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The 2405 Ma and 2310 Ma Mafic Dyke Swarms in the Karelian Craton: Age, Chemical and Sr-Nd Isotope Composition, and Tectonic Setting

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Until recently the time period 2400 - 2200 Ma in the Earth history was characterized by low amount of age data for igneous events, and was even considered as 'magmatic age gap' (Condie et al, 2009; Eriksson and Condie, 2014). Nevertheless new age data received recently around the world (Partin et al, 2014; Pehrsson et al, 2014) suggest that drawing a gap was a result of low amount of age data. We get U-Pb (ID TIMS) baddeleyite age data for mafic dyke swarms in the Russian side of the Karelian craton that fall into the 'magmatic age gap' interval.

Now the only one dyke of age 2405±5 Ma is recognized. This EW-oriented dyke is compositionally similar with dykes of younger 2310 Ma event. These dolerites are evolved with low contents of MgO and high Fe and Ti. They also characterized by low values of Nb/Nb* = 0.32-0.35, and $\epsilon_{Nd}(2400) = -0.2$ that suggest high degrees of crustal contamination.

The younger ca. 2310 Ga mafic dykes are wide spread in the central and northern parts of the Karelian craton (Salminen et al, 2014; Stepanova et al, 2015). This age group includes low-Mg high-Fe tholeiitic dykes that vary in trace element and Sr-Nd isotopic composition.

In the central part of the craton these dykes form a regular swarm that traced for 40 km (Stepanova et al, 2015). These dykes are evolved and intensively contaminated tholeiites with LREE enrichment, and ϵ_{Nd} values of +0.4-+0.8.

Another swarm of age ca. 2310 Ma recently recognized in the northern part of the craton. The quartz-bearing doleritic dykes vary in thickness from several meters up to 100 meters and form regular NE-oriented swarm. Despite the fact that these dykes are evolved they have relatively low content of incompatible trace element concentrations, flat HREE patterns, and slightly enriched LREEs. Together with Nb/Nb* values of 0.5 and $\epsilon_{Nd}(2300)$ values of 1.7 suggest a crustal contamination involvement into

primary melts evolution originated via DM-type mantle source melting.

Both ca. 2405 Ma and 2310 Ma age groups of dykes were previously considered as feeder system of Jatulian (2300-2100 Ma) continental flood basalts that are widespread in the Karelian craton because of strong similarity in their chemical composition (Ein, 1984). These correlations with Middle Paleoproterozoic basalts suggest probability of wide spreading of ca. 2300 igneous event in the Fennoscandian Shield.

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