on an Hourly Basis Using Online Computer Acquisition and Processing. W. A. BRUNS and A. R. PEREIRA, Department of Agronomy, Purdue University, West Lafayette, Indiana 47907.—A computer based data acquisition and processing system is used to record and store meteorological data through the MICROS/MIRACLE system at Purdue University. The data are available to the user in realtime, and computer processing of these data provides for the immediate application of the meteorological data. An example of the application of the system is demonstrated by the computation of potential evaporation on an hourly basis using the Van Bavel combination approach (1966). Comparison of the calculated values with other methods of determining potential evaporation are given.

The Effect of Soil Moisture on Pan Evaporation. ROBERT F. DALE and KENNETH L. SCHEERINGA, Agronomy Department, Purdue University, West Lafayette, Indiana 47907.—Crop production in the Corn Belt is largely controlled by the soil moisture supply and attendant atmospheric evaporative demand. The most widely accepted method of estimating the potential evaporation (E_0) is the Penman equation, which includes both the net radiation and advected energy components. Measurements from evaporimeters are also widely used. Because of "microadvective" conditions, measurements of evaporation from the Class A pan usually are higher than the Penman estimates of E_0 , requiring pan calibration for the local environment. The microadvective effect, sometimes called the "oasis" or "clothesline" effect, was evaluated empirically as a function of the plant available soil moisture (PAV) in the top 15 cm. When soil moisture near the weather station was at full water holding capacity (100% PAV), E_0 was very close to pan evaporation (E_p). The E_p/E_0 ratio increased with decreasing soil moisture, being about 1.2 with 60% PAV, and 1.4 with 20% PAV.

Radar Indications of Weather Modification. LAWRENCE A. SCHAAL, Agronomy Department, Purdue University, West Lafayette, Indiana 47907.—Because known ground based seeding of clouds in northern Indiana with silver iodide was taking place in the summer of 1974, it was decided to review the pictures of the radar scope taken at Marseilles, southeast of Chicago. The National Weather Service radar has a range of 250 miles. The film reviewed consisted of pictures taken about every 6 minutes from

mid-July to mid-August whenever activity was occurring. The film can be shown in time-lapse mode or viewed one picture or frame at a time.

The simple review technic was to use an overlay showing the location of the Indiana seeding stations as indicated by the commercial seeder and observe if any rain echoes occurred exclusively at or downstream from the station. Widespread rain cloud masses were exempt from consideration. The author selected 5 cases where rain appeared to be local to the seeding point. After their selection it was learned that in two cases seeding was in progress. It is obvious that results were inconclusive as were those in Michigan by Dale Linvill and Joe Waters. They counted the number of storm cells passing through two target areas and corresponding selected control areas in central Lower Michigan using Detroit radar pictures. In one pair of areas the target area had a higher count than the control area. It was the opposite in the second pair of areas with the control area having the higher count.

It is apparent that the seeding activity was not of sufficient consequence to show up in an obvious way on the radar scopes at Marseilles or at Detroit.