

Interpretation Visualization in the Petroleum Industry

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ABSTRACT

Current high-end visualization (using Insight Earth software) of various salt and sediment features in the Gulf of Mexico from use of watershedding, corendering, and other visualization technologies lead to insights. These insights include economically important findings related to structural history, depositional stratigraphy, and drilling environment parameters. Examples include a documented thrust extrusive body near Mad Dog and the documented Rum roho allochthonous salt sheets as originally detailed by other authors. Watershedding is a descriptive term for volume segmentation, which is a statistical technique for dividing a volume into different regions as demonstrated by use of a watershed algorithm. This algorithm separates a volume into regions based on the grayscale value of an attribute, and falls into the class of algorithms that are used for image processing. The result is the creation of enclosed contoured regions, called “basins” and “watersheds,” that mark the division of discrete regions based on a selection criterion within an area of interest. Segmenting the structural analysis of a seismic volume in this fashion allows for the creation of attributes that may be useful for structural interpretation, seismic facies analysis, and geologic reservoir modeling. Watershedding yields internal structural details within salt bodies which are difficult to discriminate on typical reflectivity data due to low reflectivity or low reflectivity contrast. The ability to see internal salt structure gives the interpreter the opportunity to image overturned sections near the base of salt bodies and recurrent toe thrusts which resemble offset stacked anvils. Identifying and mapping these features can lead to the ability to characterize intra-salt boundaries for drilling risks. Visualizations of the Rum roho enhance understanding of regional and local stresses. Inferences of pre-roho stratigraphy may impact many phases of asset assessment.