EGU21-10091
https://doi.org/10.5194/egusphere-egu21-10091
EGU General Assembly 2021

Tectonostratigraphy of the Southernmost Scandinavian Caledonides: testing the Shetland correlation and the Laurentian/Renlandian link

Bernard Bingen[1], Espen Torgersen[1,2], and Morgan Ganerød[1]
[1]Geological Survey of Norway, Trondheim, Norway (bernard.bingen@ngu.no; espen.torgersen@ngu.no; morgan.ganerod@ngu.no)
[2]Norwegian University of Science and Technology-NTNU, Trondheim, Norway

Geological mapping, zircon U–Pb dating of 28 samples, and mica ^{40}Ar–^{39}Ar dating of 7 samples in the Stavanger–Ryfylke region (Stavanger, Suldal, Nedstrand, Randøy) characterizes the tectonostratigraphy of the southernmost nappes in the Scandinavian Caledonides. Four main tectonostratigraphic levels are described. (1) The lowest phyllite/mica schist nappes –Buadalen, Holmasjø, Lower Finse, Synnfjell– represent the Cambro–Ordovician sediment cover of the Baltic margin. (2) The overlying nappes –Madla, Storheia, Dyrskard, Hallingskarvet– consist of felsic metaigneous rocks with a consistent age between c.1525 and 1493 Ma. They host c.1040 Ma intrusives and c.1025 Ma Sveconorwegian metamorphism. They likely represent transported Baltican (Sveconorwegian) basement, widely exposed in S Norway. (3) The overlying nappes –Sola, Boknafjord, Kvitenut, Revseggi– are more diverse and lack counterparts in the exposed Baltican crust. The Sola nappe, near Stavanger, comprises a marine succession –Kolnes succession– of mica schist, metasandstone, marble, amphibolite and felsic metavolcanic rocks. The metavolcanic rocks –Snøda metadacite–rhyolite– are fine-grained mica gneisses, with calc-alkaline composition. Their extrusion age of c.941–934 Ma date deposition of the sequence. Detrital zircons in a metasandstone sample (n=138) yield main age modes at c.1040, 1150 and 1395 Ma, as well as significant Paleoproterozoic and Archaean modes. The Kolnes succession was affected by Taconian/Grampian metamorphism peaking in eclogite-facies conditions between c.471 and 458 Ma (Smit et al., 2010), followed by regional cooling around 445–435 Ma. Leucogranite bodies (c.429 Ma) cut the Grampian fabric. Several ^{40}Ar–^{39}Ar white mica and biotite plateau ages constrain the timing of Scandian top-to-the SE nappe stacking at c.420 Ma. The Boknafjord nappe in Nedstrand comprises a c.932 Ma augen gneiss, overlain successively by amphibolite and mica schist units. Preliminary detrital zircon data (n=11) imply an Ordovician (<459 Ma) deposition for the mica schist. (4) The highest nappes –Karmsund and Hardangerfjord– host the Karmøy and Bømlo ophiolite complexes. These complexes comprise a c.493 Ma supra subduction zone ophiolite, intruded by c.485–466 Ma volcanic arc plutonic rocks, and unconformably overlain by fossiliferous upper Ordovician (<c.445 Ma) clastic sediments (Pedersen and Dunning, 1997).

We propose that the Iapetan Karmøy–Bømlo ophiolite complexes were accreted onto the Kolnes succession on the Laurentian side of the Iapetus realm, during the Grampian orogeny, before

integration of both in the Scandian nappe pile. The age of HP metamorphism in the Kolnes succession (471–458 Ma) matches the inferred timing for obduction of the Karmøy–Bømlo complexes (485–448 Ma). The evidence for a Laurentian margin obduction stems from a conspicuous similarity with Shetland. On Shetland, the c.492 Ma Unst–Fetlar ophiolite complex was obducted during the Grampian orogeny onto Neoproterozoic Laurentian marine sequences (psammite-marble-mica gneiss) of the Westing, Yell Sound and East Mainland successions. The Westing and Yell Sound successions are characterized by a c. 944–925 Ma, Renlandian, high-grade metamorphism, a dominant detrital zircon mode at 1030 Ma, and common Archean detrital zircons. They correlate well with the Kolnes succession and suggest an ancestry along the Neoproterozoic Renlandian active margin of Laurentia and Rodinia, before opening of Iapetus.