

**FLOOD BASALT ERUPTIONS, COMET SHOWERS, AND MASS EXTINCTION EVENTS; Michael R. Rampino<sup>1,2</sup>, and Richard B. Stothers<sup>2</sup> (1 Earth Systems Group, Department of Applied Science, New York University, New York, NY 10003; 2 NASA, Goddard Space Flight Center, Institute for Space Studies, New York, NY 10025).**

A chronology of initiation dates of the major continental flood basalt episodes has been established from compilation of published K-Ar and Ar-Ar ages of basaltic flows and related basic intrusions<sup>1</sup>. The dating is therefore independent of the biostratigraphic and paleomagnetic time scales, and the estimated errors of the initiation dates are approximately  $\pm 4\%$ . There are 11 distinct episodes of continental flood basalts known during the past 250 Myr. The data show that flood basalt episodes are generally relatively brief geologic events, with intermittent eruptions during peak output periods lasting only 2 to 3 Myr or less. Statistical analyses suggest that these episodes may have occurred quasi-periodically with a mean cycle time of  $32 \pm 1$  (error of the mean) Myr.

The initiation dates of the flood basalts are close to the estimated dates of marine mass extinctions and impact-crater clusters. Although a purely internal forcing might be argued for the flood basalt volcanism, quasi-periodic comet impacts may be the trigger for both the flood basalts and the extinctions. Impact cratering models suggest that large-body (>10 km diameter) impactors lead to deep initial cratering (20 to 40 km), and therefore may cause mantle disturbances and initiate mantle plume activity. The flood basalt episodes commonly mark the initiation or "jump" of a mantle hotspot, and are often followed by continental rifting and separation (for example, the Deccan Traps/Reunion Hotspot, Brito-Arctic Basalts/Iceland Hotspot, Serra Geral Basalts/Tristan da Cunha Hotspot). Can large impacts trigger volcanism? Evidence from dynamical studies of impacts, occurrences of craters and hotspots, and the geochemistry of boundary layers is synthesized to provide a possible model of impact-generated volcanism

Flood basalt eruptions may themselves have severe effects on climate<sup>2</sup>, and possibly on life. Impacts might, as a result, have led to mass extinctions through direct atmospheric disturbances, and/or indirectly through prolonged flood basalt volcanism.

1. Rampino, M. R., and Stothers, R.B. (1988) Science, in press.
2. Stothers, R.B. et al. (1986) Geophys. Res. Lett. **13**, 725-738.