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Diversity of mantle assemblages in southern Scandinavia

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Jurassic alkali-basalts from southern Sweden contain a large variety of ultramafic xenoliths which range from peridotites (sp-bearing lherzolites, harzburgites, wehrlites and dunites) to pyroxenites (websterites, clinopyroxenites). They indicate a very diverse composition of the upper mantle at the southern margin of the Fennoscandian Shield. The peridotite samples are all deformed as indicated by kink lamellae and undulose extinction of the porphyroclasts which occur in a fine grained recrystallized neoblastic matrix. The pyroxenites are rather equigranular rocks and might represent cumulates.

Microprobe and LA-ICP-MS analyses show similarities but also emphasize differences among the peridotitic rocks. Their silicates have similar mg-numbers of about 88 to 93, which is typical for group I inclusions in basaltic host rocks [1]. A few samples classified as wehrlite or dunite, however, have olivine with lower mg-numbers (81-84) similar to group II xenoliths. Primary spinel often occurs in the lherzolites, forms vermicular crystals and has a Mg-Al chromite composition. The other peridotites mostly lack primary spinel but show patches of a pre-existing phase. Herein a secondary fine-grained Cr spinel is associated with olivine, clinopyroxene, glass and a hydrous mineral. Mass balance calculations point to a break down of former amphibole due to decreasing pressure during the rapid ascent. The occurrence of such a hydrous mineral could be interpreted as indicator for mantle metasomatism. Furthermore, relatively low Ni and Cr contents in the olivine of the harzburgites and dunites suggest that these rocks are less refractory.

The olivine and both pyroxenes of the pyroxenitic cumulates have lower mg-numbers than those of the deformed peridotites, e.g. the olivine mostly shows Fo content between 80 and 86. The clinopyroxene is Al- and Ti-rich and Cr-poor. The pyroxenites are further characterized by relatively large crystals of pleonast spinel.

Results of geothermometry calculations using the two-pyroxene thermometer [2] and assuming pressures of 15 kbar range from 890 to 1060°C for the deformed lherzolites but scatter between 980 and 1200°C for the ultramafic cumulates, reflecting for the latter an origin from different positions within a layered intrusion at the crust-mantle boundary.

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Geochronological evidence of the complex nature of the Archaean Kanozero alkaline granites, Baltic Shield (Russia)

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Archaean alkaline rocks, including carbonatites, alkaline granites, lamprophyre dykes and sanukitoids, are widespread in all of the Earth's shields [e.g. 1-3]. In the NE Baltic Shield, the Keivy block consists of alkaline granite, the Ponoy, Zapadnokeivy and Belaya Tundra massifs, with a total area of about 3000 km^2. U-Pb ages on zircon from these massifs are 2751±41Ma, 2674±6 Ma, and 2654±5 Ma, respectively. The magmatic features of the Keivy alkaline granites include negative ε_{Nd}, from -1 to -4, a model Sm-Nd age of 2.9-2.8 Ga and mantle-like $^3He/^4He$ ratios about $0.7x10^{-6}$ [4-5].

The Kanozero massif, with a total area of 170 km^2, is composed of alkaline granites and mylonites and is situated in the Belomorsky block (NE part of the Baltic Shield). The aim of the study was precise U-Pb dating of zircon of the Kanozero alkaline rocks. In the alkaline granites, long prismatic zircon crystals (200 μm), which were broken to 30 μm, gave a U-Pb age of 2667±36 Ma (MSWD=1.4). This age is interpreted as the time of Kanozero alkaline granite formation. The lower concordia-discordia intercept is 1616±66 Ma and apparently is the age of the Svecofennian metamorphic event. Long prismatic zircon (150 μm) from Kanozero mylonites yielded a U-Pb age of 2264±12 Ma (MSWD=1.5), which is most likely the time of the early Proterozoic deformation. The negative ε_{Nd} (-3.5) and Sm-Nd model age of 2.84 Ga of the Kanozero alkaline granites reflect the mantle source (Serov, personal communication).

For the first time, an Archaean U-Pb age (2.67 Ga) has been obtained on zircon from the Kanozero alkaline granites. Archaean alkaline granites from the Keivy and Belomorsky blocks of the NE Baltic Shield are characterized by a complex history.

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