

U-Pb dating of detrital zircons preserved in a fossilized wood fragment from the Alpha Ridge, Arctic Ocean

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Summary

In 2003, Canada became a signatory of the United Nations Convention on the Law of the Sea (UNCLOS), thus embarking on a decade of scientific investigation focused on the polar continental shelf and other submarine features present in the Arctic Ocean. The objective was for Canada to present authoritative scientific evidence that the Arctic continental shelf both extends past 200 nautical miles from the coast and is a natural extension of the continental landmass. During Canada's 2016 scientific expedition to the Arctic Ocean under the Extended Continental Shelf-UNCLOS program, geological samples were dredged from the Alpha Ridge in an attempt to better constrain the magmatic history of the ridge. Samples collected by dredging and coring during past expeditions led by Canada and other nations predominantly consisted of volcanic rocks with a minor component of sedimentary rocks of continental and marine origin. The 2016 expedition yielded 100 kg of rocks that consisted of volcanic breccia, carbonate rocks and a single fragment of fossilized wood. We investigate the provenance of the wood using textural, structural and mineralogical analysis of the infilling material as well as U-Pb geochronological analysis of detrital zircons. Mineral Liberation Analysis (MLA) and Scanning Electron Microscopy (SEM) indicate that the mineralogical composition is uniform throughout the sample but that grain size is bimodal. The clastic infilling material predominantly consists of feldspar, quartz, and phyllosilicates, and zircons are present as an accessory phase. Preliminary laser ablation-inductively coupled plasma-mass spectrometry (LA-ICP-MS) U-Pb dating of zircons suggests a broad range of ages ranging from Triassic to Devonian. A single zircon yielded a Late Cretaceous age that provides a minimum age for the deposition of the sediment into the wood fragment. We describe some of the environmental processes that could explain the infilling and subsequent burial of the wood fragment. We also discuss the implications of the new U-Pb age dates for the origin and geological evolution of the Alpha Ridge.