

## **SORDET Valentin (2016):** Timing, tempo and paleoenvironmental implications of Deccan volcanism relative to the K-Pg mass extinction : evidence from the red bole record

### **Abstract**

Recent studies indicate that ~80% of Deccan Traps erupted over ~750 ky in magnetic polarity C29r. U-Pb zircon geochronology shows that the main phase began 250 ky before the Cretaceous-Tertiary (KT) mass extinction and continued for 500 ky into the early Danian, suggesting played a role in the mass extinction. Many lava flows are separated by red weathered horizons known as red boles that mark quiescent periods between basalt flows. Red boles have increasingly attracted the attention of researchers to understand the climatic and paleoenvironmental impact of Continental Flood Basalts. Recent advances in U-Pb dating of Deccan lava flows, studies of weathering patterns and paleoclimatic information gained from multiproxy analyses of red bole beds (e.g., lithology, mineralogy, geochemistry) yield crucial evidence of environmental changes coincident with volcanic activity.

A typical red bole begins with the fresh underlying basalt and evolves into weathered basalt, a layer of 'bole'-shaped basalt infilled with, and overlain by, clays, which is overlain by the next lava flow. The upper clay layer is composed of red silty clays characterized by high concentrations of immobile elements such as Al and Fe<sup>3+</sup> that are typical of paleosoils, which developed under semi-arid conditions during the short periods of weathering between eruptions. Clay minerals consist mostly of smectite suggesting semi-arid monsoonal conditions. At least 40 thick red bole layers are present between the lava flows forming the main volcanic phase. The short duration of exposure of these red boles is reflected in the mineralogical and geochemical data that indicate rapid weathering (high CIA) probably linked to increasing acid rains.  $\delta D$  and  $\delta^{18}O$  measured on smectite clays from the red boles approximate the meteoric water composition that prevailed during Deccan eruptions. Isotopic data from these red boles suggest significant and rapid changes in rainfall intensity and/or altitude linked to the accumulation of 3400m of basalt that erupted over about 750 ky.