

Analysis of Mass Transport Deposits in the Deepwater Gulf of Mexico using High-Resolution Non-conductive Mud Borehole Images

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Abstract

Every aspect of exploration in the deepwater Gulf of Mexico (GOM) is difficult and fraught with hurdles. Fortunately, technological advances can provide much needed solutions to encountered challenges. For sub-seismic scale geological interpretation in wells drilled with oil-base mud, new high-resolution large-coverage borehole imager technology now allows geoscientists an up-close look at the wellbore geology.

The clarity of the sedimentary features seen in the new borehole images is a much needed enabler in sand depositional environment studies. At the same time, this clarity is also present in the shales, and is revealing a lot more information about the deepwater GOM shales than has been understood comprehensibly till now. As might be expected, a lot of the footage of the shales encountered is composed of the quiet, low energy, thinly laminated shale. The new borehole images allow the geologist to see another very important type of shales – those deposited by mass transport processes. This paper presents a study showcasing details of some deepwater Gulf of Mexico mass transport deposits (MTDs) observed in the new bore-hole images. Included are examples of various parts of these deposits representing different movement and deposition mechanisms – everything from small debris to large mass movement blocks. An image based classification is also discussed.

MTDs can have profound implication on reservoir continuity, from erosion of small sections of deposited sands to complete redirection of sand body deposition. In the vicinity MTDs, low values of gamma ray curves, representing sands, need to be validated with borehole images or whole cores to ensure that it not a signature of a mere transported boulder of sand, or other such feature associated with MTDs. Extreme caution needs to be taken that such zones are not considered for completion. By means of the new high resolution borehole images, the development geologist now has a powerful tool to understand the impacts of mass transport deposits or complexes to the field being developed.