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# Biospheric response to the Young Toba Tuff super eruption 74ka BP

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After a volcanic eruption, vegetation responds to the changes in climate induced by the eruption. In the case of very large eruptions "super-eruptions", this response is expected to be very strong. We have investigated the vegetation response to the very large Young Toba Tuff (YTT) eruption 74 ka BP by forcing the the dynamic global vegetation model LPJ with climate anomalies derived from a set of experiments with the Max Planck Institute Earth system model (MPI-ESM).

The YTT eruption is the most recent eruption of a so-called super-eruptions. During this eruption, an estimated $7x10^{15}$ kg of magma was released, along with a stratospheric injection of sulphur more than one order of magnitude larger than during the 1991 Pinatubo eruption. The simulated climatic response to YTT eruption is a massive cooling reaching about 3.5K in global mean temperature, which translates to a summer temperature decrease of more than 10K over some northern hemisphere (NH) land areas. Simultaneously, annual precipitation was reduced by more than 1000mm in some equatorial regions, while the precipitation reduction was in the range of 200-400mm over large continental areas. The vegetation response to this climate change is a massive dieback of vegetation, both in tropical rainforests and in NH forests, which are initially replaced by bare ground. This vegetation change leads to a strong release of carbon stored in the land biosphere.

A few decades after the eruption, vegetation starts recovering, thereafter going through ecological succession stages until the pre-eruption state is reached again roughly 180 years after the eruption. We investigate this vegetation and land carbon cycle response in detail, imposing the climate anomalies on both a preindustrial climate and a glacial climate state in order to determine the influence of the climatic background state on the carbon cycle response.