

Crustal Structure of the US Chukchi Shelf: Insights From 9-Km Long-Offset Arcticspan™ 2-D Seismic Data

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In 2006, GX Technology acquired 3,132 km of 2-D seismic data in the US part of Chukchi Sea, offshore northwest Alaska. The acquisition was designed to image down to the base of the crust with a 9-km long cable and 18-second recording. Pre-stack Time Migration (to 16 sec) and Pre-stack Depth Migration (to 40 Km) was carried out on the entire data set, thus imaging MOHO. To the best of our knowledge, it is the only dataset of its kind available in the area.

The post-Devonian extensional crustal structure of Chukchi Shelf related to rigid rotation of Arctic Alaska and Chukotka from the Mackenzie region to form the Beaufort-Canada basin is widely accepted, but the basement geology of Chukchi is poorly imaged by previous seismic surveys and is not well understood. An integration of magnetic and gravity data with these long-record seismic data has allowed the recognition of a deep pre-Franklinian crystalline basement and associated internal crustal inhomogeneities.

The sequence regionally recognized as prospective for hydrocarbons consists of 8-10 km of well-imaged post-Upper Devonian sedimentary rocks. These new data also image several kilometers of pre-Ellesmerian rocks that record multiple as-yet poorly understood tectonic events. In the eastern Chukchi platform a mildly deformed and apparently unmetamorphosed pre-Ellesmerian sedimentary section, >10 km thick, transitions to the west into a deformed region with a number of Franklinian and possibly older extensional and compressive features. In the north, a thick (>10 km) sedimentary wedge, a significant part of which is less than 80 my old, has been recognized in the North Chukchi Basin. With further analysis, this new data set should lead to a comprehensive reevaluation of the Chukchi Shelf.