



FLOOD BASALT EXTINCTIONS

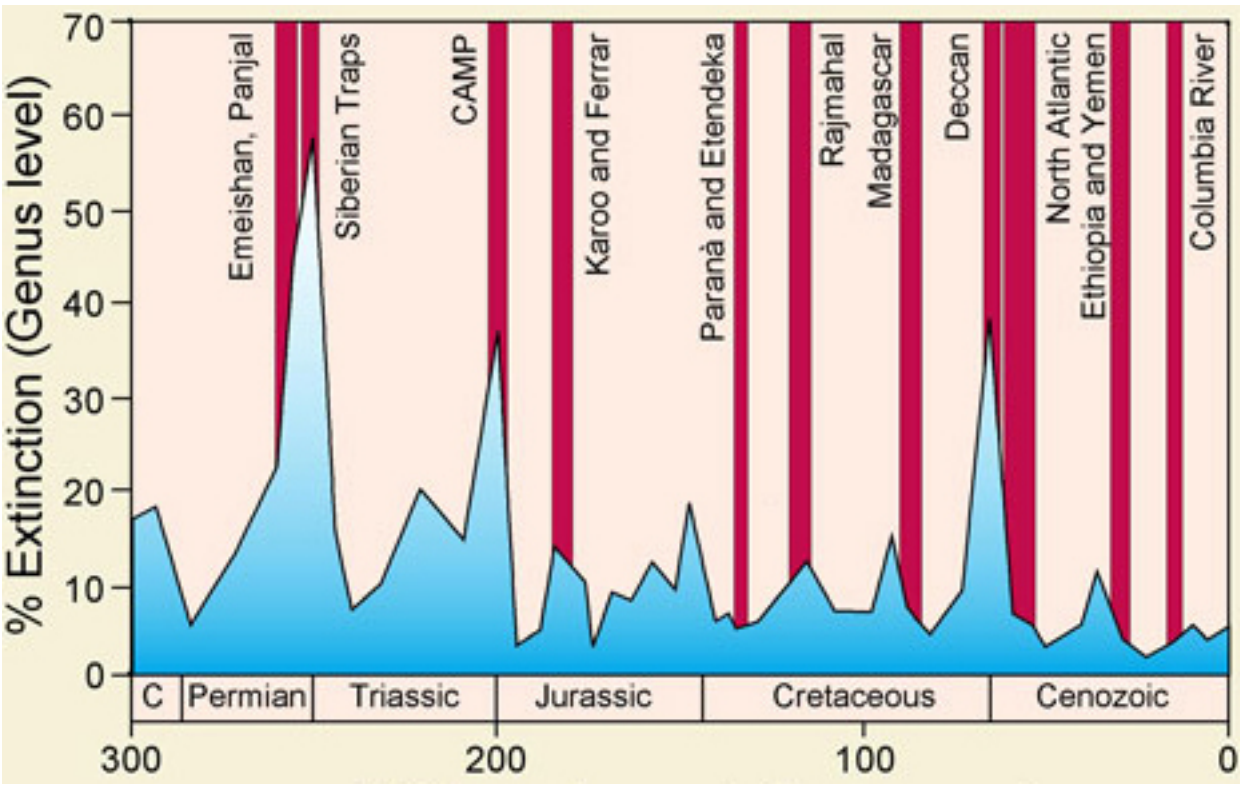
Flood basalts are the largest eruptions of lava on Earth, and the three largest in the past 545 million years correspond perfectly in time with the three largest known mass extinctions.* This correlation is too fortuitous to be pure chance. Despite searches, no comparable correlation exists for meteorite impacts (while a meteorite did fall at the time of the dinosaur extinction, it did so in the midst of a flood basalt eruption; no other known mass extinction can be correlated to a meteorite). Scientists now debate whether flood-basalt volcanism and its associated degassing, rather than meteorite impacts, are the main causes of mass extinctions.**

Flood basalts erupt when a plume of hot, molten mantle that has risen from deep in the Earth—perhaps as deep as the core-mantle boundary—first reaches the surface. Eruptions last about one million years and cover twice the area of California with hundreds of 50-m-thick flows. After the initial flood basalt episode, eruptions continue—now called **hotspots**—at a much-reduced level, potentially lasting for hundreds of millions of years. Hotspots are currently the highest-volume volcanoes on our planet, but they pale in comparison to the size of the initial flood basalts. The ongoing eruption of the Hawaiian hotspot has produced 1.5 km³ in 16 years, while a single flood basalt lava flow exceeds 2000 km³.

**The Permian-Triassic, Triassic-Jurassic, and the Cretaceous-Tertiary extinctions correspond with the eruptions of the Siberian Traps, the Central Atlantic Magmatic Province, and the Deccan Traps, respectively. Note: Trap is a Sanskrit word meaning 'step', referring to the step-like topography produced by the stacked layers of basalt lava flows.*

*** It is also worth mentioning that some flood basalts do not match with any extinction events, and some small mass extinctions do not appear to correspond with any flood basalts. This may simply be because it is highly unlikely that there is one single cause for all mass extinctions.*

****Header image: Columbia River Flood Basalts. Each flow is about 50-m thick.*
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Extinction rate of marine genera versus time in millions of years (blue field) compared with eruption ages of continental flood basalts (red columns). White and Saunders ©

