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Eclogitization of hot granulites, Bergen Arcs, Norway

A.L. Perchuk (1,2) , V.V. Davidova (3), B. Stoeckhert (4)

(1) IGEM, Russian Academy of Sciences, Moscow, Russia, (2) IEM, Russian Academy of Sciences, Chernogolovka, Russia, (3) MSU, Moscow, Russia, (4) Institute of Mineralogy, Geology and Geophysics, Ruhr-University Bochum, Germany, (alp@igem.ru /Fax: +7 495-2302179)

The rocks of Holsnoy in the Bergen Arcs, Norway, provide excellent examples of fluid-inducedeclogitization of dry granulites during the Caledonian collision between Laurentia and Baltica (Austrheim & Griffin, 1985). Based on a geochemical study of these rocks, Camacho et al (2005) proposed a new model for the behavior of subducted continental lithosphere. According to this model, the crust is cold ($\sim$400^{o}C), transient heating being restricted to shear zones by co-seismic injection of hot (700^{o}C) aqueous fluids or by frictional heating. In order to check this model, we studied fresh granulites situated far away from the eclogite facies shear zones or veins. These rocks may be considered as representative of the "cold" crust. The studied sample is a typical coronitic anorthosite, consisting of clino- and orthopyroxenes, plagioclase, garnet, spinel and opaque minerals. Garnet coronas represent the incomplete reaction between clino- and orthopyroxene and plagioclase. The P-T conditions of the granulite stage (Neoproterozoic metamorphism) are estimated to be T$\sim$950^{o}C and P $>$1.2 GPa. The detailed petrologic analysis of this rock reveals micron-scale high-pressure reactions between Fe-Mg phases (garnet, spinel) and plagioclase. Local equilibria in the reaction rims indicate T$\sim$600-700^{o}C at P$>$1.4 GPa. The presence of amphibole and biotite associated with omphacite, kyanite and corundum suggests that an aqueous K-bearing fluid phase was involved. Pathways of fluid infiltration are not obvious, which is taken to rule out a strongly focused fluid flow and thus significant advection of the heat. If this is true, here the cold-crust model seems to be inconsistent with the petrological constraints.