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Aerosol particle size confines climate response to volcanic super eruptions

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Super eruptions have been linked to global climate change, biotic turnover, and, for the Younger Toba Tuff (YTT) eruption 74,000 years ago, near-extinction of modern humans.
Very large volcanic eruptions produce extremely strong radiative forcing, which can affect the Earth system for longer times than the pure atmospheric residence time of the volcanic aerosol. This leads to large negative temperature anomalies at the surface and significant warming of the aerosol containing layers altering substantial atmospheric and ocean circulation and composition. Here we present and discuss Earth system model simulations of the YTT eruption taking into account also the temporal evolution of the volcanic aerosol size distribution one of the largest uncertainties in prior calculations. We demonstrate that there is a large negative feedback that has heretofore not been considered and which greatly reduces the climate impact of the aerosol cloud. The temperature response of the YTT is shorter and weaker as previously estimated. The smaller response, plus its geographic patchiness, suggests that most biota have escaped threshold extinction pressures from the eruption.