

## **Giant untested basins on Canada's Arctic frontier: northern Baffin Bay, Lancaster Sound and the Nares Strait region**

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Waterways linking Baffin Bay to the Arctic Ocean are associated with a zone of multiphase plate spreading, strike slip and plate convergence of Paleocene-Eocene age. Fourteen basins containing Albian and younger sediment fill lie within a region that includes the extinct Baffin rift zone and plate spreading system in the south, and the Eurekan Orogen in the north. Syntectonic basins of eastern Eurekan Orogen are associated with major late Paleocene-Eocene thrusts and strike slip faults. These include intermontane basins with up to 4 km of upper Paleocene and Eocene strata: syntectonic gravels and local facies changes in Axel Heiberg Basin west of Inglefield Uplift on Ellesmere Island; Judge Daly Basin in a fault zone of western Kennedy Channel area, and; Lake Hazen Basin adjacent to Hazen Fault Zone. The largest is Franklin Pierce Basin, a Paleogene foreland basin that underlies western Kane Basin and includes gravels and breccias in the footwall of Parrish Glacier Thrust. These basins are generally underfilled, deeply eroded and lacking in key petroleum system components such as seal integrity and a mature oil source rock.

To the south, the periphery of the Baffin Bay spreading system is associated with four additional underfilled and deeply eroded basins developed on continental crust. These are half-graben and transform fault-related structures, bound by horst blocks underlain by crystalline basement and Mesoproterozoic to Ordovician strata. Offshore are North Water, Glacier and Jones Sound basins which bear evidence of superimposed folding. Onshore is Eclipse Trough of Bylot Island which contains upper Albian to Paleocene strata.

Greatest exploration potential lies under northern Baffin Bay and the basins formed on extended continental crust that flank the buried oceanic spreading ridge to north and west. This is an area comparable in size to the entire Beaufort-Mackenzie Basin and has yet to be tested by drilling. Range of sediment fill is 5 to 12 km. Included are Kap York Basin on the northwest Greenland shelf, Carey Basin straddling the Canadian border, Lady Anne Basin east of Devon Island and Lancaster Sound Basin in the mouth of the Northwest Passage. Typical features include a Cretaceous-Paleogene sediment record, potential late Cretaceous source rocks, and numerous giant untested inversion anticlines. The two remaining basins of the region lie north and south of the central Baffin spreading ridge which has been extinct since the Eocene. Here there is a more complete Cenozoic sediment record and seismic evidence for basin-fill up to 12 km thick.