Discussion

Geochemical evidence for a rift-related origin of metadolerites within the Senja Nappe, Troms, north Norwegian Caledonides: a discussion

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Bergh & Andresen (1987) have suggested correlation of the Senja Nappe (Troms District, North Norway) with Ordovician–Silurian sequences of the Balsfjord Group which unconformably overlie mafic-ultramafic rocks of the Lyngen Nappe. This is inconsistent with c. 475–500 Ma post-metamorphic $^{40}Ar/^{39}Ar$ hornblende cooling ages previously reported for the Senja Nappe. Field and geochronologic characteristics indicate correlation of the Senja Nappe with other units of the regional Middle Allochthon Scandinavian succession.

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Bergh & Andresen (1987) have presented geochemical analyses of foliated, polydeformed metadolerite dikes within marble and mica schist of the Senja Nappe in the Troms district of the north Norwegian Caledonides. They interpreted their results to indicate that protoliths of the dikes were MORB basalts with affinities transitional between 'within plate' and 'plate margin' settings. Bergh & Andresen suggested that the protoliths were emplaced into a platformal or miogeoclinal sequence similar to that of the Caledonide Middle Allochthon. However, because of '. . . extensive carbonate build-ups . . .', which Bergh & Andresen indicated were '. . . not characteristic of the Middle Allochthon (Kalak Nappe Complex) further east', they proposed correlation of the Senja Nappe with dike intruded, Ordovician–Silurian metasedimentary sequences of the Balsfjord Group which unconformably overlie the mafic-ultramafic (ophiolitic?) igneous complex of the Lyngen Nappe (Upper Allochthon). Field, petrologic, and geochronologic characteristics of the Senja Nappe are markedly inconsistent with this correlation.

The results of a systematic program of detailed mapping and coordinated geochronological work on Senja, presented by Cumbest et al. (1983, 1984), Williams et al. (1985), Clark et al. (1985), Cumbest & Dallmeyer (1985) and Dallmeyer & Hames (1986), document a complex, polyorogenic tectonothermal evolution for the Senja Nappe. This involved initial growth of a middle amphibolite facies mineral assemblage which is only locally preserved as rotated porphyroclasts within a penetrative mylonitic foliation. This fabric developed during emplacement of the Nappe into its present relative structural position on synchronously imbricated, crystalline basement units (with geochronological characteristics indicating a Baltic Shield correlation) which comprise the Western Gneiss Terrane (WGT) on Senja. These basement rocks locally display protomylonitic–mylonitic fabrics adjacent to the Senja Nappe tectonic contact. These and the nappe contact are offset by a regional, up to 2 km wide, ductile strain zone. Porphyroblastic hornblende overgrowing this strain zone and mylonitic fabrics within the Senja Nappe record $^{40}Ar/^{39}Ar$ plateau ages which indicate that post-metamorphic cooling through appropriate argon closure temperatures occurred between c. 475 and 500 Ma, requiring an earlier emplacement for the Senja Nappe and development of related mylonitic fabric elements. The hornblende $^{40}Ar/^{39}Ar$ age spectra record variable effects of a c. 380–390 Ma thermal rejuvenation. Porphyroblastic chlorite

and muscovite overgrow mylonitic fabrics within the WGT and the Senja Nappe. The muscovite and dynamically recrystallized biotite within the mylonitic foliation record 380–390 Ma $^{40}Ar/^{39}Ar$ plateau ages indicating total rejuvenation (or growth) during a late Caledonian thermal overprint. The Late Cambrian–Early Ordovician thermal record within the Senja Nappe precludes correlation with Ordovician–Silurian successions within the Balsfjord Group.

The internally imbricated character of the Senja Nappe precludes a reliable estimate of stratigraphic thicknesses, and thereby limits the usefulness of lithologic dominance in regional nappe correlations. Bergh & Andresen's suggestion that carbonates are not typical within supracrustal units of the Kalak Nappe Complex is not supported by the descriptions of Roberts((1968) and Zwaan & Roberts (1978), which list the Falkenes Marble Group as a persistent constituent. The Late Cambrian–Early Ordovician tectonothermal record within the Senja Nappe, combined with the internally imbricated Baltic Shield basement, clearly suggest that that nappe occupies a tectonostratigraphic level similar to that of western segments of the classically defined Scandinavian Middle Allochthon. These characteristics do not permit correlation with the Ordovician–Silurian Balsfjord Group which unconformably overlies mafic-ultramafic rocks of oceanic affinity within the Upper Allochthon.

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