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Pre-Caledonian vs. late-Sveconorwegian extension - implications of the 960-950 Ma Sognefjellet intrusive suite

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The northwestern flanks of the Jotun Nappe Complex in the Caledonides of south-central Norway are underlain by a complex allochthonous assemblage, which includes various types of supracrustal rocks, highly sheared rocks of uncertain affinity, slivers of orthogneiss, and local mafic dykes, gabbros and tonalites. The identity, tectonic affiliation and role played by this tectonic unit has been debated for several decades. The recognition of a regionally continuous unit of melange, characterized among others by the occurrence of solitary mantle peridotites, and their interpretation in terms of hyperextension of the continental margin in the initial stages of the Caledonian orogenic cycle (Andersen et al. 2012) has focussed new attention on the Sognefjell suite, since it appears to be one the components of this large scale melange unit. Dating by U-Pb of zircon from a gabbro and a tonalite of the Sognefjellet suite indicates formation at 960-950 Ma, in the late stages of the Sveconorwegion orogeny. An augengneiss is instead older and correlates with rocks of the Jotun nappe Complex, indicating a likely tectonic origin. Although potentially the gabbro and tonalite could also be tectonic intercalations, their association with apparent metavolcanic rocks and the uniqueness of the association suggest that they intruded the supracrustals. In fact, although magmatism at this time was widespread in the Sveconorwegian orogen of southern Norway, plutons of this age are now found exclusively intruding continental crust. There is, however, a large suite of 960-950 Ma granites which intrude ca. 1000 Ma clastic metasedimentary rocks in Caledonian allochthons around the North Atlantic, and it has been suggested that they formed during opening of the Asgard Sea bewteen Laurentia and Baltica (Cawood et al. 2010). Potentially, such a process could also explain the formation of the melange, as well as the presence of ca. 1000 Ma volcanic units found in pelitic to clastic sedimentary units of other allochthonous units in the region (Roffeis and Corfu subm).

Andersen et al. 2012. Evidence for hyperextension along the pre-Caledonian margin of Baltica. J. Geol. Soc., London 169: 601-612.

Cawood et al. 2010. Neoproterozoic orogeny along the margin of Rodinia: Valhalla orogen, North Atlantic. Geology 38,99-102.

Roffeis and Corfu (subm) Correlation of Caledonian crystalline nappes in SW-Norway by means of U-Pb geochronology: old problems and new data. submitted to Spec. Publ. Geol. Soc. London