

SOIL AND ATMOSPHERIC SCIENCES

Chairman: DONALD P. FRANZMEIER

Department of Agronomy, Purdue University, West Lafayette, Indiana 47907

Chairman-Elect: ROBERT F. DALE

Department of Agronomy, Purdue University, West Lafayette, Indiana 47907

ABSTRACTS

Clay Mineral Study of Soils from the Savannah River Plant South Carolina. E. A. MATNEY and R. V. RUHE, Water Resources Research Center and Department of Geology, Indiana University, Bloomington, Indiana 47405.—Six soil samples from the Savannah River Plant, located near Aiken, South Carolina, were studied to determine the nature of the clay minerals. This paper concentrates on the identification and estimation of clay mineral content. Oriented slides of the $<2\mu\text{m}$ fraction of the soils were x-rayed before and after heating for 15 minutes at 450°C and 600°C , and after vaporization for 48 hours with ethylene glycol. Kaolinite ($7.2\text{\AA}$) and a $14\text{\AA}$ clay mineral dominated the suite. The $14\text{\AA}$ mineral is problematic in that it is nonexpansible and poorly collapsible. Upon heating at 450°C and 600°C , and $14\text{\AA}$ peak collapses to a plateau from 14 to $10\text{\AA}$. After a selective dissolution procedure, it is concluded that the $14\text{\AA}$ mineral in these soils is an interlayered chlorite-vermiculite. Clay mineral content was estimated using a modification of a method proposed by Ruhe and Olson. Increasing proportions of soil clay is added to a constant standard composed of equal parts by weight of the $<2\mu\text{m}$ fraction of a Georgia kaolinite and a Texas montmorillonite. The mixtures were prepared for x-ray powder diffraction analysis and x-rayed after vaporization with ethylene glycol. Peak areas were measured and intensity ratios calculated. These ratios were plotted against % soil clay. Estimation equations were derived and used to determine the amount of kaolinite and the $14\text{\AA}$ clay mineral in each of the soil samples.

Parent Material—Landscape—Soil Interrelationships in Jefferson County, Indiana ALLAN L. NICKELL, United States Department of Agriculture, Soil Conservation Service, Madison, Indiana 47250 and STANLEY M. TOTTE, Department of Geology, Hanover College, Hanover, Indiana 47243.—The soils of Jefferson County have formed from widely diverse parent materials ranging from limestone, dolomite, and shale bedrock to unconsolidated sand, silt, and clay deposited by glaciers, streams, and wind. The relationship between parent materials and soil morphology is a direct one, and the presence of a particular soil is a strong indication of the type of geologic material in which the soil formed. Because of the polygenetic origin, soil scientists need to correlate their mapping with that of geologists and geomorphologists in the local survey area.

During the process of conducting the Jefferson County Soil Survey, many joint field studies were made by soil scientists, geologists and geomorphologists for the purpose of determining interrelationships among parent materials, landscapes and soils. Studies were made by transect, some holes were drilled with a core drilling machine, and much valuable knowledge was also accumulated and recorded in notes during the process of mapping as the soil scientists traversed the land.

The bedrock exposed in Jefferson County belongs to the Ordovician, Silurian,

and Devonian systems of the Paleozoic Era. These rocks were deposited as fine grained shale and limestone in shallow marine waters from about 450 to 350 million years ago.

Jefferson County was covered by continental ice sheets two or three different times in the last 1 million years. These glaciers diverted the drainage of southeastern Indiana across the divide at Madison to form the Ohio River, but the most significant contribution of the glaciers was the deposition of till and outwash which are important soil parent materials.

Melting of Illinoian ice resulted in deposition of terrace gravels along Big Creek in the northwestern part of the county.

The Wisconsin ice advance did not reach as far south as Jefferson County, but meltwaters of this last ice advance deposited large quantities of sand and gravel outwash in the Ohio River Valley.

Following melting of the last of the ice sheets about 14,000 years ago, rivers and streams have modified the landscapes slightly, and have cut new floodplains into the underlying materials. These modern floodplains contain alluvian deposits of clay, silt, sand, gravel, and cobbles.

The joint studies made by geologists, geomorphologists and soil scientists have proven the value of cooperating among these disciplines in collecting and analyzing field and lab data.

The Varying Length of the Growing Season in Indiana. LAWRENCE A. SCHAAL, Department of Agronomy, Purdue University, West Lafayette, Indiana 47907.—The recent trend of colder winters in Indiana causes speculation that the length of the frost-free season is becoming shorter. The answer to this question lies in the comparison of early and late years of frost data recorded by over twenty climatological stations located in Indiana. Data begin in the 19th century. From such data we ascertain the short term trend, the intermediate and the over all trend of the growing season length. By definition and early years of observations, the period from the day of the last freezing temperature (0°C.) in spring to the first day of 0°C. or colder in the fall serves to define the frost-free season or the warm season crop growth period. Conflicting deductions of growing season length trend come from the varying length of historical data used in coming to conclusions.