

Lacustrine source rock potential in the Middle Triassic–Early Jurassic Chignecto Subbasin, offshore Eastern Canada

DAVID E. BROWN

Canada-Nova Scotia Offshore Petroleum Board, 800 TD Centre, 1791 Barrington Street, Halifax, Nova Scotia B4A 3S5,

Canada <dbrown@cnsopb.ns.ca>

Middle Triassic to Early Jurassic synrift extensional basins are exposed onshore eastern North America (Newark Supergroup) and extend into adjacent offshore areas with equivalent basins in Northwest Africa. Organic-rich lacustrine successions occur within the U.S. basins, and although no commercial discoveries have been made hydrocarbon shows in outcrops and a few wells confirmed that a working petroleum system existed. Their basin-fill model defines four tectonostratigraphic (TS) units. TS I is an unconformity-bounded, early synrift fluvial-eolian sequence of Late Permian age. TS II is a dominantly fluvial (with some lacustrine) sequence believed representative of an underfilled, hydrologically-open basin (subsidence < sedimentation). This is followed by either a closed basin or one in hydrological equilibrium (subsidence \geq sedimentation) dominated by lacustrine (TS III) and later playa / lacustrine (and basal CAMP volcanics) successions (TS IV). Climate sensitive lacustrine facies - especially in TS III - are exquisite recorders of paleoclimate, and with paleomagnetic data refine the determination of the basins' paleo-latitudinal positions.

Seismic profiles in the Fundy-Chignecto (Canada) and Newark (USA) basins reveal basin centre, high amplitude, laterally continuous reflections in both TS II and TS III. In the former, they are distal to up-dip fluvial successions and are interpreted as large, laterally equivalent deep-water lacustrine facies. This architecture departs from the TS model by inferring high levels of tectonically driven extension / subsidence and a hydrologically open basin. The seismic reflection character of interpreted fluvial and lacustrine successions mirrors facies associations that correspond to deposition in hydrologically open, overfilled (subsidence \leq sedimentation) and hydrologically open and closed, balanced filled (subsidence \approx sedimentation) lake basin types.

During TS II and III deposition (Late Anisian to Late Norian), paleomagnetic data positions these basins within the north equatorial humid and transitional belts that over time drifted towards the semiarid subtropical zone. Seismic data are interpreted to reveal their successions as representative of overfilled and balanced filled lake basin types. Together, this suggests a favourable setting for the creation of source rock intervals. Therefore, a potential new oil-rich resource play may exist within the faulted and fractured lacustrine successions of the TS II Wolfville and TS III Blomidon formations beneath Chignecto Bay. While recognizing that profound differences in water input, subsidence and resultant stratal successions can exist in adjacent and/or linked lakes, this interpretation may have significant impact for potential source rocks in Late Triassic lacustrine successions in pre-salt synrift basins offshore Nova Scotia and Morocco.