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**Stratigraphic and Tectonic framework of the US Chukchi Shelf:
Insights from 9-km long-offset ArcticSPAN™ 2-D seismic data**

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With one significant hydrocarbon accumulation and oil and gas indications in each of the other four wells, the presence of an active petroleum system was confirmed during the first phase of exploration in the US Chukchi Shelf almost twenty years ago. Yet, because of the remoteness of the area and cost of operations, very little activity has taken place in the intervening years.

In 2006, GX Technology acquired 3,132 km of long-offset 2-D seismic data over the US Chukchi Shelf. Data acquisition was carried out in open water outside the environmentally sensitive coastal exclusive zones to as far north and west as sea and ice conditions allowed. The program was designed to image down to the base of the crust with a 9-km long cable and 18-second recording. Final processing of this data has included Pre-stack Depth Migration (PSDM) to 40 km. To the best of our knowledge, it is the only dataset of its kind available in the area.

We have identified and tied to the well data the sequences recognized on the North Slope of Alaska and penetrated in the last round of drilling, i.e., the Brookian (Upper Cretaceous-Tertiary), Beaufortian (Lower Cretaceous), and Ellesmerian (Upper Devonian – Jurassic). The underlying “acoustic basement” has been recognized as the top of the Franklinian (pre-Mississippian) sequence. Although ours is a regional grid, the new data suggest additional structural and stratigraphic plays that have not been tested. Our data have also extended the coverage into the North Chukchi Basin, where up to 40,000 feet (12 km) of Brookian and Beaufortian sediments might be present.

The Franklinian sequence underwent a complex history of rifting, inversion, basement-involved thrusting, uplift and erosion as shown by a reconstruction of a profile that traverses the Arctic Platform in the northeast part of the area. At least part of this Franklinian sequence appears to be represented by mildly-deformed Paleozoic and upper Proterozoic rocks with a stratigraphy similar to those rocks present in the Melville Island in the Canadian Arctic. As suggested by earlier workers, this stratigraphic succession may include shallow and deep-water clastics of Middle to Upper Devonian age underlain by Upper Cambrian to Lower Devonian carbonates. These carbonates might be underlain by Lower Cambrian and Upper Proterozoic clastic sections. Prior to the acquisition of the SPAN data, details of Franklinian stratigraphy had been imaged fairly poorly.

Our seismic data, coupled with gravity modeling, has allowed the mapping of the MOHO discontinuity almost throughout the survey area. Such “basin-scale” data permits interpretation of basin evolution that is generally not feasible in more common “prospect-scale” data.

**Speaker. Coauthors include Jim Granath, Pete Emmet, Jim Helwig and Dale Bird, all consultants to ION BasinSPAN Programs*