Volcanic Ash Fall the Key to Organic Shales

Douglas M. Parker[1]

[1]Independent Geologist, Highlands Ranch, CO

ABSTRACT

Volcanic ash fall is the most important cause for the existence and preservation of organic rich shales. If this hypothesis is confirmed, the implications are many. Formation of organic-rich shales correlates with high water column productivity rather than anoxia. Coastal upwelling occurs in about one percent of the world's oceans today. Upwelling concentrates sediments locally or regionally and does not adequately explain thin shale laminations extending across large percentages of particular sedimentary basins. Cretaceous organic rich shales were induced by an undefined mechanism associated with massive volcanic events. Ash fall causes a phytoplankton bloom and, potentially, temporary sea floor anoxia. Ash fall has been concluded to cause the organic richness of many tight oil plays and at least one Triassic lacustrine shale. Organic rich shales and coals possess many layers of bentonites and tonsteins. Hundreds of thin layers of volcanic ash have been documented in the Niobrara shale, all below electric log resolution. Sixty-five layers of volcanic ash have been documented in the Paleocene Big Dirty coal bed. The Eagle Ford contains abundant ash beds of varying thickness rich in planktonic foraminifera, indicating that high production may be triggered by nutrient flux associated with ash fall. Extrapolating from the Smithsonian Global Volcanism database, 11,700 eruptions of VEI 6 or greater (Krakatoa) could have occurred worldwide during a 3 million year depositional period for the Eagle Ford shale. Cores through productive shales should be analyzed for thin volcanic ash layers and their weathered remnants intermingled with other sediments.