Geophysical Research Abstracts
Vol. 12, EGU2010-4027, 2010
EGU General Assembly 2010

Environmental Impact of Subaerial Large Igneous Provinces: the latest on the case of the Deccan and Karoo traps

Vincent Courtillot, Frederic Fluteau, Anne-Lise Chenet, and Maud Moulin
Institut de Physique du Globe, Geo/Paleo-magnetism, Paris, France (courtil@ipgp.fr, 0033144277463)

In the mid-1980s, the KT mass extinction was associated with the Chicxulub impact. In 1986, we proposed that the Deccan trap eruption in India had occurred at the time of the KT, lasting only a million years. Other correlations were established over the following decade. Courtillot and Renne reviewed the problem in 2003 and concluded that in most cases the lava was erupted in about 1 Ma. The correlation between dates of LIP eruption and extinctions has improved steadily, and the list of trap ages coincides with major divisions in the geological time scale. The four largest mass extinctions in the last 260 Ma coincide with four traps, making a causal connection unavoidable. Our recent work has focused on better measuring the number, volumes and durations of major volcanic pulses within the full lava pile and beginning to assess in a quantitative way their climatological consequences. We have completed a restudy of the Deccan and are currently analyzing the Karoo traps. We use in combination volcanology, K-Ar absolute dating and detailed analysis of paleomagnetic directions: 3500m of the Deccan traps was erupted in some 30 major eruptive pulses, with individual cooling unit volumes up to 10,000km3. Some pulses with thicknesses attaining 200m were emplaced over distances in excess of 100 km. The total time of emission could have been less than 10kyr, with most of the time recorded in a very small number of intervening alteration levels marking periods of volcanic quiescence. Based on our geochronologic results and paleontological results of Keller et al. [2008], we conclude that volcanism occurred in three rather short, discrete mega-pulses, with the largest around within C29r just before the KT boundary, the second largest shortly afterwards spanning the C29r/C29n reversal. Sulfur dioxide is likely the major agent of environmental stress: amounts and fluxes released by pulses would have ranged from 10 to 150 Gton and 1 to 3 Gton/yr respectively, over durations possibly as short as a few decades for each pulse. The input of the Chicxulub impact would have been on the same order as that of a single pulse. The impact appears important but incremental, neither the sole nor main cause of the Cretaceous-Tertiary mass extinctions. And volcanism alone is now the preferred culprit for most other mass extinctions. But the question remains of why rather similar traps generate quite different extinctions: we hypothesize that the detailed timing of sequences of eruptions with respect to oceanic equilibration time (on the order of 103 years) is the main reason...