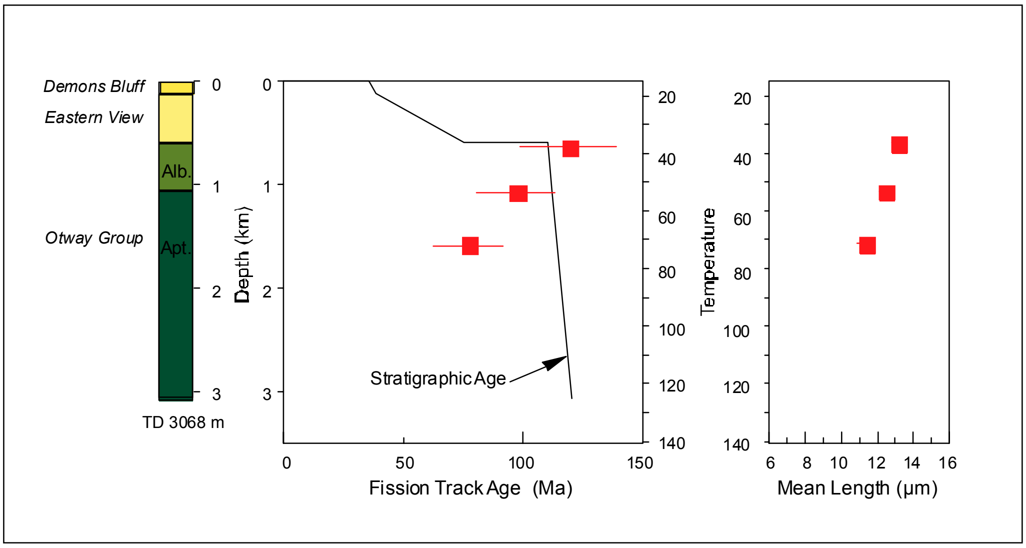
What's in a Geotrack report?

ANGLESEA-1: a THR case study

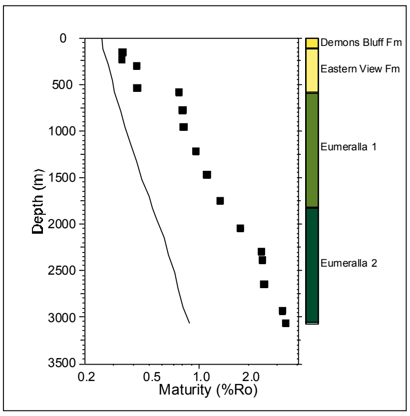
A typical Geotrack Report contains much more than just basic AFTA data (fission track age, track lengths). What we aim to do is to synthesise temperature-time solutions from individual AFTA samples with vitrinite reflectance data and/or other types of maturity data to provide a thermal history framework for the entire sampled section. AFTA results from multiple samples within a well are combined to provide the best constraint on the timing of cooling, while the variation of maximum paleotemperatures with depth provides insights into mechanisms of heating and cooling. Where applicable, estimates of paleogeothermal gradients and amounts of eroded section can be obtained.

This Information Sheet summarises the information which is provided in a Geotrack Report for a Thermal History Reconstruction study of a typical well. The example is based on the Anglesea-1 well, located in the Otway Basin, Southeastern Australia.



AFTA® data

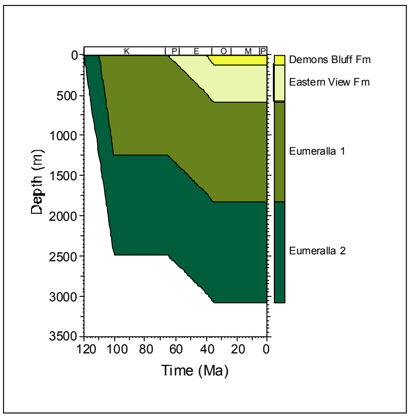
Three samples were analysed from this well. Thermal history parameters are extracted from the data using detailed kinetic modelling. (see Geotrack Information Sheet 99/2) This defines the range of temperature and time conditions consistent with the measured data.



VR data

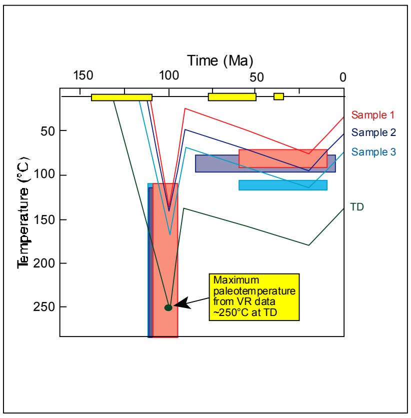
The solid line defines the profile expected if samples throughout the section are currently at their maximum temperature since deposition,. The data plot well above the profile, showing that the section has been hotter in the past.

The question is - WHEN?



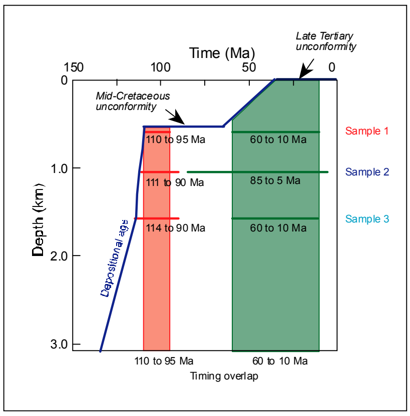
Geological info

The burial history derived from the preserved section (used together with the present gradient to predict the profile shown in the Figure to the left) contains two unconformities, one in the Late Cretaceous and one in the Tertiary.



