

The Occurrence and Seismic Expression of Volcanic Ash Beds in the Gulf of Mexico

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ABSTRACT

Volcanic ash beds within the Green Canyon, Ewing Bank, and southern Ship Shoal offshore areas of the northern Gulf of Mexico have been encountered in numerous oil and gas wells. The Yellowstone Huckleberry Ridge ash (2.06 Ma) is the source for many of these ash-rich intervals. This study describes six Plio-Pleistocene occurrences of volcanic ash identified based upon log and seismic signatures, and confirmed with samples. Inverted SP and GR curves concurrent with a decreasing downward density trend through the ash-bearing interval mark a well-established ash log signature. The low densities observed at ash-filled channel bases contrasts with the higher densities of underlying sediments. A large acoustic impedance contrast is observed in synthetic seismograms generated from density and sonic logs of these ash-bearing intervals. Correlation of the synthetically generated seismic response with available 3-D seismic facilitates mapping of corresponding seismic amplitude events. We interpret these ash deposits as occurring within higher-order depositional features within upper-slope amalgamated channel complexes.

A model of transport has been inferred from previously documented outcrops of continental ash deposits and the occurrence of the same genetically related material in the deep-water Gulf of Mexico. As a result of the Yellowstone eruptions, volcanic ashes were deposited over a broad area of the continent. Fluvial processes transported these sediments to the continental shelf of the Gulf of Mexico. During the Gelasian 1 stage lowstand, the ashes from the Huckleberry Ridge eruption were re-worked, both from continental deposits and the Gulf of Mexico shelf, and incorporated into upper-slope channels of the deep Gulf Basin.