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Provenance Analysis of the Andrée Land Basin and the Paleogeography of Svalbard in the Devonian

Owen Anfinson[1], Margo Odlum[2], Karsten Piepjohn[3], Erini Poulaki[4], Grace Shephard[5], Daniel Stockli[4], Devin Levang[1,6], and Maria Jensen[7]

[1]Sonoma State University, Geology, Santa Rosa, United States of America (anfinson@sonoma.edu)
[2]Department of Geosciences, University of Nevada Las Vegas, Las Vegas, NV, USA
[3]Federal Institute for Geosciences and Natural Resources, Hannover, Germany
[4]Department of Geological Sciences, University of Texas at Austin, Austin, TX, USA
[5]Centre for Earth Evolution and Dynamics (CEED), Department of Geosciences, University of Oslo, Oslo, Norway
[6]Department of Geoscience, University of Wisconsin-Milwaukee, Milwaukee, WI, USA
[7]The University Centre in Svalbard, Longyearbyen, Norway

During the Devonian, the Svalbard Archipelago lay near the equator, occupying an important paleogeographic position at the intersection of Caledonian and Ellesmerian orogens. We provide new sediment provenance constraints, including detrital zircon U-Pb ages, from the Devonian Andrée Land Basin, Svalbard, to understand the tectonic history of the archipelago at that time. Sedimentary provenance analysis of Devonian aged strata can help reconstruct the sediment sources and paleogeography to understand the assembly of the domains that make up Svalbard, that are presently separated by Devonian sedimentary basins and(or) faults with syn- to post Devonian displacement. The studied Andrée Land Group strata in Dicksonland, which are part of the North Atlantic's Old Red Sandstone, consist of the Early Devonian Wood Bay Formation and Middle to Late Devonian Mimerdalen subgroup. Paleocurrent indicators from Lower to lower-Middle Devonian strata record north-directed sediment transport. Detrital zircon U-Pb data are dominated by ages sourced from Svalbard's Northwestern and Southwestern Basement provinces. In Middle and Upper Devonian strata, paleocurrents and detrital zircon ages suggest a shift to a predominantly eastern-northeastern provenance, likely sourced from the uplifting Ny-Friesland block along the Billefjorden Fault Zone. The addition of significant late Ediacaran-early Cambrian detrital zircons in a sample from the uppermost Planteryggen Formation (Frasnian) indicate sources associated with the Timanian orogen and provide a useful palaeogeographic indicator when compared to other regional detrital zircon data sets. Detrital zircon ages and provenance data suggest Svalbard may have already been assembled, similar to the block we see today, with the Andrée Land Basin between modern exposures of the Southwestern/Northwestern and the Northeastern basement provinces. Comparison of detrital zircon ages from Andrée Land Group strata with those from other circum Arctic Lower, Middle, and Upper Devonian strata provides further insight on Svalbard's paleogeographic position in the Devonian.