

Geological Society of America,
Abstracts with Programs, v. 24, no. 7, p. A-216. 1994

SIGNATURES OF PENNSYLVANIAN CLIMATES IN THE CLAY MINERAL ASSEMBLAGES OF THE APPALACHIAN BASIN

YEMANE, Keddy and PFEFFERKORN, Hermann, Department of Geology,
University of Pennsylvania, Philadelphia, PA 19104-6316

An exploratory research on the semi-quantitative distribution of clay mineral assemblages attempts to trace climate changes in the Appalachian Basin throughout the Pennsylvanian (Late Carboniferous). The clastic rocks studied in this project were procured from the permanent U.S.G.S. collection of the Pennsylvanian System Stratotype from the Appalachian Basin in Virginia and West Virginia. One hundred flood plain mudstones and muddy siltstones containing identified plant remains were selected for the study. Data were gathered from petrographic studies on thin sections and XRD analyses on powdered bulk samples and $<2\mu\text{m}$ sediment fractions. Clay minerals were identified from patterns on regular, glycerolated, and dehydrated preparations of each specimen and abundances were quantified from integrated area of first-order peaks (intensity) from the glycerolated preparations. The relative abundances were standardised and plotted against a compiled stratigraphy of the Pennsylvanian.

The clay minerals vary in kind and in relative distribution within and between the different Formations. Illite-Kaolinite-Chlorite and Illite-Kaolinite are the most common clay mineral assemblages. Smectites and a mixed layer identified as smectite-chlorite, which first appeared in Kanawha, occur in the Monongahela and Conemaugh Groups. The New River and Pocahontas Groups contain less chlorite and abundant illite and kaolinite. Smectite and mixed layers also occur in the continental rocks of uppermost Mississippian rocks, whereas the Dunkard contain abundant illite and kaolinite and no smectites. The data suggests that although there were considerable short-term climate fluctuations, the long-term climate cycle remained fairly stable throughout the Lower and Middle Pennsylvanian. The first signs of marked seasonality appeared only in Late Pennsylvanian during Conemaugh and Monongahela times. The clay mineral assemblages seem to be consistent with the equatorial palaeogeography of the Appalachian Basin which did not change significantly during the entire Pennsylvanian.