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Insight into the sedimentary history of the Lomonosov Ridge, Arctic Ocean

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The Arctic Ocean region has played, and continues to play, a key role in the regulation of Earth's climate and oceanic circulation, and their evolution. Studying the Lomonosov Ridge, a "two-sided continental margin" in the central Arctic Ocean, is essential to address ongoing debate about fundamental issues, e.g. related to the complex tectonic evolution of the Arctic Basins, the glacial history, and the details of known paleoceanographic changes in the Cenozoic. During RV Polarstern Expedition ARK XXVIII/4 in summer 2014, sea ice conditions were optimal for the collection of a comprehensive network of deep penetrating multichannel seismic reflection data along the Lomonosov Ridge, between 80°N and 85°N. In this study, we present part of this dataset and provide a detailed insight into the sedimentary structures along the ridge, their possible origin, age, and formation. Projection of the ridge between 83°N and 84°30'N to its conjugate, the Severnaya Zemlya Archipelago at the Eurasia margin, is resolved based on characteristic seismic parameters and internal structures of the sediment units. We propose that the sediment sequences underlying the prominent HARS (High Amplitude Reflector Sequence) formed well before the ridge separated from the Barents and Kara shelves, and represent a prolonged evolution of the Eurasian margin's geology. Towards Siberia, the HARS is underlain by pre-Mesozoic (likely Upper Proterozoic-Early Paleozoic) metasedimentary material that is correlated to metamorphic complexes exposed on the Bol'shevik Island. Northward, this unit descends and gives way to a sedimentary basin complex, presumably of Ordovician/Devonian age, which underwent strong deformation during the Triassic/Jurassic Novaya Zemlya orogeny. This suggests that the transition zone between these units may be an extensional feature of the Eurasian margin's Bol'shevik-Thrust Zone.