

The Varangerian/Marinoan glaciation in Scandinavia – new age constraints

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Neoproterozoic glacial units in Scandinavia have been referred to the Varangerian glaciation. The Smalfjord and Mortensnes formations in E. Finnmark have recently been correlated with the worldwide Marinoan glaciation (635-650 Ma) and the local Gaskiers glaciation (580-590 Ma), respectively. Neoproterozoic glacial formations in the Caledonian nappe region have been correlated with the Mortensnes Fm in Finnmark and should be of Gaskiers age. However, the Lillfjället Fm in Härjedalen contains two glacial diamictite units separated by a >500 m thick sandstone and mudstone unit; a stratigraphy similar to that in Varanger where the Nyborg Fm siltstone separates the Smalfjord and Mortensnes formations. Neoproterozoic glacial units in Scandinavia are floored with carbonate platform formations, lack cap dolomites, and are overlain by several hundred meters thick late Cryogenian (?) – Ediacaran fluvial to shallow-marine sandstones. In Härjedalen, this tripartite compound unit is cut by the Ottfjället dolerite dyke swarm. A U/Pb baddeleyite age of 596 Ma from an Ottfjället dyke (Kumpulainen et al. this volume) shows that the Lillfjället Fm was buried and cemented well before the dolerite dykes were emplaced; a Gaskiers age of glaciation is excluded. The Neoproterozoic glacial units of Scandinavia thus appear to correlate with the Marinoan glaciation, a supposed “Snowball Earth” event. The term Varangerian is still valid, covering the whole time interval from the first to the second glacial Neoproterozoic stratigraphic unit in Scandinavia, including interglacial sediments, as the Nyborg Fm in Finnmark and the unnamed sandstone-mudstone unit between the two major glacial diamictites of the Lillfjället Fm. The new age constraint and revised correlation is of crucial importance for the global Neoproterozoic glacial history.