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## Does Geochronology of Few Dykes of a Swarm are True Representative of All Dykes of the Same Magmatic Event?: Constraints from the Geochemistry and Google™ Earth Image–ArcGIS™ Studies of the Paleoproterozoic Mafic Dyke Swarms of the Eastern Dharwar Craton, Southern India

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A precise dating of a mafic dyke of a swarm in shield areas has great advantage to identify Large Igneous Provinces (LIPs; short-lived, mantle-generated magmatic event) (Bryan and Ernst, 2008; Ernst et al., 2010). Such studies are helpful to record intraplate mantle melting events through space and time and provide many key information on tectonics, secular evolution of the mantle, age and location of igneous centers, paleo-stress directions, main paleomagnetic poles, paleo-intensities of the core dynamo, plume frequency, mantle sources, and where they are subsequently deformed, on timing of deformation and regional strain patterns and gradients (Bleeker, 2004). Age barcode of these individual magmatic events of a crustal block can be used to reconstruct their connections in past continents and supercontinents (Bleeker and Ernst, 2006). Many such large dyke swarms comprises hundreds of dykes and it is difficult to have precise geochronological data on many dykes of each swarm; some selected dykes may be dated to represent a complete set of dyke swarm. However, in some cases, many dykes of the same swarm may have different compositions and emplacement ages. This raises an important question – whether all the dykes of a same swarm represent a single or more than one magmatic event? To answer this crucial question, we have studied distinct Paleoproterozoic mafic dyke swarms of the eastern Dharwar craton of the Indian shield to know their relative emplacement ages through cross-cutting field relationships and using the Google™ earth images and the ArcGIS™ techniques. Geochemical characteristics of these distinct mafic dykes are also used to answer the question.

Available petrological, geochemical and geochronological indicate presence of at least five different

Paleoproterozoic mafic dyke swarms in the eastern Dharwar craton viz. (i) NE–SW to E–W trending ~2.37 Ga Bangalore swarm, (ii) N–S to NNW–SSE trending ~2.21 Ga Kunigal swarm, (iii) NW–SE to WNW–ESE trending ~2.18 Ga Mahbubnagar swarm, (iv) N–S to NNE–SSW trending ~2.08 Ga Devarakonda swarm, and (v) NE–SW to E–W trending ~1.89 (?) Ga Bastar–Dharwar swarm. From these identified swarms, it is observed that the ~2.37 Ga and ~1.89 Ga dyke swarms have similar trend i.e. NE–SW to E–W. Similarly, ~2.21 Ga and ~2.08 Ga swarms trend in similar, mostly in N–S, direction. Although, these two sets of dyke swarms trend in a similar direction, they have distinct geochemical signatures that suggest different genetic histories. The Google™ earth images and the ArcGIS™ studies also corroborate these observations as, at many places, field relationships of the studied mafic dykes show contradictory results. Therefore, it is suggested that there should be a cautionary use of U–Pb ages for assigning a particular age for all the dykes of the same swarm (event). Other criteria, such as geochemistry and Google™ earth image analysis, should also be used for including dykes to the same swarm. There could always be a possibility to have some different magmatic event having similar dyke trend.

### References

- Bleeker, W., 2004. Taking the pulse of planet Earth: a proposal for a new multidisciplinary flagship project in Canadian solid Earth sciences. *Geoscience Canada* 31: 179–190.
- Bleeker, W., and Ernst, R.E., 2006. Short-lived mantle generated magmatic events and their dyke swarms: the key unlocking Earth's paleogeographic record back to 2.6 Ga. In: Hanski, E., Mertanen, S., Rämö, T., Vuollo, J. (Eds.), *Dyke Swarms – Time Markers of Crustal Evolution*. Taylor, Francis/Balkema, London, pp. 3–26.

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Bryan, S.E., and Ernst, R.E., 2008. Revised definition of large igneous provinces (LIPs). *Earth Science Reviews* 86: 175–202.

Ernst, R., Srivastava, R.K., Bleeker, W., and Hamilton, M.A.,

2010. Precambrian largeigneous provinces (LIPs) and their dyke swarms: new insights from high-precision geochronology, paleomagnetism and geochemistry. *Precambrian Research* 183: vii–xi.