

## **Simulating the coupled response of the carbon cycle, climate and oceanic biodiversity to the onset of the Siberian Traps**

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Numerous studies have pointed at a direct causal link between the end-Permian mass extinction and the eruption of the Siberian Traps (Burgess et al., 2017). Geochemical tracers indeed suggest that large carbon cycle and environmental perturbations at that time are related to magmatic pulses. Paleontological data also record the greatest mass extinction of the Phanerozoic.

We present end-Permian simulations performed with the revised GEOCLIM model ([geoclimmodel.wordpress.com](http://geoclimmodel.wordpress.com)). The new GEOCLIM model includes now a marine ecological model where food webs are simulated with 4 distinct trophic levels. The global biomass is distributed among the ecological entities (called “species”). Each of the “species”, belonging to any given trophic level, has characteristics randomly fixed (such as the tolerance to pH or temperature changes, efficiency of the predation, ...), to avoid any determinism in the response to the environmental perturbations. Ensembles of simulations are run, each using a random ecosystem structure. The GEOCLIM model is thus able to simulate the impact of the environmental changes on the oceanic biodiversity, but also the feedback of the biodiversity changes on the global carbon cycle (through modulation of the bioproductivity in the surface ocean and of the subsequent burial of organic carbon in the sediments). The model is forced with a precise reconstruction of a pulse like degassing sequence (CO<sub>2</sub> and SO<sub>2</sub>) lasting 500 kyrs.

The coupled evolution of the carbon cycle, climate, isotopic composition of seawater, and biodiversity will be discussed, showing that the biotic response is heavily pending on the ecosystem structure prior to the Traps eruption.