

Recent Thermal Cooling in the Outer Bonaparte Basin: Evidence from Maturity Analysis and Thermal Modeling of Kelp Deep-1

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The CFR maturity analysis of 18 samples from Kelp Deep ST1 defines a steadily increasing maturity profile ranging from 0.69 %Ro at 2220 m to 1.35 %Ro at 3795 m. This profile is counter to that of standard measured Ro and is also contrary to the dog leg temperature profile measured in the well.

Thermal history analysis of Kelp Deep ST1 indicates that the sediments above the Dombey Limestone (less than approximately 4300m) have experienced hotter temperatures in the past and that the lower geothermal gradients in the upper sections are the anomalous thermal event. Overpressure has been noted in the well, however the break in the temperature profile is synchronous to that of the onset of the overpressure and suggests some other mechanism for the lower gradients in the upper sections. This is also supported by the fact that many of the surrounding wells have similar geothermal gradients to that of the deeper Kelp Deep ST1. Thermal history analysis of Kelp 1 also indicates that the sediments have been hotter in the past. The recognition of this varying thermal history is important to the understanding of the timing of potential hydrocarbon generation and migration from identified source rocks within the region.