

Short Quiescence Duration between Deccan Flows near K-T Boundary: Evidence from Glass Shards and Pyroxene Alteration in Bole Beds

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Deccan volcanics is one of the largest eruption in Earth's history. High precision Ar-Ar and U-Pb dates resulted estimation of high gas flux rate, intensifying cretaceous-tertiary (K-T) mass extinction caused by Deccan eruption. Large volcanic provinces display multiple stages of eruption suggesting, a significant portion of entire volcanism duration remaining unerupted. Given the associated error resolution attached to dating systematics, the hiatus duration between successive flows is insignificant. Formation of clay rich beds, bole beds, by pedogenesis and palagonitization of mafic volcanic clasts (Sriwastava et al., 2023), deposited at flow boundaries, signifies the hiatus extent. Although red boles are clay rich, they are chemically so low altered (CIA < 70 and IOL < 40), that glass shards and pyroxene crystals are remaining with dissolution features. Current study uses pyroxene and basalt glass dissolution kinetics to measure the time required for developing the alteration features preserved at the flow boundaries. Denticles are shawtooth structure, developed by surface controlled dissolution (low temperature) of chian silicates (pyroxenes and amphiboles), and grows with increasing extent of weathering. Palagonitization is alteration product of glass at elevated temperature and its extent increases with time.

Poladpur formation has 5 red bole beds within 10 m thick lava piles, and each bole has denticles size >10 μm while overlying Ambenali formation has 3 red boles in 600 m thick lava piles, with denticles size < 1 μm , in sinhghad fort section. The volume of 3D shape, inscribed in the hollow space between denticles, gave dissolved mass, and resulted time when calculated with dissolution rate ($10^{-12} \text{ mol.m}^{-2}.\text{s}^{-1}$). Accordingly, each red bole below Ambenali formation have been formed within ~ 1350 years, while entire Ambenali formation (600 m thick) was emplaced within 61 years. The palagonite thickness (10-20 μm) in glass shard suggests 990- 1100 years of continuation of alteration at elevated temperature, due to upper flow. According to this study, Ambenali and Poladpur boundary seems to demarcate K-T boundary.