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Midcrustal xenoliths from Beistein, Austria

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The main aim of this work is to study crustal granulite xenoliths from Beistein (Styrian Basin, Austria). Styrian-basin is situated at the westernmost part the Pannonian-basin-system. We collected 17 felsic granulite xenoliths, from basaltic pyroclastics near Beistein. We made petrography, geothermo-barometry and fluid inclusion studies to find out their evolution and fluid content and to make a comparison with other crustal xenoliths found in the Pannonian Basin. The petrography shows, that these xenoliths experienced 3 evolutional stages. At the beginning, a felsic magmatic body intruded into the middle crust. It contained feldspar, pyroxenes, quartz, biotite, opaque minerals, apatite and zircon. This intrusion experienced cooling. This cooling generated the stable mineral assemblage of the granulite facies (feldspar + orthopyroxene + quartz ± garnet) at p=5.5-6.7 kbar and T= 800-850oC and resulted in antiperthitic exsolution of feldspars. The third step was the uplift of the xenoliths in the basalt to the surface which generated temperature increase, and pressure decrease.

Considering the petrology of the fluid inclusions (FI) in these xenoliths, there are primary and secondary FIs in the samples. This shows us, that there were minimum of two fluid events (fluid-rock interaction). The very first fluid event coeval with the emplacement and crystallization of the magmatic body in the deep crust, witnessed by primary inclusions in the relict magmatic minerals like apatite and zircon. There are other primary FIs also in the main rock-forming minerals, such as plagioclase, quartz and pyroxenes. The second fluid event happened still in the lower crust. This produced the secondary FI rows along healed fractures mostly in the felsic minerals. The microthermometry shows, that CO_2 was the dominant fluid phase in the crust, but genetically the different FIs have different compositions. The melting temperatures (Tm) of primary FIs were between -58,0 and -65,6 °C, and that of the secondary ones were between -57,2 and -61,7 °C. These temperature values are lower than the triple point of the pure CO_2 system, which means some additional components like e.g. N_2, CH_4, H_2S or CO. The difference in the Tm values of the different FI generations show that the fluids in the crust have slightly changed their chemical composition during geological times.