Geomorphic evolution of Nova Scotia since the Triassic - constraints from fission track analysis and vitrinite reflectance

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Triassic and Jurassic rifting during the break-up of Pangea and opening of the Atlantic Ocean were the last major tectonic events to have influenced Nova Scotia. Since that time, the landscape of Nova Scotia has evolved through processes of landscape denudation. Davisian evolutionary models were first proposed by geologists who envisioned a single Mesozoic cycle of erosion, peneplanation, deposition and rejuvenation. The caveat of an alternative equilibrium model is that present-day landscape relationships have been maintained since the Triassic. The test of these hypotheses is the presence or absence of extensive Mesozoic and Cenozoic cover.

Thermochronological and organic maturity data from Nova Scotia provide constraints on the post-Triassic cooling history of the region and thus have a direct bearing on models of landscape denudation. The maturity of lignite from Cretaceous outliers has been used to suggest prior burial to depths of about 1 km. Previous forward modelling of apatite fission track data from Meguma Group metasedimentary rocks suggested post-Cretaceous heating of rocks presently exposed at the surface to temperatures around *ca.* 60 to 80°C. These earlier suggestions have been confirmed by new apatite fission track data from the Maritimes region and by new vitrinite reflectance data from the Shubenacadie area.

Random search forward modeling of apatite fission track data from Triassic sandstones collected near the Bay of Fundy requires linear cooling below *ca.* 120°C beginning in the Triassic to near-surface temperatures in the Cretaceous, followed by heating to temperatures in the range 50 to 60°C in the Tertiary in order to provide an acceptable fit to the data. Vitrinite reflectance of lignite coals from inferred Cretaceous strata intersected by the Shub 94-5 drill core ranges from 0.31 to 0.48% over depths of *ca.* 100 to 150 m, respectively. This level of organic maturity indicates heating to temperatures up to *ca.* 80°C, as well as suggesting a very high geothermal gradient at the time of peak temperatures. Estimating a former depth of burial from the paleotemperture data is spectulative in the absence of an extensive vertical profile to evaluate, but at least 1 km of additional Cretaceous section is suggested for geothermal gradients typical of sedimentary basins (i.e., 20-40°C/km).

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