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Interactive Stratospheric Aerosol models response to different sulfur injection amount and altitude distribution during volcanic eruption

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Large magnitude tropical volcanic eruptions emit sulphur dioxide and other gases directly into the stratosphere, creating a long-lived volcanic aerosol cloud which scatter incoming solar radiation, absorbs outgoing terrestrial radiation, and can strongly affect the composition of the stratosphere.

Such major volcanic enhancements of the stratospheric aerosol layer have strong "direct effects" on climate via these influences on radiative transfer, primarily surface cooling via the reduced insolation, but also have a range of indirect effects, due to the volcanic aerosol cloud's effects on stratospheric circulation, dynamics and chemistry.

In this study, we investigate the 3 largest volcanic enhancements to the stratospheric aerosol layer in the last 100 years (Mt Agung 1963; Mt El Chichón 1982; Mt Pinatubo 1991), comparing co-ordinated simulations within the so-called HErSEA experiments (Historical Eruptions SO2 Emission Assessment) several national climate modelling centres carried out for the model intercomparison project ISA-MIP.

The HErSEA experiment saw participating models performing interactive stratospheric aerosol simulations of each of the volcanic aerosol clouds with common upper-, mid- and lower-estimate amounts and injection heights of sulfur dioxide, in order to better understand known differences among modelling studies for which initial emission gives best agreement with observations.

First, we compare results of several models HErSEA simulations with a range of observations, with the aim to find where there is agreement between the models and where there are differences, at

the different initial sulfur injection amount and altitude distribution.

In this way, we could understand the differences and limitations in the mechanisms that controls the dynamical, microphysical and chemical processes of stratospheric aerosol layer.