Geophysical Research Abstracts
Vol. 13, EGU2011-7403, 2011
EGU General Assembly 2011

Geochemistry and petrology of border zones between mafic/ultramafic bodies and surrounding TTG gneisses (SW Greenland)

Alfons Berger (1), Thomas F. Kokfelt (2), and Martin B. Klausen (3)

(1) Department of Geography and Geology, University of Copenhagen, Øster Voldgade 10, 1350 Copenhagen K, Denmark.(Ab@geo.ku.dk), (2) Geological Survey of Denmark and Greenland (GEUS), Øster Voldgade 10, 1350 Copenhagen K, Denmark (tfk@geus.dk), (3) Department of Earth Sciences, University of Stellenbosch, Private Bag X1, Matieland 7602, South Africa (klausen@sun.ac.za)

Achaean TTG field areas often contain different ultramafic and mafic bodies, which have been investigated from different points of view (e.g., Clemens et al. 2006). Some of such studies investigate such acid and basic rocks from magmatic point of view (e.g., protholiths for partial melting, magmatic fractionation, etc.). However, most TTG areas also show a metamorphic overprint, and the magmatism and metamorphism often occur within a narrow time interval. Multiple intrusions of the magmas may induce "auto-metamorphism" of already crystallized but similar country rocks. Because of large volumes of the TTG series, the possible temperature gradient did not occur as around single, isolated plutons. During this metamorphism low temperature partial melting may also occur alongside with small scale metasomatic changes related to potential fluid flow from crystallizing melts. The recognition of primary magmatic and secondary metamorphic changes is often ambiguous. Therefore, we present petrological and chemical data from migmatites, TTG gneisses and mafic and ultramafic bodies inside the TTG dominated area of the Frederikshåb Isblink area, SW-Greenland, in order to get insights into the interplay between basic and acid rocks in such areas.
Petrology data from garnet amphibolites constrain the condition of metamorphism of the mafic rocks in the amphibolite facies. The mafic rocks show systematic correlation between MgO and most other major elements (i.e. TiO2, Al2O3, CaO), which is in accordance with magmatic evolutions. The large range of the MgO-content in this rock group ($\sim$4-19 wt%) include restitic compositions and intermediate material. The direct surrounding TTG gneisses are high-SiO2 tonalitic rocks (SiO2 content 65-74 wt%) and cannot be directly linked to the first described restitic rocks. In addition, local migmatites are present in the area, which are either related to an intrusive phenomena, partial melting and/or metasomatic processes. Possible intrusive development of the migmatites should be characterized by chemical mixing lines of the two rock groups (TTG versus mafic rocks). Major and trace elements exclude such processes for the migmatites. The local occurrence of leucosomes may reflect partial melting at water saturated conditions and/or metasomatic transport via a fluid. However, these processes are local (m-scale) as known from contact metamorphism. The use of such migmatites to reconstruct the genesis of TTG melts may lead to misinterpretation, if local metamorphic changes are played down.

References:
Clemens et al. 2006, Precambrian Geology, 151, 53-78.