

ALASKA NORTH SLOPE:

Constraining the Timing, Magnitude and Distribution of Multiple Thermal Events



Background

Knowing the timing and intensity of geological events across the North Slope of Alaska is of fundamental importance to finding oil and gas in the region. One way to constrain these events is to measure the thermal history of rock units. Such constraints provide the necessary framework with which the structural evolution and prospectivity of the region can be practically assessed for exploration. Without firm constraints on timing and magnitude of paleo-thermal events, the exercise of describing and ranking prospective petroleum plays becomes strongly dependent on assumptions, which may be wildly inaccurate. By basing assessment on measured data, costs and risks of exploration can be significantly decreased.



Objectives

Central to the concept of the Petroleum System is knowing the Relative and Absolute Timing of events. Those regions where the main phase of hydrocarbon generation took place after structures were formed are likely to be most prospective at the present day. The main objective of this study is to provide direct (measured) constraints on the thermal history in the region, which can be used to reconstruct the history of hydrocarbon generation and structural development across the region. This provides a coherent framework for defining the most prospective areas.

INVESTIGATORS

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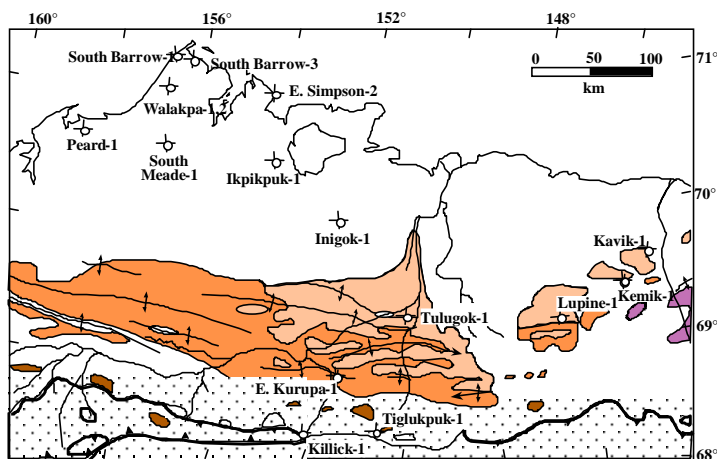
Technical details

Apatite fission track analysis (AFTA[®]), combined with VR (vitrinite reflectance) data, has been used to directly measure the timing, intensity and regional variation of multiple paleo-thermal events across northern Alaska in this study. AFTA provides direct measurement of the timing and magnitude of the paleo-thermal episodes responsible for maturity development and hydrocarbon generation, while VR data also provide control on the maximum paleotemperature. The paleotemperature estimates derived from AFTA and VR also provide quantitative constraints on paleogeothermal gradients, paleo-heat flow and amounts of section removed during exhumation. Knowing these variables through direct measurement necessarily reduces exploration risk, particularly by removing the guesswork associated with determining the time at which source rocks cooled from their maximum paleotemperatures, and how this varies across the region. Since this effectively dates the time at which hydrocarbon generation effectively ceases, knowledge of this key aspect of the petroleum system can result in significant reduction in exploration risk.

Scope of study

AFTA data from approximately 60 **outcrop** samples will be included in the study. Of these AFTA outcrop samples, ~10 will be newly collected and analyzed, ~20 will be re-processed and ~30 others from published results will be included and reviewed in the context of the new results. This sampling program and data review ensure good regional coverage, and full and consistent assessment of all relevant publicly available data.

Results from the new outcrop samples will be combined with results from **well** samples (AFTA and VR) from about 11 wells. Some of the re-processed AFTA analyses will include data released to Geotrack by previous Geotrack clients and companies participating in the study. Thus in summary, the study will be based on data from approximately 110 AFTA samples and 100 VR samples



Deliverables

The final report contains

- (1) A comprehensive tabulation and presentation of all analytical data derived for AFTA – i.e., measured grain ages, lengths and chlorine content – and for VR – i.e., mean reflectances, histograms, and detailed maceral descriptions for any new analyses.
- (2) Thermal history interpretations and justifications for all new and re-processed AFTA data.
- (3) Maximum paleotemperature determinations from all new and reliable VR data, together with an assessment of WHEN these maturities developed, in light of the AFTA results.
- (4) A comprehensive review of all available and existing VR data from the region that can be accessed for this study. Contributions of maturity data from participating companies are invited.
- (5) Discussion and estimates of the cause of heating, eroded section, paleogeothermal gradient and maturity history for each of the wells selected for THR.
- (6) Discussion of the results in terms of the implications for various petroleum systems in the region (e.g. timing of main phases of hydrocarbon generation across the region, reservoir quality of the Brookian sequence, etc).
- (7) A discussion of overall results in terms of consequences for future exploration programs.

Cost

The current purchase price for the study is \$US68,2500. A detailed proposal is available on request, containing further details on well names, sample locations, the investigators and their experience in the region. Group escalations are available at the following rates: 2 companies, 1.6 times total cost; three companies 2.1 times total cost.

For further information

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