Revisiting the stratigraphy of offshore Labrador: integrating sedimentological and palynological analyses with regional seismic data

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The Labrador margin developed through rifting as Greenland separated from the North American plate during formation of the Labrador Sea. Rifting began in the Early Cretaceous along the present-day shelf with active faulting migrating offshore during the mid- to Late Cretaceous, with breakup occurring by Chron 27 in the middle Paleocene. Our study builds upon previous work in the area by combining new well and seismic results with established frameworks to improve upon the stratigraphic resolution, including the timing of events and nature of missing sections in both the Hopedale and Saglek basins of offshore southern and northern Labrador, respectively. We integrate paleoenvironmental interpretations from core analyses, cuttings descriptions and well logs with new palynostratigraphic results and modern multichannel seismic data. The stratigraphic succession is composed of 4 major sequences. The lowermost sequence is Early Cretaceous in age and ends with a prominent unconformity at the top of the Bjarni Formation, of likely early Cenomanian age. New palynological results suggest that some of the Cenomanian through Santonian succession is missing at the base of sequence two. Later within sequence 2, a prominent flooding surface is present in the early–middle Maastrichtian. We use a more rigorous sequence stratigraphic framework for the late Cretaceous and Cenozoic section, where tectonic influences on margin stratigraphy decrease and paleoceanographic factors become more important. In the early Paleocene, the base of sequence 3 is marked by a major drop in relative sea level, which resulted in two distinct, prograding, forced regressive lobes of the Gudrid Formation. A maximum flooding surface of early Ypresian age caps the top of the Gudrid Formation and is followed by highstand progradation within the Kenamu Formation. A major late Oligocene–early Miocene sequence boundary marks the base of sequence 4. The sandy phase of this sequence is the Saglek Formation, which is characterized by progradational shelf edge deltas in the southern part of Hopedale Basin and heavily channelized successions to the north. These refinements to the stratigraphic framework aid in understanding deposition in offshore Labrador, and will be used in future studies as an analogue that can be applied to the stratigraphy in Baffin Bay, which shares a similar tectonic history to the Labrador margin.

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