CHEMICAL SIGNATURES OF THE INFRATRAPPEAN SEDIMENTS OF DECCAN TRAPS, INDIA AND THEIR IMPLICATIONS TO THE K-T BOUNDARY SCENARIO. **A. V. Murali**, Lunar and Planetary Institute, 3303 NASA Road 1, Houston, Tx 77058, **Y.-G. Liu**, **R. A. Schmitt**, Departments of Chemistry, Geology, the Radiation Center and college of Oceanography, Oregon State University, Corvallis, OR 97331 and **Sankar Chatterjee**, The Museum, Texas Tech University, Lubbock, TX 79409.

Although the relationship of the Deccan volcanics to the K-T event is debatable, the fact that the main Deccan eruptions straddle the K-T event (66 $\pm$ 2 Ma) is apparent from the recent $^{40}Ar/^{39}Ar$ ages of Deccan flows (1, 2). Infratrappean sediments (Lameta formations and their equivalents) underlying the basalt flows are exposed in the western, central and southern fringes of the Deccan volcanics, and well preserved dinosaur egg fossils and skeletal remains are common in these sediments (3, 4). Reviewing the vertebrate and microfossil evidence of Lameta beds and the intertrappean sediments and the paleomagnetic data of the Deccan flow sequences, Sahni and Bajpai (1988) concluded that the terminal Cretaceous event is represented by the infratrappean (Maastrichtian) and basal intertrappean (upper Maastrichtian) sediments in the Indian subcontinent. Therefore, a detailed petrochemical study of the Lameta sequence is pertinent to evaluate the 'internal' and/or 'external' signatures of the K-T boundary event. We selected 8 samples of the Lameta beds (Jabalpur, India) from the Bara Simla Hill Section (Fig. 1) consisting of sandstones, limestones and marl for the proposed study. Detailed chemical analysis (~30 major minor and trace elements) was carried out on these samples employing INAA procedure. The dark (BS5B) and white (BS5W) units of the clayey sandstone immediately below the basalt flow were carefully separated and analyzed to see any chemical differences between these two lithologies. The results of our study indicate the following:

1) There is a general similarity in the REE and compatible elemental abundances of different Lameta samples. However, the overall elemental abundances are much higher at the top of the sequence compared to a similar sample in the lower regions. For example the lower sandstone (#1) has La ~30 C1 compared to the sample at the top (#5) which has ~200 C1. The increase in the absolute abundances of the elements in the Lameta beds below the basalt flows might be due to an increase in weathering (and transportation) of the material around the time of Deccan eruptions.

2) The abundances and ratios of the compatible and the incompatible elements of the Lameta formations indicate that these are probably derived from the Aravalli phyllites and quartzites underlying the Lameta beds (4) or from the older gneisses in the region.

3) Abundances of Mg, Al, Sc, Ti, V, Cr, Mn, Fe, Co, Rb and Th in the white (BS5W) and black (BS5B) portions of the sandstone indicate that these samples contain ~15% and ~ 18% of clay component in an arenaceous (terrigenous) matrix.

4) Both BS5W and BS5B exhibit negative Cerium ($Ce/Ce^* = \sim 0.65$) anomalies and show identical chemical patterns (Fig. 2)

5) Iridium content in the Lameta beds is low, and apparently below the detection limit (<0.2 ppb) of our technique.

Interestingly, the intertrappean beds from Takli, Nagpur [upper Maastrichtian (5)] also have low iridium (~0.1 ppb) contents (6). If the Deccan volcanism (predominantly fissure eruptions) caused the global iridium dust (7) it is difficult to explain the lack of iridium in the Deccan K-T boundary clay itself! Therefore, it is unlikely that the Deccan volcanism contributed to the global iridium anomaly of the K-T event.

