Discrimination of Volcanic Ash in the Gulf of Mexico Using Trace and Rare Earth Elements

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ABSTRACT

Sands rich in volcanic ash have been encountered within the late Cenozoic sequence offshore Louisiana in the northern Gulf of Mexico. These beds are identified on well logs by their high radioactivity and low density. Paleontological markers used to date these deposits are consistent with the timing of eruptions from the Snake River Plain (SRP) and Yellowstone calderas. Lead isotope ratios from the Gulf of Mexico samples are also consistent with the SRP-Yellowstone tuffs. The objective of this study was to compare the trace and rare earth element (REE) data from the Gulf of Mexico samples to determine whether they may be differentiated from one another, and also whether they correlate to the SRP data.

Well cuttings and sidewall core samples from sixteen wells known to contain volcanic ash were density separated using lithium metatungstate to isolate the low-density volcanic glass from the remaining minerals. The concentrated ash was dissolved and analyzed using ICP-MS (inductively coupled plasma mass spectrometry). Trace and REE variations were plotted by depositional age based upon paleontological markers.

Variations in most trace elements are not useful criteria for discriminating ash by age. There is a wide spread in fairly mobile elements (e.g., Ba), suggesting that each ash bed has had a different diagenetic history. REE variations, in particular the magnitude of the Europium anomaly, are good discriminates of each ash. A few anomalous samples plot within an older field, which might be explained by the reworking of older ash into younger deposits. Direct correlation to SRP-Yellowstone eruptions is hindered by the lack of SRP samples analyzed using similar methods.

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