

Stratigraphic Revelations Regarding Mesozoic Salt on the Scotian Margin and Implications for Early Trans-Atlantic Basin History

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Abstract

Mesozoic salt of the Scotian Margin is traditionally assigned to the Argo Formation, and its palynological age to the Early Jurassic (Wade and MacLean 1990; Barss et al. 1979). On the Grand Banks, two Mesozoic salt formations are recognized: the Late Triassic Osprey Formation and the Early Jurassic Argo Formation (McAlpine 1990). Besides the age distinction, the Osprey Formation is characterised by low Br content in salt (<20ppm), whereas the Argo is characterised by higher Br (60 to >200ppm; Holser et al. 1988). Recent biostratigraphy (Weston et al. 2012) confirmed the occurrence of Late Triassic salt on the southwest Scotian Margin at the Glooscap well. It occurs beneath basaltic tholeiites related to the Central Atlantic Magmatic Province (CAMP; Pe-Piper et al. 1992), the same relationship to CAMP basalts as observed for Grand Banks Osprey Formation. Is this a Scotian Margin equivalent to the Osprey Formation?

In our study we examined the petrography and geochemistry of the salt at Glooscap and 5 other Scotian Margin wells, including stratigraphically in-place (autochthonous) and diapiric salt. As predicted, the Late Triassic salt at Glooscap is indeed low-Br facies (<1ppm) and probably represents Osprey Formation equivalent. All other sites with Early Jurassic ages have much higher Br content (50 to 142ppm), consistent with their continued assignment to Argo Formation.

An earlier, Late Triassic, low-Br salt-dominated evaporite facies followed by CAMP basalts, and then a later, Early Jurassic, high-Br salt is therefore a consistent stratigraphic pattern that extends about 1000km along the Scotian-Grand Banks margins. Intriguingly, the same stratigraphic pattern occurs on the conjugate Moroccan Margin (Et-Touhami 2000). This could indicate a continuous evaporite basin existed during the early phases of Atlantic Ocean opening that evolved from a non-marine salt basin (low Br) to one with direct marine connection (high Br), with the transition occurring almost coincident with eruption of the CAMP basalts. Alternatively, these were isolated basins that evolved in parallel through similar successive evaporite phases. In either case, this stratigraphic history has important implications for the paleoenvironmental and tectonic history of the Central Atlantic on this margin and elsewhere.

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