Geophysical Research Abstracts
Vol. 15, EGU2013-8997-1, 2013
EGU General Assembly 2013

Did the Hudson Strait in Arctic Canada record the opening of the Labrador Sea?

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The Hudson Strait-Evans Strait-Foxe Channel is a major E-W trending composite topographic feature in Arctic Canada that connects Hudson Bay and Foxe Basin with the Labrador Sea. It corresponds to a ∼1000 km long, WNW elongated body of water with maximal depths reaching 900 m in its eastern part. Based on high-resolution seismic reflection profiles, the Hudson Strait comprises several fault-controlled sub-basins having a half graben geometry and corresponding to gravity lows on the Bouguer anomaly map. In the sub-basins, the sedimentary succession is thicker than the one preserved onshore (a few hundred metres) and reaches a maximum of ∼ 2.6 km in the eastern part of the Hudson Strait, an estimate comparable with the maximum thickness documented in the Hudson Bay. Despite the low penetration of high-resolution seismic data, several angular unconformities have been documented locally. The lower part of the offshore succession unconformably overlies the Precambrian basement and correlates with Middle Ordovician to Silurian rocks exposed in nearby islands. The nature and age of the upper part of the succession remains poorly constrained even if a Mesozoic age has been proposed in the past. Phanerozoic strata generally dip less than 3° except in deformed zones characterized by open folds and down to basement faults, where strata dip locally at 10° or more. Faults are steeply dipping and generally have a clear geomorphological expression. Faults are oriented WNW and ENE, dip predominantly toward the north and record an extensional (or transtensional) tectonic event. Deformed zones characterized by open folds that trend parallel with the main faults attest of a subsequent episode of shortening. Forward modelling of satellite-derived gravity data indicates that interpreted sediment thickness alone cannot explain the entire negative anomaly found in sub-basins and that an additional source, possibly associated with the depth variation of the crust-mantle interface, contributes to the gravity signal.
An attractive hypothesis would be to link tectonic structures (normal or transtensional faults and subsequent open folds) to Cretaceous - Paleocene rifting and seafloor spreading in the Labrador Sea. However, a better understanding of the role and timing of the Ungava Fault zone which is located offshore, to the east of Baffin Island is crucial to test this hypothesis as this fault may kinematically decoupled the Labrador Sea from the Canadian landmass.