# Paleonvironmental implications of Deccan volcanism relative to the KTB extinction: evidences from the red bole record

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Recent studies indicate that the bulk (80%) of Deccan trap eruptions occurred over a relatively short time interval in magnetic polarity C29r. U-Pb zircon geochronology shows that the main phase-2 began 250 ky before the Cretaceous-Paleogene (K-Pg) mass extinction and continued into the early Danian suggesting a cause-and-effect relationship [Schoene et al., 2015]. Closer to the eruption center, intra-volcanic red weathered horizons known as red boles can be observed and mark quiescent periods between basalt flows. A typical red bole begins with the fresh underlying basalt and evolves into weathered basalt, then, a layer of basalt in a rounded shape called ‘bole’ surrounded by clays at the top, which is overlain by the next lava flow. Red boles have increasingly attracted the attention of researchers to understand the climatic and paleoenvironmental impact of Continental Flood Basalts (CFB). 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 triggered by volcanic activity. Red boles consist mainly of red silty clays and represent a comparatively early stage in weathering; characterized by concentrations of immobile elements such as Al and $Fe^{3+}$ ions that are typical of paleo-laterites, which probably developed during the short periods of weathering between eruptions. Clay minerals consist mostly of smectite suggesting semi-arid monsoonal conditions. At least 30 thick red bole layers are present in C29r below the K-Pg boundary between lava flows of phase-2 that erupted over a time span of about 250 ky. The short duration exposures of these red boles are reflected in the mineralogical and geochemical data that indicate rapid weathering (high CIA) linked to increasing acid rains. $\delta D$ and $\delta^{18}O$ values measured on smectite clays from the red boles lie along the smectite line and approximate the meteoric water composition that prevailed during the Deccan eruptions. Recent isotopic data from analysis of red boles deposited through the main phase-2 suggest significant and rapid changes in rainfall intensity and/or altitude linked to the accumulation of a 3100m thick basalt pile that erupted over a short period of time. These results suggest an increasing paleoclimatic instability beginning at the top of the Bushe formation corresponding to an acceleration in the rate of volcanic emissions ~~70Ky~~ before the KPg boundary. Finally, the role of mercury as a proximal proxy

of Deccan volcanism is analysed. An increase in the mercury content is recorded as we move further away from the eruption center.

Keywords: *Deccan volcanism, Cretaceous-Paleogene Boundary, paleoclimate, red bole horizons, mineralogy, geochemistry*