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Margins of the Amerasia Basin, Arctic Ocean

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For a relatively small ocean basin, the Amerasia Basin of the Arctic Ocean reveals a plethora of margin types reflecting both the complex tectonic origins of the basin and its diverse sedimentation history. The majority of the basin formed during stretching and spreading in the mid to Late Cretaceous with the opening of Canada Basin. Following on or concurrent with this opening was emplacement of the Alpha Ridge and Mendeleev Rise volcanic province.

The Chukchi Plateau and Northwind Ridge extend north from the Chukchi Shelf forming the western edge of Canada Basin. The tectonic origin of this margin is not well known, but it is steep (>10°) and sediment starved suggesting transform or trans-tensional tectonics. The Alaska-Beaufort, Mackenzie-Beaufort and Canadian Arctic Island Archepelago margins formed as passive rift margins. Early in the basin's history, the Alaska-Beaufort margin was heavily sedimented, but since the Miocene it is sediment deprived, creating a relatively steep (∼4°) and erosional continental slope. The Mackenzie-Beaufort margin is dominated by outflow from the Mackenzie River, forming a large, low-grade deep water fan at its seaward edge. This fan dominates sedimentation in the entire Canada Basin since the Miocene or earlier. Recent sediments along the slope of the Canadian Arctic Archepelago margin are glacially derived, dominated by glacial-marine debris flows. The Alpha Ridge and Mendeleev Rise form a ridge across the entire Amerasia Basin. Sediments drape this ridge suggesting hemipelagic to pelagic sedimentation with slow accumulation rates. There is little evidence of the margins of these ridges contributing sediments to adjacent basins, except with local small mass failures. Lomonosov Ridge is a fragment of continental shelf spanning the Arctic Ocean basin. This ridge was attached to the Barents Shelf prior to opening of the Eurasia Basin in the Paleogene. Its southern flank forms the northern boundary of Amerasia Basin. The origin of this flank is debatable, but may represent a transform to trans-tensional margin at the northern extent of seafloor spreading that created the basin. Its flanks are sediment starved and contribute little to adjacent basins aside from local mass failures of the ridge flank.

There appears to be significant sediment supply from the East Siberian Shelf, burying Lomonosov Ridge and Mendeleev Rise, where they adjoin the shelf, and infilling the intervening 'perched' basins such as Podvodnikov Basin and North Chukchi Basin. Little or no sediment is provided to the deep basin floor.

The seafloor and sedimentary succession of Canada Basin is remarkably flat-lying in its central region, with little bathymetric change over most of its extent. Reflections correlate over 100's of km's and on-lap bathymetric and basement highs. The sedimentary succession is thickest in the southern Beaufort Sea region, reaching more than 11 km, and generally thins to the north and west. Much of the sediment volume input to the Arctic Ocean was dominated by turbidity currents, largely sourced from sediment mass failure of the Mackenzie fan.