

### Thermal evolution of the Maritimes Basin: A review

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Burial history plots for the various parts of the Maritimes Basin and the surrounding areas have been constructed using the available geological information. The plots were constructed based on present day stratigraphy, minimum stratigraphic thicknesses of the units based on the overall basin facies relationships, unconformities, temperatures necessary to produce the measured vitrinite reflectance, minimum temperature estimates based on the clay mineralogy studies, apatite fission track closure ages, estimates of the geothermal gradient based on the vitrinite reflectance profiles, maximum temperatures based on  $T_{max}$  from RockEval pyrolysis, and maximum temperatures based on Thermal Alteration Index (TAI) measurements. The burial history plots suggest that there was 1-3 km of additional cover throughout most the Maritimes Basin.

The time-temperature paths derived from the burial history plots for the various areas within and adjacent to the Maritimes Basin were corroborated by both forward and inverse modelling. The modelled apatite fission track ages,

distribution of the fission track lengths and the modelled vitrinite reflectance values closely correspond to the measured values. The apatite fission track analyses of the samples from the basin accurately constrain the timing of the additional cover throughout the basin. The thermochronological evidence suggests that an additional 1-4 km of strata were deposited throughout the Maritimes Basin and were subsequently eroded. These sediments accumulated to a maximum thickness in the Permian and were eroded during exhumation that preceded the Triassic/Jurassic rifting of the Atlantic margin. The timing of the maximum burial in the Maritimes Basin has important implications for hydrocarbon generation and preservation. Hydrocarbons produced during the regional maximum burial episode (Permian) would require a very tight cap rock in order to preserve oil and gas to the present day. Basal Windsor Group carbonates and sandstones of the Horton Group that are covered by thick salt and evaporites of the lower part of the Windsor Group represent the most prospective hydrocarbon horizons in the Maritimes Basin.