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Lamprophyres from Southern Karnataka, Dharwar Craton, India: Insight on the Rodinia Break-up and Addition of Juvenile Crust

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The late Archean Dharwar Craton is an important part of the Archean and Proterozoic terrains in Peninsular India. Dharwar Craton consists of Western and Eastern Blocks, separated by the Chitradurga Shear Zone. Eastern Dharwar Craton (EDC) is composed of the Dharwar Batholith (dominantly Granitic), greenstone belts, intrusive volcanic and middle Proterozoic to recent sedimentary basins. The Harohalli / Banglore dyke swarm in southern Karnataka, is one of the dyke swarms in EDC, located between the south-western portion of the Cuddapah Basin and the south-eastern limb of the Closepet Granite. The present study was carried out on the lamprophyre dykes occurring in the Halaguru area and Mysore industrial area; both of which were parts of Harohalli dyke swarm, referred collectively as Southern Karnataka Lamprophyres (SKL).

Field characteristics indicate that the lamprophyre dykes are fresh, contains crustal xenoliths, and occasionally show chilled contacts with the country rocks, i.e. charnokites. Petrographic studies revealed that all the lamprophyre dykes are dominently composed of amphiboles, which form well- developed phenocrysts exhibiting porphyritic–panidiomorphic texture. Clinopyroxenes are also present but not in all the dykes and their modal proportion also vary among the dykes. Olivine is totally absent and magnetites/ titanomagnetites are scantily present. Feldspars show bimodal distribution, i.e. albite or orthoclse, without much variation in their end- member compositions. Geochemical characters of SK lamprophyres do not deviate too much. They show almost consistent sodi- potassic characters (K_2O/ $Na_2O \approx 1$), calc – alkaline nature, and shoshonitic affinity. In the regional geologic set-up, the SKL dykes are characterised by two major influences; namely, primary source region characteristic (which is geochemically more primitive, roughly falling within fields of primitive - MORB and enriched- MORB) and second one is continental crust. The data points for all the SKL dykes distinctly plot near NMORB field and scatter towards the continental crust end member. The data array also indicates that the SK lamprophyres are not related to subduction process. From the present study it has now become evident that the SKL were derived from the rift- related (MORB-like) mantle source, which has been contaminated by the continental crust. The process identification diagrams have indicated that fractional crystallisation is a dominant mechanism. A graphical model has been presented which indicates that clinopyroxene was the main fractionating phase, with smaller roles played by plagioclase and magnetite in the proportion Cpx (80%): Mt (05) %: plg (15 %).

It is widely known that the Neoproterozoic period witnessed significant addition of the juvenile crust (~20%) all over the globe through a single cycle of supercontinent break-up (Rodinia) and reformation (Greater Gondwana and Pannotia). Most of the activities were linked to the convergent margin settings; however, our data on SK lamprophyres indicate that they were formed in a rift related setting co-relatable to the break-up of Rodinia (~830 Ma) and not with the subduction related Pan-African (~600 Ma) event in the then adjacent East Antarctic orogen.

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