

Caledonian metamorphism of siliciclastic sediments from the Lomonosov Ridge and Franz Josef Land

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Rock samples collected from two dredge positions at water depths of 2 to 3.5 km on the Lomonosov Ridge are dominated by arkosic sediments deformed and metamorphosed at greenschist facies conditions at 470 Ma according to $^{40}\text{Ar}/^{39}\text{Ar}$ dating of metamorphic mica. This shows that the Lomonosov Ridge was involved in a Mid-Ordovician orogenic event correlating with early arc-terrane accretion observed in northern Ellesmere Island, Svalbard, and other parts of the Caledonian orogeny.

Mica in fine-grained arkoses from the Nagurskaya drill-core on Franz Josef Land, also deformed and metamorphosed under greenschist facies condition, show $^{40}\text{Ar}/^{39}\text{Ar}$ ages of ca. 400 Ma, probably related to a late Caledonian orogenic event. These rocks are very similar to the ones from the Lomonosov Ridge; the younger age may be due to metamorphic overprinting of the 470 Ma event. Detrital zircon age spectra of the metasediments on both the Lomonosov Ridge and Franz Josef Land span the Meso- to Paleoproterozoic with a main peak around 1.6 Ga, similar to Caledonian metasedimentary rocks in East Greenland and Scandinavia as well as from Cambrian sediments in Estonia and Paleozoic sediments on Novaya Zemlya.

The rocks from the Lomonosov Ridge are covered by an up to 8 Ma ferromanganese crust that proves that the samples represent in situ outcrops. The data from the Franz Josef Land and the Lomonosov Ridge indicate that mid Ordovician to early Devonian Caledonian orogeny extended from Scotland and Scandinavia into the Arctic, including Svalbard, the Pearya Terrane, Crockerland and the Chukchi Borderlands.