

Depositional Evolution of the Western Amundsen Basin, Arctic Ocean

Carlos F. Castro, Paul C. Knutz, John R. Hopper, & Thomas Funck

cfc@geus.dk

Seismic reflection data collected in the western Amundsen Basin as part of the Law of the Sea program for the Kingdom of Denmark show a uniform and continuous cover of sediments over oceanic basement. An interpretation of seismic facies units shows that the depositional history of the basin reflects changing tectonic, climatic, and oceanographic conditions throughout the Cenozoic.

A new stratigraphic model of the Amundsen Basin is presented that includes four distinct phases of basin development. From the onset of seafloor spreading up to the mid-Eocene, the Amundsen Basin formed a small, isolated lake system with high sedimentation rates linked to terrestrial input and high pelagic productivity. During the late Eocene–early Oligocene, sediment wedging and mass transport into marginal depocentres reflect a phase of tectonic instability linked to the high Arctic Eureka Orogeny. In the early to mid-Miocene, mounded, asymmetric sedimentary features interpreted as contourites, indicate a distinct change in sedimentation style. This was probably associated with a establishment of a counterclockwise geostrophic current system in response to the onset of a deep oceanic connection through the Fram Strait. In contrast, the Plio–Pleistocene stage is characterized by erosional features such as scarps, channels, and levees, indicative of a change to a high-energy environment of suspension currents. These deposits may be associated with discharges from northern Greenland but also brine formation originating below thick multi-year sea-ice over the northern Greenland continental shelf.