



## Using simple models to understand the global mean temperature response to volcanic aerosol forcing

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Radiative forcing from stratospheric aerosols produced by major volcanic eruptions is likely to be the primary forcing agent of preindustrial climate variability, and will have a significant impact on climate when the next strong eruption occurs. The radiative forcing from volcanic eruptions is relatively short-lived, and the surface cooling is controlled by various factors including the magnitude of the forcing, its duration, the climate feedback parameter and other aspects like effective ocean heat capacity and ocean mixing. Here, we explore analytical solutions to simple energy balance models using idealized forms of volcanic aerosol forcing, and estimate model parameters based on comprehensive Earth-System Model simulations of volcanic forcing from VolMIP and LESFMIP experiments. We use the analytical solutions to explore relationships between forcing and response, for example, between the magnitude of forcing and the peak temperature anomaly, and the sensitivity of these relationships to the model parameters.