

Geotrack International

Thermal history in hydrocarbon exploration

Maturity development and hydrocarbon generation are kinetic processes, controlled by temperature and time. Detailed understanding of the thermal history of potential source rocks is therefore crucial in understanding hydrocarbon prospectivity.

Timing of oil generation - a vital component of the hydrocarbon system

In any prospect evaluation or exploration program, it is vital to establish not only the presence of mature source rocks but also to determine when maximum maturity levels were reached and when hydrocarbon generation took place. Structures will only be prospective if they were in place when hydrocarbons were generated. Where traps formed after the hydrocarbon charge, prospects will be dry.

Apatite Fission Track Analysis (AFTA®)

In many situations, the time at which source rocks reached maximum maturity levels cannot be reconstructed from conventional information. From analysis of radiation-damage features in detrital apatite grains, AFTA® provides direct determination of the timing of paleo-thermal episode, as well as the paleotemperatures reached by individual samples. It can therefore be used to determine the timing of hydrocarbon charge with respect to structure formation, and to estimate source rock maturity.

AFTA is unique in this ability to produce direct timing information

The importance of measured thermal history parameters

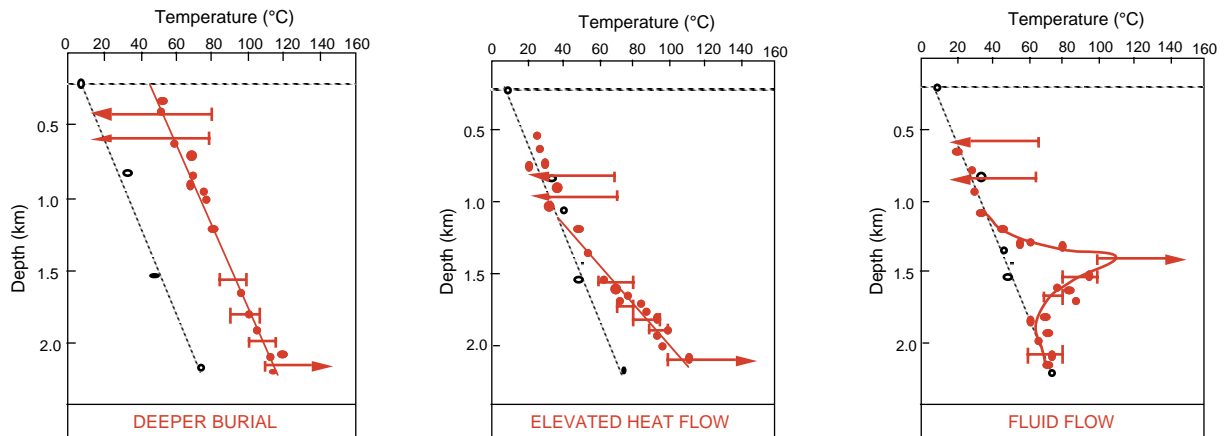
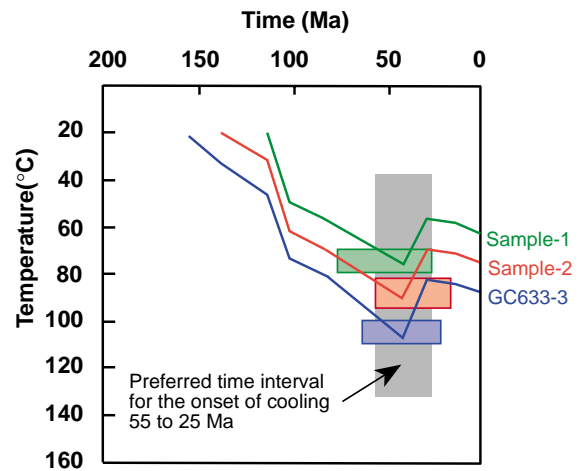
Thermal histories of potential source rock horizons within prospective sedimentary basins are controlled chiefly by depth of burial, basal heat flow and lateral influx of heat due to fluid movements. Changes in these parameters through time can exert critical controls on the history of hydrocarbon generation, but can only be detected by application of analytical techniques which measure their effects. Without such data, serious errors can occur in assessment of regional hydrocarbon prospectivity.

Benefits

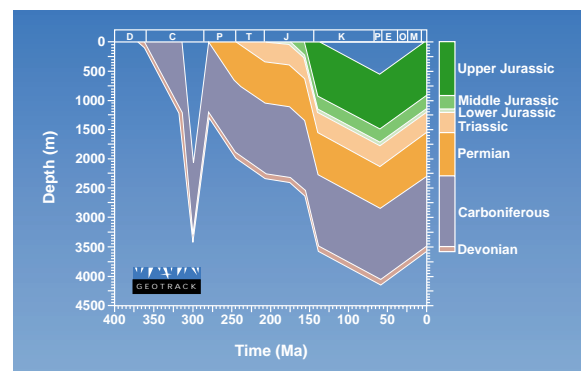
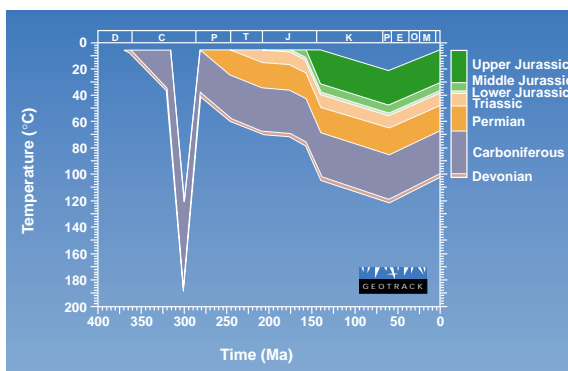
By identifying, quantifying and characterising the important episodes of heating and cooling which have affected a source rock sequence, the explorationist can proceed to evaluate likely hydrocarbon generation scenarios within a firm framework, constrained by measured data. Many hours of modelling using non-viable options can be eliminated, allowing work to be quickly and efficiently focused on more realistic, data-constrained solutions.

Geotrack's methods of Thermal History Reconstruction using AFTA and VR allow you to:

- 1: **Identify** significant paleo-thermal episodes - i.e. heating episodes in the past in which rocks reached paleotemperatures which were higher than their present temperatures.
- 2: **Quantify** the effects of these paleo-thermal episodes. - what were the maximum paleotemperatures in individual samples and when did cooling occur?
- 3: **Characterise** the episodes - by defining the way paleotemperatures vary with depth, we can assess the mechanisms of heating and cooling in each episode.



- 4: **Reconstruct** thermal, maturation and burial/uplift histories within a consistent framework, constrained by measured data, allowing rigorous evaluation of likely hydrocarbon generation scenarios - **Constrained Basin Modelling**.



Interested? Want to know more? WWW.geotrack.com.au, or Contact:

Geotrack International Pty Ltd ABN 16 006 821 209

37 Melville Road, Brunswick West, Victoria 3055 Australia EMAIL mail@geotrack.com.au
telephone: national (03) 9380 1077 international +613 9380 1077 facsimile +613 9380 1477

AFTA® is a registered trademark of Geotrack International Pty Ltd