Main mafic dyke swarms of the southern Siberian craton: their ages and geochemical features

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An oldest generation of Palaeoproterozoic dolerite dykes yielded a U-Pb zircon age of 1864 ± 4 Ma, and U-Pb baddeleyite age of 1863 ± 1 Ma. The dolerite compositions are close both to OIB and to arc basalts. These dolerites were originated by melting of a mixed mantle source during the post-collisional extension after amalgamation of the Siberian craton. Mesoproterozoic dykes (U-Pb baddeleyite age of 1350 ± 6 Ma and U-Pb zircon age ca. 1338 Ma) correspond to sub-alkaline basalts. These dykes are interpreted to have been generated during plume-related intra-continental extension, and represent part of the plumbing system of a Large Igneous Province (LIP). The Neoproterozoic (725 – 715 Ma) mafic dyke swarms are sub-alkaline tholeiitic dolerites. Non-contaminated dolerites of these swarms were derived from a primitive mantle source, whereas other dykes formed as the result of crustal contamination of a primitive mantle source. The emplacement of these and other south Siberian Neoproterozoic dykes could be related to break-up of the Rodinia, and separation of Siberia from northern Laurentia. Early Palaeozoic dykes (U-Pb zircon age of 495 ± 4 Ma) are geochemically close to sub-alkaline tholeiites. These dolerites were derived from mantle sources contaminated by continental crust. Emplacement of these dykes could be related to Early Palaeozoic post-collisional extension after the accretion of Neoproterozoic – Early Palaeozoic terranes to the southern margin of the Siberian craton. The youngest group of dykes (U-Pb zircon age of 275 ± 4 Ma) are highly alkaline basalts in composition. The isotopic and geochemical data indicate a mixed mantle source with both recycled and enriched components. These dykes were emplaced through the interaction of a mantle plume with the subducted slab of the Mongol-Okhotsk Ocean.