

# **Palaeoenvironmental implication of red and green palaeosol developed within lava flow of Deccan volcanic province, India**

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This study presents physical, petrographical, and mineralogical investigations of interbasaltic red and green palaeosols within the late Cretaceous western and central Deccan volcanic province, India to understand the palaeoenvironmental condition. Although several studies provided chemical characteristics of these interbasaltic palaeosols, called bole beds, a detailed mineralogical and petrographical characterization has not been done. The field study reveals that the palaeosols occur in variable thickness (ranging from a few centimeters to meters), color (red to green), and lateral extent. These palaeosols occur either as fine laminations or as thick beds having sharp contact with upper basalt and gradations or uneven contact with lower basalt, which infers the significant contribution of constituents from lower basalt. The micromorphological investigation reveals that red palaeosol shows a varying degree of pedogenesis, ranging from incipiently developed soil to moderately developed soil. It shows subangular to blocky peds with a few sections showing granular peds. It also contains altered basaltic fragments, different colors (brown and orange color) of altered glass shards of variable vesicularity, authigenic clay, and secondary minerals (e.g. zeolite). However, the textural study of green palaeosol shows incipient development of soil with some signature of bioturbation and faunal activity. It mainly contains green clay altering volcanic glasses and minerals (plagioclase and pyroxene). The XRD (random and oriented mount), visible near-infrared spectroscopy, and FTIR spectroscopy indicate the presence of Al-smectite i.e., montmorillonite and iron oxide in red palaeosol, and celadonite (green clay) and Fe-smectite in green palaeosols. Thus, red palaeosol indicates prolonged sub-aerial weathering of flow top basalt, under oxic conditions indicating significant hiatus in Deccan volcanism. However, green palaeosol indicates a waterlogged or anoxic condition of formation during a lull in Deccan volcanism. The studied interbasaltic palaeosols are significant because they can be used to understand the origin of various hydrous Al-Fe-Mg phyllosilicates associated with Noachian terrain on the Martian surface.