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Hyperextension in the pre-Caledonian margin of Baltica: new observations and U-Pb ages from the Samnanger Complex, Major Bergen Arc, western Norway.

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The Samnanger Complex (SC) of the Major Bergen Arc in western Norway (Færseth et al., 1977) comprises a thick succession of original fine-grained marine sediments, now mica- and graphitic schists, some fine-grained impure marbles as well as local quartzite, meta-sandstones and meta-fanglomerates of continental affinity. There are also minor meta-igneous rocks including amphibolite, metagabbro as well as felsic and mafic gneisses. The most characteristic rocks in this heterogeneous unit, however, are numerous solitary mantle-peridotites now present as variably altered serpentinites and soapstones with commonly developed ophicarbonate alteration. Detrital serpentinite and soapstone deposits have also been identified in one locality, now mostly removed by quarrying for building and ornamental stones. The SC is continuous with a regional mélange unit, which can be traced across southern Norway towards Røros (Andersen et al., 2012). The mélange is structurally positioned below large crystalline nappes such as the Jotun Nappe and the SC is structurally positioned in-between the underlying Lower Bergsdalen and the overlying Lindås nappes (Færseth et al., 1977). The lithological association of the mélange with its common presence of solitary and detrital meta-peridotites suggests that it was formed by hyperextension in a magma poor margin. After early-Caledonian metamorphism and deformation associated with emplacement of gabbro and granitoids in the early Ordovician it was finally emplaced in the Caledonian nappe stack after the closure of the Iapetus Ocean. Late granitoid dikes cutting most of the deformation fabric are ∼420 Ma. New ID-TIMS U-Pb ages of a pegmatitic meta-gabbro (∼486 Ma) and a mylonitic granitoid (∼476 Ma) indicate magma emplacement, probably related to subduction within distal parts of the hyperextended margin. We suggest that the exhumation and hydration of subcontinental lithospheric mantle in hyperextended basins may lead to a long-term weakening of the crust and zones of exhumed mantle may therefore be prone to localized compressive deformation during later stages of a Wilson Cycle. The Ordovician magmatic rocks within the SC might therefore be produced by incipient subduction, which was contemporaneous with the formation of supra-subduction ophiolite and island arc complexes in the oceanic terranes (e.g. Slagstad et al., 2014).

Andersen, T.B. et al., 2012. Evidence for hyperextension along the pre-Caledonian margin of Baltica. Journal of the Geological Society, 169, pp.601–612.

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