

CRITERIA TO AID IN THE ESTABLISHMENT OF GENETIC BOUNDARIES WITHIN A CARBONIFEROUS BASIN; MARY LEE COAL ZONE, BLACK WARRIOR BASIN, ALABAMA

Terry Wayne Bryant and Robert A. Gastaldo
Department of Geology, Auburn University, Alabama, 36849

ABSTRACT

The upper portion of the Mary Lee coal zone of the Lower Pennsylvanian (Westphalian A) Pottsville Formation in northwest Alabama is composed of the Mary Lee and the Newcastle coal seams. The Mary Lee coal seam has been economically significant in terms of both mining and coalbed methane production. A sedimentological, paleontological, and geochemical investigation of the lithologies associated with this coal zone was undertaken in order to define the changes that occur from terrestrial into marine facies. A ravinement bed ranging in thickness from 13.0 to 60.0 centimeters, marks the boundary between marine and terrestrial deposits. Fifteen surficially exposed sections were observed and sampled in the study area.

Geochemical analyses were conducted on samples collected from seven sections along the perimeter of the study area. The analyses conducted involved inductively coupled atomic plasma spectrometry (ICAP) for seven elemental oxides that include aluminum, iron, silica, calcium, potassium, magnesium, and manganese. Atomic absorption was utilized to determine sodium content. Carbonate carbon was determined by weight percent difference after hydrochloric acid treatment, whereas organic carbon content was determined by use of a carbon analyzer on a LECO induction furnace. Sulfur content was also determined by a LECO induction furnace equipped with a sulfur analyzer. Loss-on-ignition (LOI) percentage was based upon change in weight of samples after a period of 30 minutes in a muffle furnace at a temperature at 1000 degrees celsius.

The combination of sedimentological, paleontological, and geochemical characteristics have been utilized in order to better understand the depositional setting of the upper Mary Lee coal zone in terms of a transgressive event. These criteria can be used in similar basin systems to better understand the depositional history of those settings.