RELATIONSHIP OF DECCAN VOLCANISM TO GLOBAL K-T BIOTIC EXTINCTIONS: A CASE OF UNFOUNDED ASSUMPTIONS? **A. V. Murali,** Lunar and Planetary Institute, 3303 NASA Road 1, Houston, TX 77058, **D. P. Blanchard,** NASA/ Johnson Space Center, Houston, TX 77058, **N. Bhandari,** Physical Research Laboratory, Ahmedabad 380009, India, **J. D. Macdougall,** Scripps Institution of Oceanography, La Jolla, CA 92093

In the debate about external versus internal causes for the K-T scenario, a spate of recent publications (1-5) suggest that there is a strong case in favor of the latter. $^{40}Ar/^{39}Ar$ ages of Deccan volcanics (2, 3) and the observation of high iridium concentrations in Kilauea aerosols (6, 7) are considered as the strong points that link the K-T Ir anomaly and possibly extinctions to the voluminous Deccan eruptions (1, 3). However, our studies of the Deccan basalt province show that these connections are tenuous at best.

Iridium anomalies: It is well known that the Deccan Traps represent one of the most extensive flood basalt provinces in the world (~10^6 km^3); they occur mainly as flat lying tholeitic lavas (Fig. 1). Continental K-T sections (infratrappean Lameta beds and basal intertrappean beds with abundant dinosaur fossils) occur near the periphery of the province (Fig. 2) and several marine K-T sections (in Meghalaya and Tamilnadu states) also occur in the Indian subcontinent. We sampled numerous Deccan basalt flow sequences (Fig. 1) for chemical and isotopic studies (8, 9). Eight selected samples of the Deccan flows representing major chemical groups were analysed by RNAA for iridium. The data show that the iridium in the Deccan basalts is low and variable (0.02 ± 0.002 to ≤ 0.002 ppb). This is comparable to Columbia River basalt values (10).

Based on detailed vertebrate and microfossil evidence, Sahni and Bajpai (1988) identified continental K-T sections at Jabalpur (infratrappean Lameta beds) and Nagpur (Takli intertrappean beds). Detailed study of the Jabalpur section showed (12) that the iridium of these samples is <0.2 ppb (below the detection limit of our INAA technique) indicating that there is no iridium anomaly in these layers. We carried out systematic studies of the Takli intertrappean beds and the marine K-T boundary clay layer from Meghalaya (Fig. 3) Iridium in Takli beds also is low (<0.2 ppb) and comparable to the Jabalpur section. This means that the continental K-T boundary sections in India do not show any significant iridium anomalies. However, the Meghalaya marine K-T layer shows a significant iridium anomaly (4.1 ± 0.3 ppb) similar to many marine K-T sections (13) but much lower than values at Stevns Klint, Denmark (87 ppb), Caravaca, Spain (44 ppb), Woodside Creek, New Zealand (28 ppb) etc. Were Deccan eruptions an important Ir source, much higher values would be expected in these nearby K-T sections in the Indian subcontinent. It should be noted that, although 10^5 fold Ir enrichments were observed in Kilauea aerosols, iridium has not been detected in numerous measurements of volcanic gases elsewhere (7).

Age of Deccan Volcanism: Recent $^{40}Ar/^{39}Ar$ age determinations of Deccan volcanics generally cluster near 65 Ma and it has been argued that the entire province was erupted at ~65 Ma within a very short time interval (2, 3). This interpretation is based on a limited number of ages for surface samples and may be oversimplified. Furthermore among the surface flows sampled for the $^{40}Ar/^{39}Ar$ age determinations only nine samples (5) seem to have any stratigraphic control and the samples selected do not cover the region north of Indore or south of Poona (Fig. 3) which excludes a large part of Deccan basalt province.

Deep Seismic Sounding (DSS) profiles across the Deccan province are suggestive of trap thicknesses upto ~ 3-4.5 km in some areas (14). Much of this material must be buried. Unless these stratigraphically lower flows are dated neither the time of initiation nor the duration of Deccan volcanism can be constrained.

If Deccan eruptions were caused by simple progression of the 'hot spot' from north to south as the plume model would suggest (15), an ~7-Ma age difference would be expected between flows erupted in north and those in the south based on the Indian plate motion of 14 cm/yr (16) and 1000-km trap.

From this study we conclude that the global iridium spike cannot be attributed to Deccan volcanism. Although it is clear that Deccan volcanism occured near K-T time, the present age data are inadequate to determine the time of initiation and total span of the Deccan volcanic episode. Systematic study of deep drill core samples may resolve this issue.

REFERENCES: [1] Courtillot, V and Cisowski, S (1987), EOS, 68, 193. [2] Duncan, R. A and Pyle, D. G. (1988), Nature 333, 841. [3] Courtillot, V. et al.(1988), Nature, 333, 843. [4] Courtillot, V. (1988), EOS, 69, 301. [5] Jaeger, J-J. et al. (1989), Geology, 17, 316. [6] Zoller, W. H. et al. (1983), Science, 222, 1118. [7] Olmez et al. (1986), J. Geophys. Res., 91, 653. [8] Mahoney, J. J. et al. (1982), EPSL, 60, 47. [9] Murali, A. V. et al

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(1987), LPSC XVIII, 676. [10] Ganapathy, R, et al. (1974), Anal. Chim. Acta, 72, 1. [11] Sahni, A and Bajpai, S. (1988) J. Geol. Soc. India, 32, 382 [12] Murali, A. V. et al. (1989), LPSC XX, 740. [13] Alvarez, et al. (1982), Geol. Soc. Am. Spl. paper, 190, 305. [14] Kaila, K. L. (1989), Int. Geol. Congress 28th (Abstr), 2, 145. [15] Morgan, W. J. (1972), Am. Assoc. Pet. Geol. Bull. 56, 203. [16] Pierce, J. W. (1978), Geophys. J. R. Astron. Soc. 52, 277.

