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Simulating the volcanic forcing and climate responses induced by Tambora volcanic eruption using a global aerosol model.

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Volcanic eruptions are a potential source of uncertainty in future climate projections as they cannot be predicted in advance, but eventually will occur, causing short-term climatic impacts on both local and global scales. Several outstanding questions remain and concern the behaviour of huge SO_2 cloud injected into the stratosphere after super eruptions such as those that did occur during the last centuries. In order to simulate climate impacts of volcanic eruptions, models require time-evolving global distribution of volcanic aerosols and their radiative properties. Past volcanic forcing can be reconstructed using a range of data, in particular volcanic sulphate deposition in ice core records, atmospheric (satellite, ground-based, balloon) observations of present-day volcanic eruptions, and global aerosol microphysical simulations. To contribute to the on-going effort to reduce the large uncertainties regarding the climatic responses to large volcanic eruptions, a process-oriented experiment for the 1815 eruption of Mt. Tambora has been carried out using a Sectional Stratospheric Sulfate Aerosol module (S3A-v1) within the LMDZ general circulation model. The Tambora eruption is estimated to have injected in the stratosphere 2 to 4 times more sulphur than the Pinatubo eruption. The present study aims at analyzing and estimating some of the uncertainties in the model calculation of Tambora volcanic forcing. It also explores possible biases in previous simple volcanic forcing reconstruction and related climatic impacts.