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Nicholas B. Harris[1] (1) Department of Geosciences, The Pennsylvania State University, University Park, PA

Organic Carbon-Sulfur Relations in Lacustrine Shales of the West African Basins: Implications for Paleoclimate and Source Rock Potential

The chemical composition of Early Cretaceous syn-rift shales from the Gabon, Congo and Kwanza basins has been analyzed for sulfur and total organic carbon (TOC). Organic carbon - sulfur trends in the three basins define very different trends: 1) Gabon - low sulfur and low correlation with %TOC and a possible slight decrease in sulfur with %TOC; 2) Congo - low to moderate sulfur, strong correlation with %TOC and moderate increase in sulfur with %TOC ; 3) Kwanza - moderate to high sulfur, strong correlation %TOC and strong increase in sulfur with %TOC. The sulfur - organic carbon trends coincide with clear differences in sedimentary lithology and structures. The Kwanza sedimentary section shows clear indications of aridity, including common carbonate beds, red beds, shallow water lakes and evaporites. The Congo section generally shows restricted carbonate beds, deep to moderate depth lakes, rare evaporites and no red beds. The Gabon section shows no carbonate beds, deep lakes and no evaporites or red beds.

The carbon-sulfur data are interpreted in terms of paleoclimate. The Kwanza basin section, with geochemical similarities to the Green River Formation, reflects evaporative concentration of both carbon and sulfur in the rift lake. The high concentration of sulfur may have represented a significant oxidizer of organic carbon in the rift lake. In the Gabon basin, processes that concentrate sulfur may have the effect of slightly diluting organic carbon.