

PALEOMAGNETIC, AMS AND MAGNETOSTRATIGRAPHIC STUDIES ON LAVA FLOWS FROM MANDLA LOBE OF THE EASTERN DECCAN VOLCANIC PROVINCE, INDIA

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Introduction: Deccan volcanic province (DVP) in India (Fig. 1) is one of the largest terrestrial flood basalt provinces ($0.51 \times 10^6 \text{ km}^2$) of the world that records immense accumulation of tholeiitic magma. We report Paleomagnetism, and Anisotropy of Magnetic Susceptibility (AMS) studies focussed on the Mandla lobe - an isolated, large northeastern outlier of the Deccan Traps. Basalts of the Mandla lobe cover an area of 29,400 km^2 in a thick pile of lava flows, preserved as isolated remnant of erosion on the eastern extremity of the Deccan Traps. The spatial detachment of the Mandla lobe from the western Deccan outcrop points to a possible different source. Flow-by-flow palaeomagnetic measurements of 37 lava flows in the 900 m-thick, isolated lava pile around Mandla in the eastern DVP reveals multiple magnetic polarity events: implying C29n-C28r-C28n magnetostratigraphy. Magnetic chron reversals in conjunction with field and chemical data support these findings. Further, these lavas are compositionally akin to Bushe, Poladpur, Ambenali and Mahabaleshwar Formational lavas and follow the same stratigraphic order as in the Western Ghats. Alternating field (AFD) and thermal demagnetizations (THD) isolate the normal mean direction of the Mandla lobe: $D = 344.58^\circ$ and $I = -30^\circ$, where D and I are the mean declination and inclination of the each lava flow ($\alpha_{95} = 8.2$; $K = 72.6$; $N = 17$, where α_{95} is the half-angle of the cone of 95% confidence about the mean direction, K is the precision parameter and N is the number of flows). The Virtual Geomagnetic Pole (VGP) position determined for these lavas indicates concordance with the main Deccan volcanic province. Total 816 standard size specimens were measured for AMS study. The main objective of the present AMS work is the identification of lava flow movement and study of magnetic fabrics of each flow associated with Mandla lobe. Oriented thin sections of each flow have been prepared for identification of magnetic mineralogy and their correlation with AMS results. Oriented photomicrographs of representative flow were prepared and compared with AMS results for the determination of the flow emplacement directions and petrofabric analysis. AMS results show inverse fabrics in most of the flows, where, foliations are perpendicular to the flow boundaries and the K3 axis is parallel to the flow direction, while in a normal magnetic fabric the K1 is parallel to the direction of the lava flows and the magnetic foliations are parallel to the flow planes. Inmost of the cases, the present orientation of the ma-

netic fabric analysis of Mandla area gave sense of magnetic fabric which is usually observed in discordant bodies. Although, the Deccan lava flows are horizontal or gently dipping $< 2^\circ$ and shows no lateral or vertical compositional variations along the strike (Lightfoot and Hawkesworth, 1988). Therefore, the possibility of vertical type of flow emplacement cannot be denied.

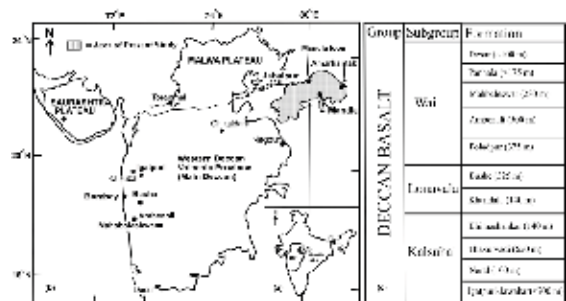


Fig. 1. (a) Map in the inset showing the DVP and the Mandla lobe in India. (b) Map (modified after Shrivastava et al. 2014) of the DVP showing the Mandla lobe (area of the present study). (c) The SW Deccan formational stratigraphy (after Cox & Hawkesworth 1985; Beane et al. 1986; Subbarao & Hooper 1988; Lightfoot et al. 1990).