

Comparison of apatite fission track length spectra and organic maturation indicators in the Maritimes Basin, eastern Canada

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This study attempts to establish the relationship between apatite fission track length spectra and organic maturation indicators in the Late Devonian to Early Permian strata of the Maritimes Basin, in order to derive thermal profiles for the basin.

Fission track length measurements are compared to the R_o values of vitrinite samples from 1 km deep drill holes in the Cumberland and Sydney basins (sub-basins). The drill holes studied show erratic vitrinite reflectance profiles which are

typical of many drill holes in the basin. In the literature, these have been explained as resulting from variables such as time, temperature, pressure, and oxygen fugacity. The variability of the R_o values may be related to the presence of faults, recycled organic matter, changes in the type of organic matter, proximity to intrusions, thermal conductivity contrasts related to lithologic boundaries, coalification jumps, and gas-bearing sequences. The presence of marcasite and pyrite in the drill holes suggests that

secondary effects of oxidation and chemical alteration related to low temperature sulphide mineralization, may be significant variables contributing to the erratic Ro profiles. Unlike the organic indicators apatite fission tracks are only affected by temperature. For example, preliminary results from the Cumberland Basin drill hole SA-1+2 reveal that track lengths progressively shorten from a mean of 14.8 microns at 305 m to 12.8 microns near the bottom of the hole at 1030 m. The fission track

length spectra do not correlate with the inconsistent ("kinky") downhole distributions in the Ro values which vary from 1.09 to 2.05.

The results from this study indicate that apatite fission track length analyses, when combined with the organic maturation methods can isolate the temperature variable from other controlling factors which affect organic maturation.