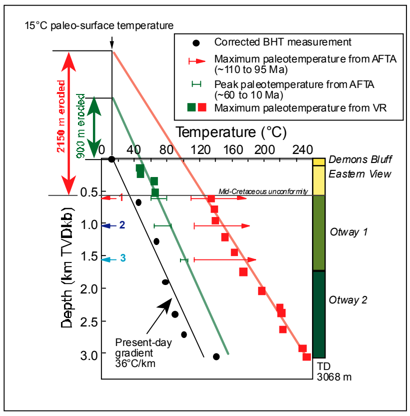
Identify

In each AFTA sample, data suggest two major episodes of heating and cooling. Boxes define the maximum or peak paleotemperatures and timing of cooling determined from the AFTA data in each sample.



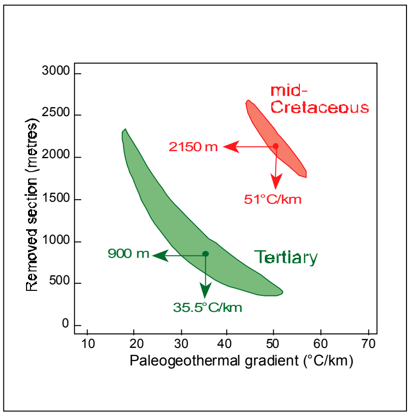
Quantify

Synthesis of timing information from the three AFTA samples defines two key paleo-thermal episodes: cooling began some time between 110 and 95 Ma in the earlier episode and between 60 and 10 Ma in the later episode.



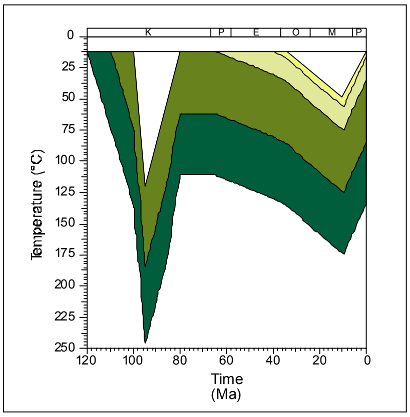
Characterise

The linear nature of paleotemperature profiles derived from the AFTA and VR data suggests that heating in both episodes was due chiefly to deeper burial.



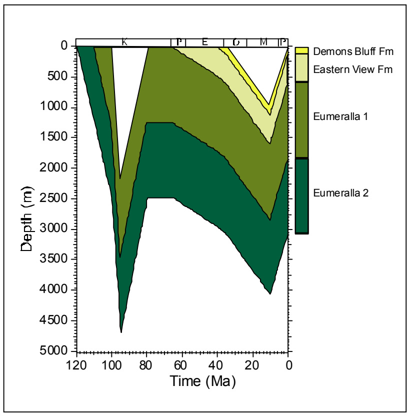
Analyse

Statistical analysis of paleotemperature data provides rigorous constraints on paleogeothermal gradients and removed section. The contoured regions define the range of allowed values (within ±2□ limits) for each episode.



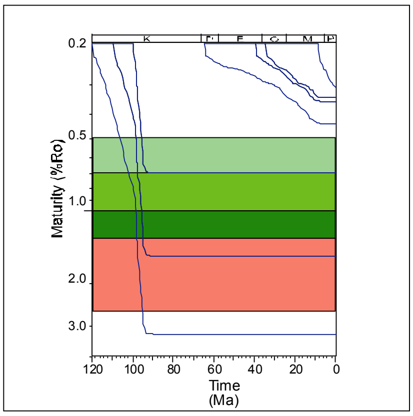
Thermal history

Using the best-fit values of removed section and paleogeothermal gradient, we can reconstruct thermal histories for each preserved unit. The Early Cretaceous section reached maximum temperatures during the mid-Cretaceous episode.



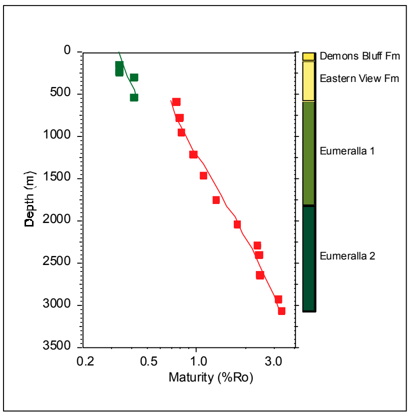
Burial/Uplift history

The burial and uplift history is reconstructed by adding in the removed section during each episode estimated from the paleotemperature data.



Maturation history

From the reconstructed thermal histories, the maturity of each unit through time can be predicted. Early Cretaceous units reached maximum maturity values within the oil or gas windows during the mid-Cretaceous episode, while Tertiary units remain immature. Only early traps that were available when hydrocarbons were generated will be prospective in this region.



Maturity vs depth

The variation of maturity with depth at the present day predicted from the reconstructed thermal histories matches the data, as expected.

Geotrack International Pty Ltd ABN 16 006 821 209
37 Melville Road, Brunswick West, Victoria 3055 Australia
telephone: national (03) 9380 1077 international +613 9380 1077 facsimile +613 9380 1477
website: www.geotrack.com.au