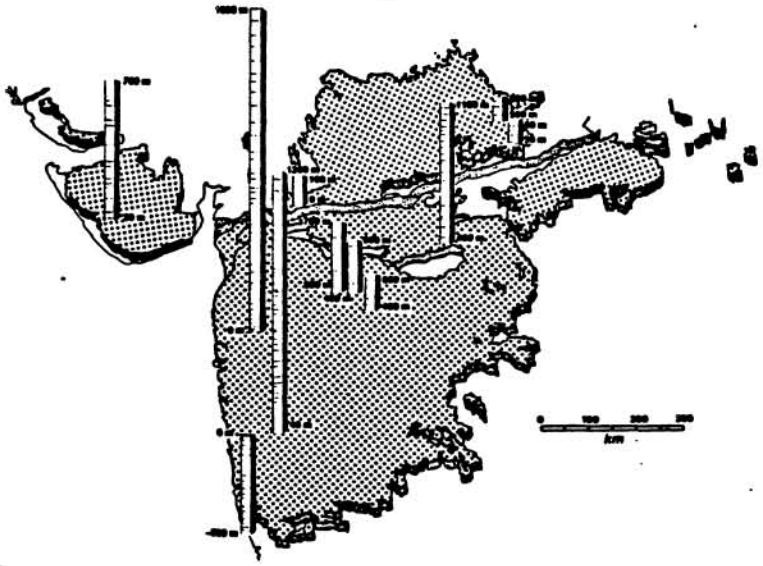
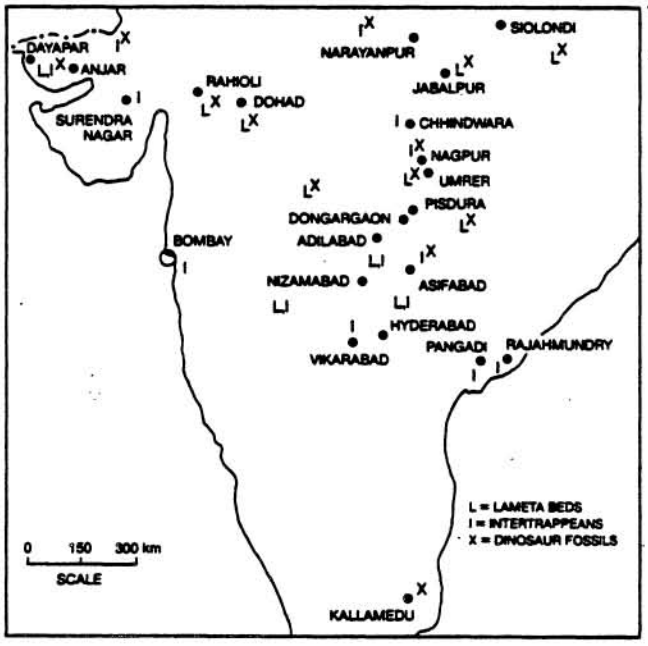


Fig. 1 Deccan Traps, India- Major flow columns sampled for the study (Numbers indicate the heights of basalt columns in meters above or below MSL).



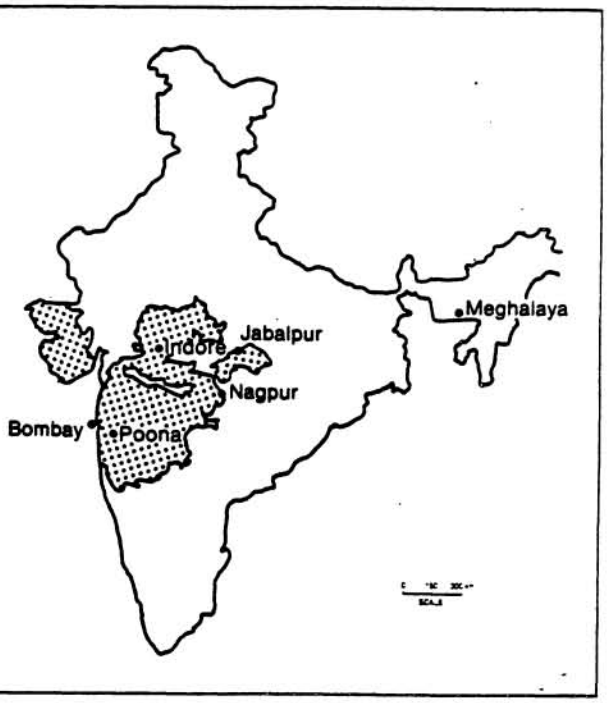


Fig. 2 Continental K-T boundary sites around Deccan province.

Fig. 3 Deccan province (stippled area), India and K-T boundary sites of the present study.