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Large meta-eclogite massifs within the Western Gneiss Region, Scandinavian Caledonides: Subducted ocean-continent transition?

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The northern part of the Western Gneiss Region (WGR) has distinctive belts of allochthonous metasediments and mafic rocks lying within tight infolds into the Baltica basement. They outcrop from the Grong-Olden Window to the Norwegian coast, possibly as far SW as Sørøyane, predominantly comprising metapelite and amphibolite with psammite, marble, calc-silicate, local large eclogite (>4km) lenses and ultramafites. These supracrustal lithotectonic units are attributed to the Blåhø Nappe, correlated with the Seve Nappe Complex (SNC) in its main outcrop in Sweden, which is considered to represent the pre-Caledonian continent-ocean transition (COT) of Baltica. They closely resemble the Lower Seve Nappe in northern Sweden where large amphibolite massifs with marbles are common, along with local eclogites. At least some have geochemical characteristics of spilitised extrusive MORB basalt in contrast to the better known, Neoproterozoic Baltoscandian Dyke Swarm in the SNC.

In the WGR near Molde a >10km long massif of such “amphibolite” at Tverrfjella commonly exhibits a relict high-P granulite precursor that has, in turn, overprinted eclogite. It encloses marble, scapolite-bearing calc-silicate, garnet peridotite (harzburgite) and Cu ores. Marble and meta-eclogite are intermixed which, along with its high Na spilitic character, suggests that the protolith was extrusive. Limited geochemical data suggest MORB composition. P-T estimates for eclogites in adjacent belts suggest UHP, possibly diamond-stable, conditions; in Sørøyane the well-known Ulsteinvik eclogite contains coesite. In the Molde area some of the mafic rocks and metasediments have partially melted. Eclogite metamorphism was Scandian in the Tverrfjell massif at 418 ± 11 Ma, with similar ages but tighter errors for adjacent belts and Ulsteinvik. These are significantly younger than ages for (U)HP metamorphism in the main SNC outcrop in Sweden, where early Ordovician subduction with a latest Ordovician granulite overprint is recorded. However, metapelites in other Blåhø-like supracrustal belts in the WGR do seem to record this earlier history as does one eclogite, consistent with the “double-dunk” hypothesis in this hinterland region. The protolith age of the metabasalts is unknown; analogy with the BDS suggests Neoproterozoic, but some zircon data from the WGR may suggest magmatic crystallisation during the Ordovician.O-isotopes indicate that the marbles were Palaeozoic, rather than Proterozoic, carbonates. Overall, the available literature data show that some large mafic massifs in the WGR, with associated metasediments and peridotites, are allochthonous with respect to Baltica basement; they represent major additions of extrusive basalt to a far-distal COT or fully oceanic basin that have been subducted at least once during the Caledonian Wilson cycle. Isotopic data

hint that at least some of their protoliths are unusually young. These supracrustal belts certainly merit closer attention.