Title: Neoproterozoic stratigraphy of the Southwestern Basement Province, Svalbard: Constraints on the Proterozoic-Paleozoic evolution of the North Atlantic-Arctic Caledonide

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Publication: American Geophysical Union, Fall Meeting 2018, abstract #T43I-0524

Publication Date: 12/2018

Origin: AGU

Keywords: 8120 Dynamics of lithosphere and mantle: general,
TECTONOPHYSICSDE: 8155 Plate motions: general,
TECTONOPHYSICSDE: 8177 Tectonics and climatic interactions,
TECTONOPHYSICSDE: 8178 Tectonics and magmatism,
TECTONOPHYSICS

Bibliographic Code: 2018AGUFM.T43I0524W

Abstract

Neoproterozoic metasedimentary and metavolcanic rocks exposed on southwestern Svalbard provide important insight into circum-Arctic evolution and the break-up history of the supercontinent Rodinia. New sedimentological and geochronological constraints on these strata are provided herein by combining field observations, carbonate carbon and strontium isotope chemostratigraphy, detrital and igneous zircon U-Pb analyses, and previously reported detrital monazite U-Pb ages. The lowermost Tonian(?) metasedimentary units in southwestern Svalbard (Deilegga Group) are folded beneath a prominent <640 Ma angular unconformity referred to regionally as the Torellian unconformity. Detrital zircon U-Pb data from these strata are characterized by abundant Paleo- to Mesoproterozoic and variable Archean age populations that are typical of North Atlantic Mesoproterozoic-Neoproterozoic passive-margin successions. Glacial diamictite and associated cap carbonates of the ca. 640-635 Ma Marinoan Snowball Earth glaciation outcrop above the unconformity (Sofiebogen Group) and locally interfinger with mafic volcanic rocks of the rift-related Jens Erikfjellet Formation. These units yield detrital zircon U-Pb age spectra similar to the underlying Deilegga Group. In contrast, immediate post-Marinoan Ediacaran strata of the Gåshamna Formation contain bimodal ca. 1800 and 2850 Ma U-Pb age peaks, which indicates a prominent shift in provenance prior to a return to U-Pb spectra characteristic of the Gaskiers-related Kapp Lyell Group. Integrating these datasets with our field observations and previously published geochemical and geochronological data from Svalbard and other circum-Arctic successions, we propose that the Southwestern Basement Province of Svalbard represents a peri-Baltican terrane that was deformed in the late Neoproterozoic Timanide orogeny and then displaced during the early-mid Paleozoic Caledonian Orogeny. This interpretation has implications for the Proterozoic-Paleozoic displacement histories of other Caledonian terranes that have used the peri-Laurentian origin of southwestern Svalbard as a piercing point for regional tectonic reconstructions, as well as global models of Neoproterozoic sedimentary successions.

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