Paper Number: 4440

Architecture of lavas from Deccan Volcanic Province, India and its implications

Kale, Vivek S.

ACWADAM, Pune 411 021, INDIA.
& Department of Earth Sciences, Indian Institute of Technology Bombay, Mumbai, India.
Email: dr.vivekale@gmail.com

Earlier classification (simple / compound; pahoehoe / *àā*; etc) of the basaltic flows from the Deccan Volcanic Province are found lacking in being able to unambiguously explain the mode of their emplacement. Recent studies have shown that a large proportion (perhaps as much as 95%) of these lavas are compound pahoehoe-type sheet flows, constituted of multiple lobes that are variably welded together. This is also true for most of the flows exposed all along the rim of the province that were considered earlier to be "simple'' flows. Observations of the physical structure and lateral architecture of individual lobes in the province show that they display variations between two end-member types. Lateral changes in internal the lobe geometry are also seen within a single flow. These two types are designated as Deccan Type "A" and Type "B" flow lobes and represent extreme conditions of lava emplacement in terms of extrusion rate and lateral movements. All variations between these two end-member types are observed in the component chemostratigraphic formations of the Deccan Volcanic Province.

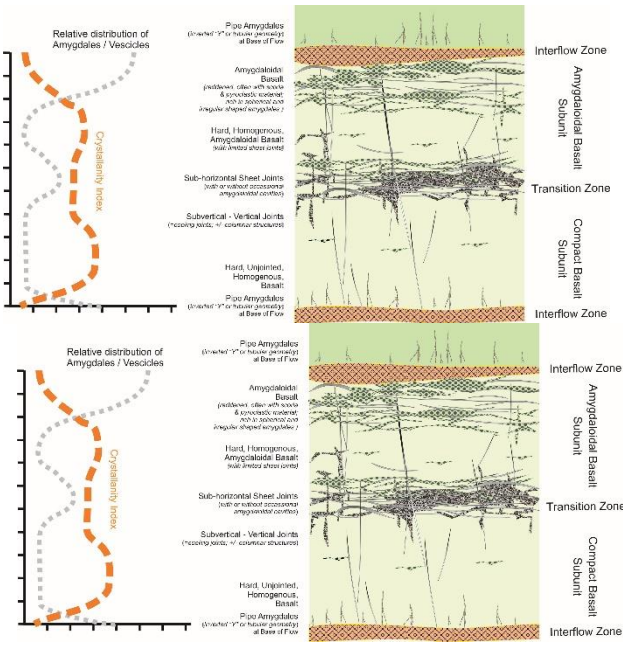

Fig. 1a: Typical internal structure of Type "A" lobes

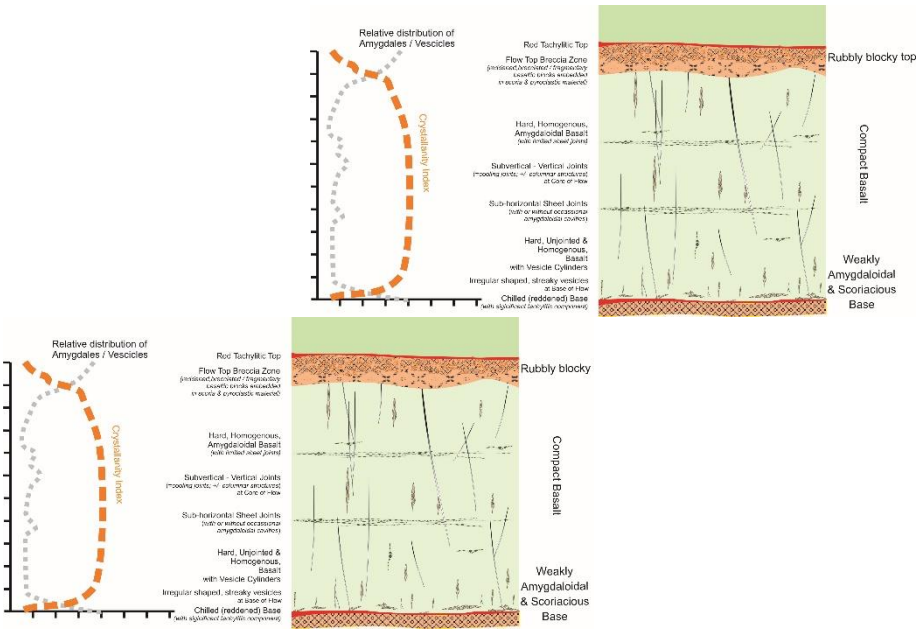

Fig. 1b: Typical internal structure of Type "B" lobes. Flow-base breccia may be encountered in some cases in this type.

Deccan Type "A" units are comparable to the pahoehoe type (Fig. 1 a). The Deccan Type "B" units (Fig. 1 b) bear only a limited resemblance to the typical *àā* type flows. Endogenous emplacement with lateral transport under a cap of a chilled tachylitic crust is inferred to be the main mode of emplacement for the Deccan Trap lavas, with multiple emplacements (yielding compound flows) being the norm and not an exception. The two types manifest the terminal cooling that takes place after the lava has come to rest; but contain relicts of structures that evolved during its transient phase of movement. Features such as amygdales / vesicles (pipe, sheet and spherical) , cooling joints (sheet joints as well as columnar joints), brecciated tops (with rare basal breccias), chilled / tachylitic crusts are indications of how the lava was emplaced, while the overall geometry gives clues to its 'fluidity' at the point of coming to rest.

Where slow lateral transfer has occurred, the Type "A" has evolved, while Type "B" is an indicator of swifter and more dynamic lateral transfer (indicating less viscous lava). The interplay between bulk effusion rates, volume of extrusion during the single pulse and the effective gradient of the surface across which the lava moved, was responsible for the variations between these two end-member types. It is demonstrated that within a single flow, Type "A" lobes occur more frequently and dominantly in the proximity of the vent, while the Type "B" manifests the more distal facies.