

Seismic Mapping of the King Christian Formation, Sverdrup Basin, Arctic Canada: Spatial Visualization with Potential Field Data

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Summary

Both new and legacy seismic interpretations at the stratigraphic level of the early-Jurassic King Christian Fm in the Sverdrup Basin, were compiled creating a preliminary GIS surface in two way time. Features evident in this image include both low relief structures and ones of higher relief, thought to be cored with evaporities of the Carboniferous Otto Fiord Fm. Some of these salt structures pierce the entire Sverdrup stratigraphy to surface or sea floor. Most faults mapped at this level are extensional with the exception of reverse faults beginning to appear east of Cornwall Island, in the Norwegian Bay area. The map illustrates the general structural context of the 17 hydrocarbon discoveries between Sabine Peninsula and Ellef Ringnes Island.

This surface is also displayed as sun-illuminated relief overlain with color fill representing magnetic anomaly (Fig. 1). The resulting data integration image shows the spatial coincidence of magnetic anomalies with present subsurface structure. Some of the larger magnetic features may be a indication of considerable intrusive emplacement at depth, which may have influenced local thermal maturity of sediments, such as the large magnetic anomaly east of the Cisco field. Other NE trending linear magnetic features are observed to trend coincident with extensional faults (grabens). These magnetic anomalies are thought to be dykes at depth, which created by volume accommodation, the graben formation of overlying section. (Balkwill and Fox 1982). Also shown is seismic-derived sea floor relief within the inter-island channels, and selected seismic profiles illustrating data quality issues from acquisition in environments of permanently frozen bedrock and over permanent, variably thick sea ice.

The time structure surface is corrected for the low-velocity effect of the variable water column within the inter-island channels, but not for the permafrost velocity effect on the islands. Most permafrost velocity effects at shorelines are small (<40 ms) but can be in excess of 140 ms.

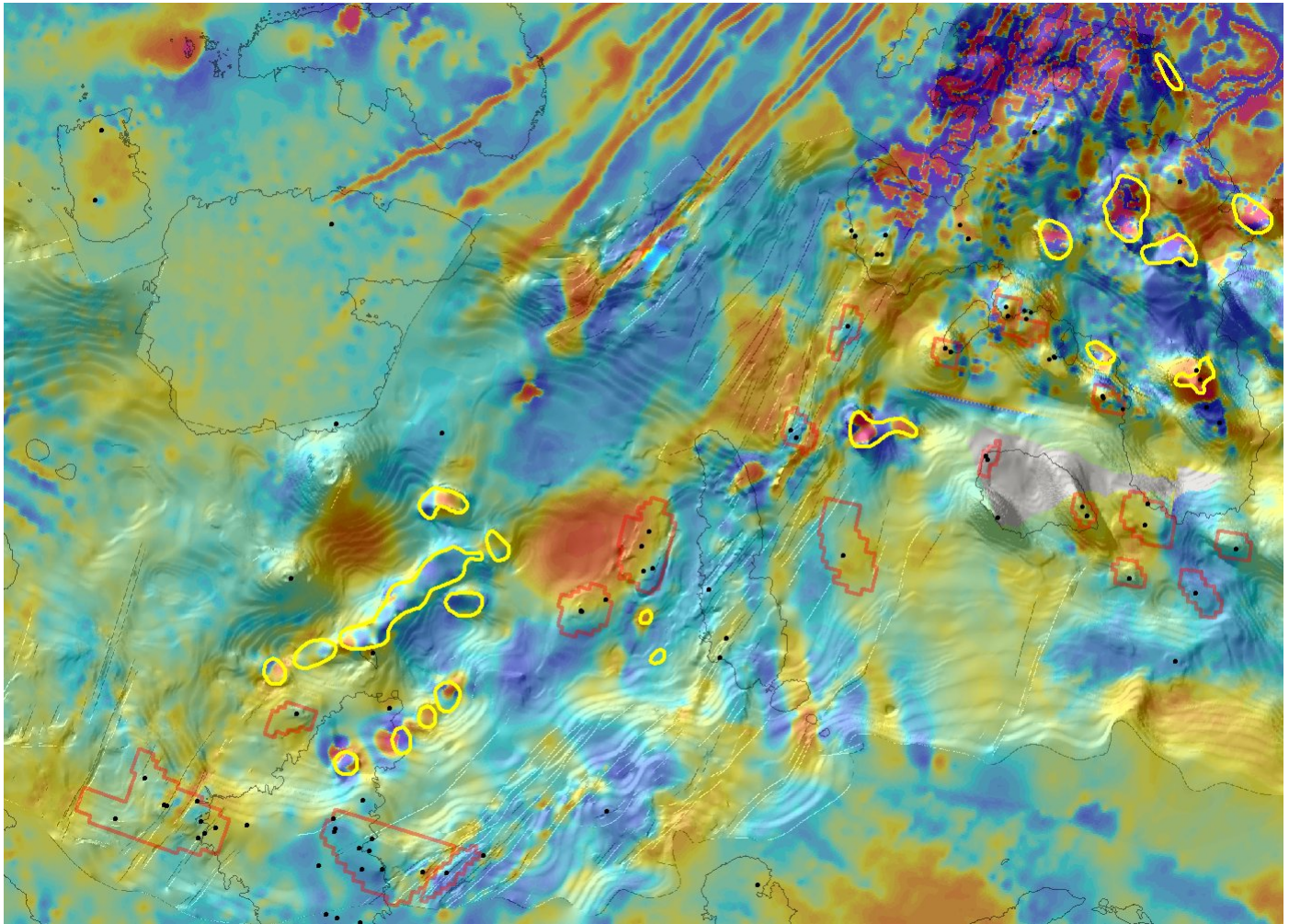


Figure 1: Time structure of King Christian Fm. over part of the western Sverdrup Basin, (source map PetroCanada Inc.), time structure is represented as hillshade, overlain on 1st derivative magnetic anomaly color. Orange to blue color are magnetic high to low respectively. NOTE: hillshade inside diapir outlines (yellow), should be ignored. Wells are black and hydrocarbon discovery areas are pink outlines. Field of view is 375 km.

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