



## **Geological and geophysical setting of the intracratonic Hudson Bay basin, Canada**

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The Phanerozoic Hudson Bay basin is a large sedimentary basin that unconformably rests over the Canadian Shield. Its basement is composed of metamorphic rocks of the Superior and Churchill provinces (respectively to the south and north of the basin) that amalgamated at circa 1.9-1.8 Ga. Superimposed on a continental-scale gravity low, significant regional-scale positive gravity anomalies characterized the Hudson Bay.

The Hudson Bay basin has a nearly circular outcrop pattern with around 2/3 of its surface covered by water of the Hudson Bay. It is saucer-shaped in cross-section and is mainly filled with relatively undeformed Paleozoic sediments with up to 2 km of preserved thickness. Shallow water limestones and dolostones, with some evaporites and minor silstones, dominate the Upper Ordovician to Upper Devonian succession. The occurrence of Upper Paleozoic rocks is still uncertain and the presence of Cretaceous rocks over a significant portion of the basin has been proposed on the basis of fragmentary data.

A detailed knowledge of the geometry of the basin is hampered by the low quality of vintage seismic data due to water bottom multiples. Among the main structural features is a NNW trending basin-central horst, perpendicular to the Precambrian basement suture zone. Onlapping relationships indicate that the faults bounding the horst were mainly active during the Silurian. Another major structural feature is a WNW-trending fault array that forms the northern boundary of the basin. This fault array parallels the Hudson Strait, a morphologic feature that connects the Hudson Bay to the Atlantic Ocean which may have been tectonically active during the Cretaceous or even later.

The similarities between the Hudson Bay basin and other North America intracratonic basins (Williston, Michigan and Illinois basins) have long been emphasized. However, compared with these other basins, the Hudson Bay basin was located farther from major plate boundaries and orogens during the Paleozoic and the mechanical coupling with adjacent foreland basins is far more elusive. Moreover, the Hudson Bay basin is the only present-day topographic low with active modern sedimentation. The current boundaries of the Quaternary marine basin mimic the limits of the Paleozoic basin, reinforcing the apparent bull's eye geometry of the Hudson Bay basin and the perception that basin forming mechanisms are somewhat unchanged and related to a long term lithospheric feature. However, this perception may be false as the sedimentary succession recorded several episodes of deposition, some of them potentially unrelated to the presence of a restricted saucer-shaped basin.