Geophysical Research Abstracts
Vol. 13, EGU2011-8525-1, 2011
EGU General Assembly 2011

The Bjørnesund anorthosite-greenstone belt - a link between the Fiskenæsset complex and the Ravns Storø metavolcanic belt, southern West Greenland

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Non-tectonic contact relationships between the Fiskenæsset complex (FC; southern West Greenland, c. 62.5-63°N) and adjacent meta-volcanic amphibolites are rare. However, the Bjørnesund anorthosite-greenstone belt (BAGB) is considered to be part of the FC (e.g. Myers 1985), and here the best-preserved amphibolites preserve primary volcanic structures such as lithic tuffs. These volcanic rocks are similar to those in the Ravn Storø metavolcanic belt (RSMB, a.k.a. Ikkattoq Nunaa belt). Therefore, the BAGB provides an ideal opportunity to explore a possible genetic relationship between the Ravn Storø metavolcanic belt and the Fiskenæsset complex.

The amphibolites in the eastern part of the BAGB (c. 62.99ºN, 49.54ºW) have a similar lithostratigraphy, and the same volcanic structures and rocks as in the RSMB. In the RSMB, undeformed and little deformed equivalents of the upper part of the BAGB layered amphibolites contain pillow lavas, interlayered leuco-amphibolites and mela-amphibolites, distinctive lithic tuffs, and aplitic layers and dykes containing garnets with leucocratic haloes. All these features are observed in the BAGB east of the Bjørnesund.

In the BAGB the assemblage: hornblende and plagioclase $\pm$ quartz $\pm$ minor biotite is dominant in the amphibolites, but locally these rocks may contain garnet, cummingtonite or orthoamphibole. Peak metamorphic conditions were in the amphibolite- to upper amphibolite-facies. Amphibolites in the RSMB reached slightly lower metamorphic grades.

The BAGB amphibolites were intruded by an anorthosite sheet, which mainly consists of leucogabbro (locally cumulate), gabbro and anorthosite that locally contains chromitite layers. Way-up criteria (anorthite-hornblende graded layers) indicate right-way-up in the south of the sheet but an inverted orientation in the north. The stratigraphy of the anorthosite is distinctly similar to that reported for the FC (e.g. Windley et al. 1973; Myers 1985). The anorthosite was folded into an isoclinal synform (F1/F2) that has also affected the diorite and amphibolites.

The anorthosite sheet and amphibolites were intruded by granodioritic to tonalitic gneiss, which has a $\sim$2.89 Ga protolith zircon age peak. The gneiss obscures the connection between the BAGB and RSMB. A regional D2 deformation event caused folding, thrusting (with only minor displacement) and granite intrusions in both the BAGB and the RSMB are associated with this deformation. The amphibolites in the two areas are structurally continuous and likely part of the same sheet of extrusive rocks that were folded and thrusted during this event. Elevated gold values that are associated with the granite intrusions were discovered in part of the BAGB along D2 thrusts, especially where D2 is mainly expressed by strike-slip shearing. The F2 folding was associated with shearing of the anorthosites to finely banded anorthosite mylonite. The shearing was facilitated by the presence of minor biotite (probably derived from intruding gneiss or pegmatites) in the anorthosite. Ultramafic bodies form σ-clasts in intensively sheared anorthosite. Granites, which intruded the amphibolite-anorthosite belt in F2 fold cores (syn- to post-tectonically), have an intrusion peak zircon age of $\sim$2.84 Ga.

A mild, later, NNW-SSE-trending fold phase, F3, has slightly bent the regional foliation, causing the Bjørnesund anorthosite-greenstone belt to have a stair-case-like appearance on the geological map. The orientations of F2 and F3 fold axial planes are concordant with those farther to the north in the FC (Myers 1985). Both gneiss and

granite display a strong 2.74-2.70 Ga metamorphic age component. Pegmatites that intruded along F3 fold axial planes have ∼2.70 Ga zircon ages.

New information on the stratigraphy, geochronology, geochemistry, structural geology, and metamorphic petrology further unraveled the history of the BAGB and showed that the FC and the RSMB have an intrusive contact that was tectonically overprinted.

References:
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