Glacial striations from the Varangerian glaciation in South Norway

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Neoproterozoic glacial deposits ('tillites') referred to the Varangerian or Marinoan glaciations (Ediacaran or Cryogenian age) are in Scandinavia well known from South Norway, central western Sweden and northern Norway. In Finnmark, northern Norway, glacial striae on a quarzitic basement beneath the Smalfjord Formation at Bigganjargga were documented already by Reusch (1891). ESE-WNW oriented glacial striae also occur on polished granitic basement beneath the Moelv Fm diamictite east of Storsjøen in South Norway (Nystuen & Lamminen 2011). Glacial striations of basement rocks in Scandinavia have elsewhere been ascribed to Pleistocene glaciation.

Remapping of the Sub-Cambrian Peneplain (SCP) in Hardangervidda, South Norway, has confirmed the striking topographic regularity of this surface (Rekstad 1903). The surface is locally involved in Caledonian deformation and is faulted and warped in places (Jarsve et al., 2014). A plethora of sediments of contrasting origin have been preserved in primary (erosional) and secondary (tectonic) pockets on top of crystalline basement rocks. The SCP is characterized by a mm-thick coating of Fe(OH), MnO(?) and locally Pb-minerals (Gabrelsen et al. 2015). Careful inspection in localities where the SCP is particularly well preserved reveals a set of W-erly directed striae of glacial origin. The striae are associated with chatter marks also indicating westerly transport, which is oblique to the Weichselian glacial transportation in the area (south to south south-east). Compared to Pleistocene glacial structures, striae and chatter marks are slightly rounded/weathered and covered by the Fe(OH)/?MnO-mineralized coating. In one locality (Holværsvatn, eastern Hardangervidda) glacial striae are broken by a system of NE-SW-striking (N215-225E, down-to-the SE) mineralized microfaults. Postglacial mineralized fractures cutting glacial striae are not known from South Norway.

The observed glacial striae are therefore supposed to be of similar age as the striae beneath the Moelv Fm at Storsjøen. This correlation indicates a widespread Neoproterozoic ice sheet of Baltica, likely corresponding to the 635 Ma Marinoan glaciation. The striations of the basement also put the age of the SCP back in time as a Sub-Ediacaran Peneplain.

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