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Influence of Salt Tectonics on the Deposition of Deep-Water Marine Deposits, Jeanne d'Arc Basin

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Summary

The Jeanne d'Arc Basin is located in the north-eastern region of the Grand Banks of Newfoundland. While the basin is well-known for its prolific hydrocarbon deposits found in thick shoreface and fluvial packages, it is less well-known for deep water marine deposits. The complex structural history of the Jeanne d'Arc Basin includes significant structural extension and normal faulting, accompanied by mobilization of deep salt layers. Within the project area is the Adolphus salt diapir complex, one of a few large salt structures within the basin. Sedimentation in the Adolphus region was likely locally affected by salt tectonics by overthickening of the overlying deposits in peripheral structural lows and thinning over structural highs.

The project consisted of detailed seismic mapping of two 3D seismic volumes allowing for the recognition of several geological elements. Two wells in the region were available to tie to the seismic data for this study. Both wells penetrated the key Aptian–Albian unconformity that is a key surface which underlies important sediment deposition pathways in the early Albian. Across the study area, strong seismic amplitude anomalies were observed within the Albian Nautilus Formation adjacent to the Adolphus salt diapir complex. Seismic amplitude extractions are interpreted to show the presence of a large-scale deep marine depositional system within the Nautilus Formation, known informally as the Badger Fan.

The Badger Fan is mapped as a widespread (~170km2) negative seismic amplitude anomaly situated on the basin floor between the interpreted submarine canyon and the Adolphus salt diapir complex. It is stratigraphically the lowermost anomaly within the Nautilus Formation, overlying the major Aptian-Albian unconformity. The amplitude anomaly clearly displays the transition from confined submarine canyon to unconfined basin floor sedimentation. The shape of the Badger Fan likely represents interplay between deepwater turbidite systems and the Adolphus salt diapirs during deposition in the early Albian. Sand trends are interpreted to be influenced by salt diapirism which influenced the depositional patterns, while fine grained deposits were more widespread and were less confined by seafloor topography. These findings support the existing knowledge base for submarine fan deposition being influenced by sea floor salt diapirism.

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