

Timing and possible setting of the metavolcanic Grønfjellet unit in the Eastern Trondheim Nappe Complex, central Scandinavian Caledonides

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The Grønfjellet unit is a metavolcanic complex recently discovered 75 km southeast of Trondheim. The unit is situated in the eastern part of the Trondheim Nappe Complex and was previously included into greenstone and amphibolite belonging to the Funnsjøen Group. However, more detailed field mapping has revealed a unique metavolcanic unit consisting of both agglomerates, welded tuffs and various pyroclastic sequences. The unit covers at least 20 km² and is associated with layers of marble and rusty phyllites and metasandstones.

Field evidence indicates that feldspar-porphyrific dolerite dykes belonging to the latest stages of the Funnsjøen Group cut the volcanic complex. This implies that the Grønfjellet unit and the Funnsjøen Group must have been in proximity during the intrusion of the dolerites, either in primary contact or tectonically juxtaposed. To the north and east, the Grønfjellet unit has uncertain field relationships to the pre-doleritic parts of the Funnsjøen Group. Both the Grønfjellet unit and the Funnsjøen Group display a strong ductile to semiductile deformation with a prominent south-west plunging ductile stretching lineation. The dolerite dykes cut an early phase of deformation in the Funnsjøen Group (Grenne & Lagerblad, 1985), but the same field relationship has not yet been documented for certain in the Grønfjellet unit.

So far, extraction of zircons from the volcanic rocks of the Grønfjellet unit has been unsuccessful. But the Funnsjøen Group is intruded by the 437.8 ± 2.3 Ma Fongen-Hyllingen intrusion (Nilsen et al. 2007), where the feldspar-porphyrific dolerite dykes can be found as inclusions, therewith predating the intrusion. Since the Grønfjellet unit is cut by the dolerite dykes, it has to be older than the Fongen-Hyllingen intrusion. This provides a minimum age for the Grønfjellet unit, the Funnsjøen Group and part of the deformation. It is estimated that the Fongen Hyllingen intrusion was emplaced at 3.5 ± 0.5 kb, meaning that the Grønfjellet unit and the Funnsjøen Group were buried to depths of ca. 11-15 km before the emplacement of the gabbro intrusion.

Preliminary geochemical data from ten fine-grained samples of volcanic origin reveal a peculiar composition: they plot as alkaline rocks in the Nb/Y vs. Zr/Ti diagram; they are enriched in LREE as well as Th, U, Nb and Ta; they plot close to the MORB–OIB array in the Nb/Yb vs Th/Yb diagram; and they do not show significant negative Nb-Ta anomalies typical for island-arc or back-arc settings. Ranging in composition from trachybasalt, through basaltic trachyandesite to trachyandesite, they are very different from the typical island arc tholeiites and back-arc basin basalts of the Funnsjøen Group metavolcanic rocks elsewhere, and are more similar to rift-related alkaline rocks from the western Trondheim Nappe Complex. The complex therewith represents a hitherto unknown, possibly rift-related volcanic phase prior to emplacement of the dolerite dykes and the Fongen-Hyllingen intrusion.

References

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