Geophysical Research Abstracts
Vol. 19, EGU2017-6244, 2017
EGU General Assembly 2017

Mafic dyke swarms of the Bastar Craton, central India: geochemistry, Sr-Nd isotopes and tectonic implications

Chien-Yi Liao (1), J. Gregory Shellnutt (1), Kosiyathu Raghvan Hari (2), and Neeraj Viswakarma (3)

(1) Department of Earth Sciences, National Taiwan Normal University, Taipei 11677, Taiwan, (2) School of Studies in Geology and Water Resource Management, Pt. Ravishankar Shukla University, Raipur 492010, Chhattisgarh, INDIA, (3) Department of Applied Geology, National Institute of Technology, Raipur 492010, Chhattisgarh, India

The Archean Bastar Craton of central India which is demarcated by Godivari rift in the west, Mahanadi rift in the east, Narmada-Son rift in the north and the Eastern Ghats Mobile Belt in the south was intruded by several generations of mafic dyke swarms during the Precambrian, with most of the dykes NW-SE to WNW-ESE trending. The dyke swarms can be subdivided into three main groups: the Meso-Neoarchean sub-alkaline mafic dykes (BD1), Neoarchean to Paleoproterozoic boninite-norite dykes (BN) and Paleoproterozoic sub-alkaline mafic dykes (BD2). In the present work, an attempt has been made to constrain the petrogenesis and tectonic implications of the dykes in the Bhanupratapur area of central Bastar Craton. Petrographically, the dykes are metabasites / metadolerites that experienced hydrothermal alteration, as most of the samples are moderately to highly altered. Primary minerals were replaced but still retain the original igneous texture (ophitic). The least-altered samples contain orthopyroxene, plagioclase, secondary amphibole, secondary quartz and some euhedral Fe-Ti oxides. The dykes can be classified into two groups according to major element data. Petrographically, the two groups cannot be clearly distinguished. Group 1 is sub-alkaline basalt (SiO_2 = 51 wt%) with low magnesium (MgO = 4.6 to 7.2 wt%), low Mg-number (Mg# $\leq$ 53) and higher titanium ($TiO_2 \geq 0.83$ wt%). Group 2 is sub-alkaline basaltic andesite and has boninitic characteristics with higher silica (SiO_2 = 51 to 56 wt%), higher magnesium (MgO = 5.9 to 19.1 wt%), higher Mg-number (Mg# = 50 to 79) and lower titanium ($TiO_2 \leq 0.8$ wt%). The chondrite-normalized REE patterns of Group 1 show variability in the light rare earth elements (La/SmN = 1.2 to 2.4). Group 2 exhibit light rare earth element enrichment (La/YbN = 2.2 to 10.4). The Sm-Nd isochron age of Group 1 is approximately 1.9 Ga, with the initial 87Sr/86Sr ratios range from 0.7029 to 0.7058 and εNd(t) values range from–0.9 to +1.8. Group 1 is suggested to be derived from a spinel peridotite mantle source. Group 2 has initial 87Sr/86Sr ratios range from 0.7036 to 0.7106 and the εNd(t) values range from –5.6 to –11.4. The enriched Nd isotope and trace element ratio indicate the rocks were contaminated by continental crust. Strontium isotope modelling using the sialic Bastar crust and a Group 1 sample as endmembers, suggest that $\sim$20% crustal contamination may have affected the Group 2 parental magmas. We think that a high thermal regime is responsible for such high amount of contamination. It is possible that the dykes were emplaced during the rifting of the Columbia supercontinent.