

ISA-MIP: A co-ordinated intercomparison of Interactive Stratospheric Aerosol models

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The SPARC activity, “Stratospheric Sulfur and its Role in Climate” (SSiRC) was initiated to coordinate international research activities on modelling and observation of stratospheric sulphate aerosols (and precursor gases) in order to assess its climate forcing and feedback. With several international activities to extend and improve observational stratospheric aerosol capabilities and data sets, and a growing number of global models treating stratospheric aerosol interactively, a new model intercomparison activity “ISA-MIP” has been established in the frame of SSiRC. ISA-MIP will compare interactive stratospheric aerosol (ISA) models using a range of observations to constrain and improve the models and to provide a sound scientific basis for future work. Four ISA-MIP experiments have been designed to assess different periods of the observational stratospheric aerosol record, and to explore key processes which influence the formation and temporal development of stratospheric aerosol. The “Background” experiment will focus on the role of microphysical and transport processes under volcanically quiescent conditions, where the stratospheric aerosol size distribution is only modulated by seasonal circulations. The “Model intercomparison of Transient Aerosol Record” (MiTAR) experiment will focus on addressing the role of small- to moderate-magnitude volcanic eruptions and transport processes in the upper troposphere – lower stratosphere (UTLS) aerosols loading over the period 1998-2011. Background and MiTAR simulations will be compared to recent in-situ and satellite observations to evaluate the performances of the model and understand their strengths and weaknesses. Two further experiments investigate the radiative forcing from historical major eruptions. The Historical Eruptions SO₂ Emission Assessment (HErSEA) will involve models carrying out mini-ensembles of the stratospheric aerosol perturbations from each of the 1963 Agung, 1982 El Chichon and 1991 Pinatubo eruptions, using a range of observational datasets to constrain uncertainties in the initial sulphur emission from the eruptions. The PoEMS experiments will involve each modelling group carried out a perturbed parameter ensemble of runs to carry out a dedicated analysis to assess how each model’s simulated radiative forcing from Pinatubo is sensitive to uncertainties in emissions and model process parameters.

This presentation gives an overview of the ISA-MIP experiments illustrating how each experiment in the assessment is seeking to improve understanding, reduce uncertainty and increase the reliability of the simulated climate effects from stratospheric aerosol changes.