
The ups and downs of Guysborough County –
the mid Cretaceous Naskapi Member in the
Scotian Basin: eustacy or tectonics?

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The Naskapi Member is a distinctive shale unit of Aptian age in the Scotian Basin, underlain by the sandy deltas of the Missisauga Formation and overlain by sandy deltas of the Cree Member. It has been generally regarded as resulting from the eustatic early Aptian transgression, creating a classic highstand systems tract (HST). It has a fully marine biota, contrasting with marginal marine biota in under- and overlying units.

The authors question this classic interpretation. The Naskapi Member thins and onlaps onto a regional unconformity on the Banquereau Platform and in Orpheus graben. The presence of remnants of basalt flows at the Hesper wells, derived from Scatarie Ridge, implies erosion of an emergent Banquereau Platform in the mid Aptian. Only in the Cree Member did significant sediment accumulation resume. Regional seismic reflection profiles suggest Barremian tectonic uplift of the Banquereau Platform, with tilting of the Missisauga Formation and cutting of the regional unconformity. Thus deposition of the Naskapi Member was not controlled solely by eustacy.

The four unconformity-bound units of the Chaswood Formation in the Elmsvale Basin provide a record of related tectonism. The lowest Unit 1 includes ash correlated with the Hauterivian volcanism of the SW Grand Banks. Unit 2 accu-

mulated following uplift of Unit 1 and has low kaolinite, characteristic of the arid Barremian, and is overlain by a pronounced unconformity analogous to the top Missisauga unconformity offshore. Unit 3 includes ash correlated with Aptian volcanism in the Orpheus graben.

Offshore wells show an important change in sediment source in the late Hauterivian to Barremian, with greater input of sediment from the Meguma terrane indicated by more negative ϵ_{Nd} and more metamorphic lithic clasts. In the Scotian Basin, published work on Glenelg and Panuke has shown that the late Hauterivian to Barremian Upper Member of the Missisauga Formation has an overall transgressive character, with maximum regression near the base of the Member. The onset of tilting is interpreted to have occurred in the late Hauterivian, resulting in increased sediment supply from landward of the hinge zone and increased accommodation seaward. Throughout the Missisauga Formation and Cree Member, two rivers entering the basin through Cabot Strait supplied vast amounts of sand. What stopped this sand supply and allowed fully marine conditions to flourish during deposition of the Naskapi Member? It is suggested that the Barremian tilting of the Banquereau Platform culminated in the river pathway being blocked along the Chedabucto–SW Grand Banks fault, so that the only sand supply to the basin was from small local rivers from the Meguma terrane. Whether the blocked rivers found a new route through the Strait of Belle Isle or along the Cobequid fault system and out through the Bay of Fundy is uncertain. The abrupt influx of sand at the base of the Cree Member includes a high proportion of volcanic clasts, implying that the rivers eroded through the Aptian volcanic edifices at that time, restoring the former drainage systems through Cabot Strait.