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Mafic Dykes from the Southwest Coast of India: Palaeomagnetism and tectonic implications

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Late Cretaceous magmatism, south of the Deccan Traps, is widely distributed in the south west coast of India, mainly in the form of dyke intrusions. Most prominent dykes were emplaced around 70-65 Ma and are distributed in central Kerala, north Kerala and Goa. The strike trend of these dykes is NW-SE in central Kerala, whereas two orthogonal directions with NW-SE and NE-SW trends are found in north Kerala. In Goa region, they are mostly perpendicular to the coast. A subordinate magmatism, 90-85 Ma in age, is also traced in Agali and in the St. Mary Group of Islands off the Malpe coast. This magmatism is coeval with the leucogabbro dykes in central and north Kerala.

Samples were collected from fifteen dykes with NW-SE trend. Samples belonging to the older episode of magmatism include one dyke from Agali and two sites from Coconut Island of the St. Mary volcanics. Most of the doleritic dykes are fine to medium grained with typical mineral assemblages of plagioclase, augite, olivine, and Fe-Ti oxides. Olivine is often transformed to iddingsite. Fe-Ti oxides are found either as early inclusions within pyroxene or as interstitial and may constitute the late crystallization phases. Selected specimens from each site were subjected to low and high temperature susceptibility measurements to define the magnetic carriers and the thermal stability of the samples. They have indicated titanomagnetite as the main carrier of magnetization.

Palaeomagnetic measurements were carried out by detailed step-wise alternating field and thermal demagnetizations. After removal of sometime significant secondary components of magnetization, characteristic remanent magnetizations could be defined for most samples and mean directions of magnetization were obtained for twelve sites. Six of these sites come from the 70-65 Ma dykes, three being of reverse polarity with a mean direction of (D/I = 139/62) and a mean pole (Lat/Long = -26/101) and three yielding normal polarity (D/I = 340/-68 and Lat/Long = 23/267). Sites from the Agali dykes and the volcanic rocks of the St. Mary Island, representing the 90-85 Ma activity, are all of normal polarity (D/I = 323/-57 and Lat/Long = 29/288), in agreement with an emplacement during the Cretaceous Normal Superchron. Finally the last two dykes display a mean direction (D/I = 151/-68) which is quite different from the late Cretaceous results. This direction is comparable to directions reported for the Proterozoic (1.65 Ga) dykes of Thiruvannamalai and Kolar region in south India, suggesting a possible extension of Proterozoic dykes far south of Palghat - Cauvery “shear” zone. Ar/Ar dating is in progress to test this hypothesis.

Late Cretaceous results will be discussed in relation to Madagascar vs. India–Seychelles breakup and the final breakup of India vs. Seychelles.