

Correlation of the Early Cretaceous Naskapi Member, Scotian Basin, Canada, and its implications

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The Naskapi Member of the Logan Canyon Formation, a 150 m thick shale-dominated unit, overlies the sandy Upper Missisauqua Formation and is overlain by the sandy Cree Member. Previous studies have suggested that the great decrease in sediment supply resulted from tectonic and/or eustatic changes. The tectonic hypothesis suggests that uplift of the Meguma block diverted rivers draining Labrador along the re-activated Cobequid-Chedabucto-SW Grand Banks fault system. This resulted in sand supply through the Bay of Fundy to the Shelburne subbasin, consequently allowing shale to accumulate farther east in the Scotian Basin. The eustatic hypothesis proposes that global high sea-level stand during the Aptian allowed a fully marine environment for the deposition of the shale of the Naskapi Member, trapping coarser sediment inboard in flood plains and estuaries.

Wireline logs and recent biostratigraphy of 27 wells from the Scotian Shelf and Georges Bank were examined. Minor sandy intervals based on gamma and sonic log signatures from the type section in the Cree E-35 well were correlated to progressively more distant wells, on the assumption that the sands represent periods of lowered eustatic sea level, as demonstrated from conventional core in the Panuke B-90 well. Correlation was confirmed by the distribution of highstand black shales in washed cuttings and biostratigraphic markers identified in some wells. The bottom of the Member is characterized by an abrupt change in sedimentation from sandy to shaly, corresponding to the Barremian-Aptian Unconformity. The top of the Member is more complex and its boundary with the sandy Cree Member is diachronous, but in most wells, including the type section, it corresponds to a relatively thick and blocky sandy unit. This lithostratigraphic marker is not seen in the more shaly outboard wells, for example, Evangeline H-98.

The eustatic model is not consistent with the known rates of progradation in the under- and overlying sandy deltaic sequences. Thick Naskapi Member sands are lacking in wells on the southwestern Scotian margin and in the COST G-2 well on Georges Bank. Rather, the shales show similarities of key markers and overall thickness within the Naskapi Member between the Scotian Shelf and Georges Bank wells. This implies that the Labrador rivers were not diverted through the Bay of Fundy. They may have been directed from the Gulf of St. Lawrence northeastwards along the Humber Valley fault system to the Orphan Basin, where Aptian sands were intersected in the Great Barasway F-66 well.