Geochemical and Petrophysical Studies on Basaltic Formations of Eastern Deccan Volcanic Province, India: Implication for the Mantle and Magma Chamber Processes

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Geochemical variation within a single basaltic province is largely attributed to differentiation processes. Inspite of the huge work done on basalts there is still controversy regarding generation of the primary basaltic magma and formation of continental flood basalts as it involves complex magma chamber processes. The present work emphasises on the role of shallow magma chamber processes to better understand flood basalt magmatism. The area of study is in Eastern Deccan Volcanic Province (EDVP) around the Gangakhed – Ambajogai Section in Maharashtra, which comprises of four Formations namely Ajanta, Chikhli, Buldhana and Karanja. Systematic sampling across increasing elevation coupled with the observation of characteristic features in field was carried out followed by geochemical investigations supported by detailed petrography and petrophysical properties which have given clues about the major role of magma chamber processes in the formation of these basaltic flows. Our studies suggest that (1) Karanja Formation is a new pulse of magma as indicated by the abrupt change in texture, increase in MgO, CaO, Ni, Cr, and Sr, and drastic decrease in Al_2O_3, Na_2O, K_2O, Rb, Ba, REE contents, Bulk-Rock density and magnetic susceptibility.(2) Trace element geochemisty has been affected by assimilation-fractional crystallisation, crystal laden magmas, and accessory cumulus phases.(3) there was mineralogical variation in the initial and final stages of equilibration of the magma. (4) A small layer of oxide basalt may represent the latest erupted pulse in a given magmatic cycle in DVP. (5) Parental basalt to some of the red boles, considered as formation boundaries, might represent small degree partial melts of the mantle.(6) EDVP is a continuation of the SW Deccan basaltic type (7) Dynamic melting of mantle is also an important process after magma chamber processes for constraining the geochemical composition of Deccan basaltic lavas. The present work highlights the importance of studying specific stratigraphic intervals in selected areas of DVP to understand mantle and magma chamber processes relevant to CFB magmatic activity leading to the formation of the Deccan Large Igneous Province.

Keywords : Continental Flood Basalt, EDVP, Petrophysics, Magma Chamber ,Dynamic Melting .