

Investigation of Devonian Unconformity Surface Using Legacy Seismic Profiles, NE Alberta

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Abstract

The Devonian Grosmont Formation in northeastern Alberta is the world's largest accumulation of heavy oil in carbonate rock with estimated bitumen in place of 64.5×10^9 m³. Much of the reservoir unconformably subcrops beneath Cretaceous sediments, known as Devonian Unconformity (DU). This study described the reanalysis and integration together of legacy seismic data sets obtained in the mid 80's. Standard data processing was carried out supplemented by some more modern approaches to noise reduction. These reprocessed data was then used for construction of time surfaces of some key horizons both above and below the DU. The seismic maps show substantially more detail than those constructed on the basis of well log information only. Although features smaller than about 40 m in radius could not be easily discerned at the DU due to wave-field and data sampling limits, the data does reveal the existence of a roughly E-W trending ridge-valley system. A more minor NE-SW trending linear valley also is apparent. These observations are all consistent with the model of a karsted/eroded carbonate surface. Comparison of the maps for the differing interpreted horizons further suggests that deeper horizons may influence both the structure of the DU and even the overlying Mesozoic formations. This suggests that some displacements due to karst cavity collapse or minor faulting within the Grosmont occurred during or after deposition of the younger Mesozoic sediments on top of the Grosmont surface.