Onshore Structural Movement Revealed through the Presence of Volcaniclastic Deposition Offshore — Cholula-1EXP, Miocene Salinas del Istmo Basin, Mexico

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Abstract

In February of 2019 Murphy Oil drilled the Cholula-1 wildcat discovery-well in the Salinas del Istmo Basin, southern Gulf of Mexico. The well was positioned slightly off the crest of a complex compressional structure and encountered 64m net pay in the Late Miocene. The well drilled to a total depth of 2746m penetrating Late, Middle and Early Miocene strata. Post well analysis of wireline logs, cuttings, and sidewall cores indicate multiple episodes of volcaniclastic deposition, particularly in the lower parts of the Langhian, mid & upper Serravallian as well as a single pulse in the lower Messinian. Volcaniclastic material was not noted within the Tortonian interval though it seems likely that their presence is obscured by significant amounts of sand deposited by turbidity currents. Standard petrophysical analysis performed on the Cholula-1 well revealed the presence of multiple layers of volcaniclastic material within the Miocene, having a typical low density & high resistivity expression. Image-log also detected the volcanics through a similar resistivity response but at a higher resolution. The identification of the volcaniclastics was confirmed though rotary side-wall core analysis and thin-section examination. The appearance of the volcaniclastic material in thin-section is of well-preserved acicular volcanic glass implying relatively little transport or reworking. We interpret these to have been derived from volcanic ash-fall that settled though the water-column to be buried on the seafloor. The exception to this is the single pulse of volcaniclastic in the Tortonian in which the acicular fragments appear

more broken and mixed with other sediment. We believe that this material has undergone some form of physical transport either in turbidity currents or possibly through the action of geostrophic currents. The occurrence of these episodes of volcaniclastics deposition coincides or closely post-dates important stratigraphic boundaries. The cluster of volcaniclastics in the lower Langhian occurs after a sequence boundary marking the base of that stage. More importantly however is that the cluster of volcaniclastics occur after a significant unconformity and hiatus in the Middle Miocene at the Langhian-Serravallian boundary. We believe that the hiatus seen in the Cholula well is a result of compression onshore at the onset of the Chiapanecan Orogeny, resulting from the subduction of the Cocos Plate beneath the North American plate (Gutiérrez-Paredes et al, 2018) and we speculate that the presence of the volcaniclastics post-hiatus relate to volcanic activity that resulted from this subduction event. Further we believe that the presence of volcaniclastics that tie to sequence boundaries in the offshore present opportunities to enhance regional correlations in the Salinas del Istmo Basin.