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Magnetostratigraphy of the upper formations of the Deccan traps : an attempt to constrain the timing of the eruptive sequence.

Anne-Lise Chenet (1), Vincent Courtillot (1), Frédéric Fluteau (1), Jean Besse (1), K.V Subbarao (2), Sunil Bajpai (3), Anne Jay (4)

1. Institut de Physique du Globe de Paris, place Jussieu, 75005, Paris, FRANCE
2. Proposed Centre of Earth and Space Sciences, University of Hyderabad, Gachibowli, Hyderabad-46, INDIA
3. Department of Earth Sciences, Indian Institute of Technology, Uttaranchal, Roorkee – 247667 INDIA
4. Volcano Dynamics Group, Dept. Earth Sciences, Open University, Milton Keynes, MK7 6AA, UK.

The Cretaceous-Tertiary (K-T) mass extinction coincides with the emplacement of the Deccan continental flood basalts, making a causal connection between the two through some form of catastrophic climatic perturbations difficult to escape. Final proof of this theory requires modeling of the climatic consequences of this eruption. The key unknown is the precise time sequence of flow emplacement. This can be constrained using a number of approaches, among which detailed magnetostratigraphy (using geomagnetic secular variation as a century-scale clock) and soil formation (using the development of alteration). We present our first results concerning the upper part of the traps, the Ambenali and Mahabaleshwar Formations, which encompass the R29-N29 reverse to normal transition. These formations represent the latter part of the eruptive sequence. A number of intertrappean layers (red boles) suggests several halts of volcanism. Each exposed lava flow was sampled along the Mahabaleshwar-Ambenali road: when possible, we drilled the bottom, middle and upper parts of each lava flow. We studied a second, parallel traverse (the Wai road section) to estimate lateral flow continuity and ascertain the robustness of our results. Rock magnetism experiments

have determined that the formations are mainly characterized by the presence of a single thermally stable ferromagnetic phase with Curie point of $\sim$540˚C, compatible with low-Ti titanomagnetite and indicated a pseudo single-domain grain size. Samples were analyzed, mainly using thermal demagnetization, in order to determine 27 site-mean directions of characteristic magnetizations and reconstruct the magnetostratigraphy. Altogether, 20 lava flows, 27 sites, 282 samples and 312 specimens were analyzed. Evolution of these directions as a function of stratigraphic position shows successive flows with well-grouped (correlated) directions, which testify to rapid emplacement. The eruptive sequence can therefore be divided into successive lava pulses. One may next attempt to estimate the amount of volcanic gases emitted during each pulse, scaling with data from analogous historical or geological fissure eruptions. Approximate reconstruction of the volcanic forcing function (both in amplitude and time) may allow us to determine, or at least constrain the possible climate change induced by eruptions.