The infratrappean beds of the present study ($Ce/Ce^* = 0.65$), as well as the Takli intertrappean beds ($Ce/Ce^* = \sim 0.3\text{-}0.5$) and the intensely weathered flow tops (between the eruptive intervals of Deccan flows) referred to as 'red boles' ($Ce/Ce^* = 0.4\text{-}0.5$), also show conspicuous negative Ce anomalies (6, 8). Presence of negative Ce anomalies ($Ce/Ce^* = 0.1\text{-}0.5$) among the K-T boundary clays of different geological setting has already been pointed out (8). Lack of the Ce anomalies among the various post-Deccan clays [offshore drill core samples, west coast of India covering 45-2 Ma period (9)] indicates the temporal restriction of the Ce anomalies to the K-T event.

Cerium anomalies in the marine environment are explained as due to the oxidation of Ce^{3+} to insoluble $Ce(OH)_4$ in open oceans which is scavenged by insoluble Fe-Mn-Al-Ti-oxyhydroxides (10, 11). This mechanism would explain the Ce depletion of the DSDP samples but not the anomalies of the nonmarine K-T boundary samples including the clays of Deccan. The mobility of Ce in the acidic environment of weathering profiles (12) as well as in the laboratory acid leaching experiments (13, 14) is known. Acid rain

and the weathering of continental regions during K-T event is predicted by the impact or volcanism models proposed for the K-T biotic extinctions (7, 15). We believe that the negative Ce anomalies are the fingerprints confirming the acid rain weathering of the continental regions at that time.

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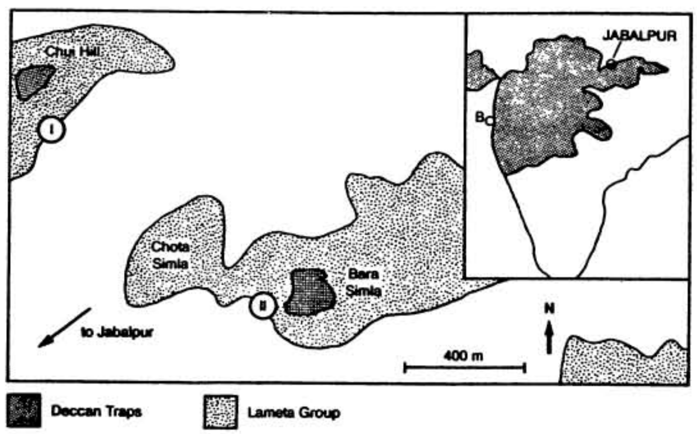

Figure 1. Location map. Inset-central India with Deccan Basalt outcrop and location of Jabalpur and Bombay (B) I and II on Jabalpur map are main localities (I—quarries on Chui Hill; II—roadcuts on Bara Simla).

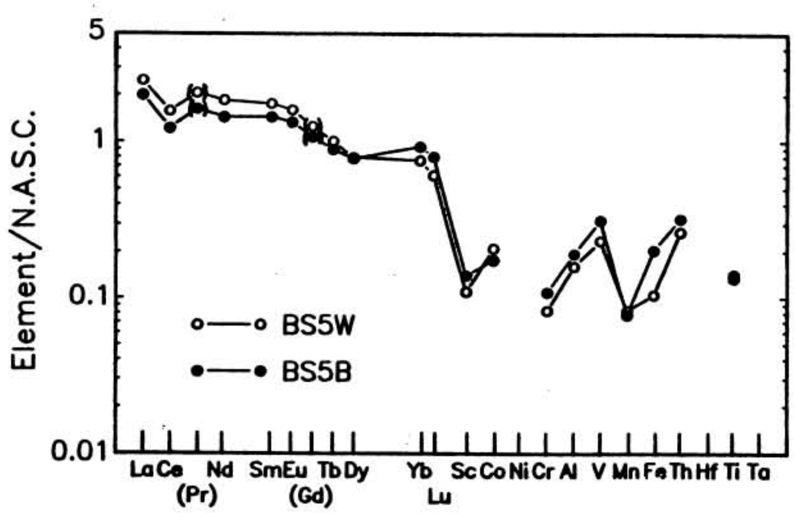

FIGURE 2