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Pinatubo Emulation in Multiple Models (POEMs): co-ordinated experiments in the ISA-MIP model intercomparison activity component of the SPARC Stratospheric Sulphur and it's Role in Climate initiative (SSiRC)

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The World Climate Research Program's SPARC initiative has a new international activity "Stratospheric Sulphur and its Role in Climate" (SSiRC) to better understand changes in stratospheric aerosol and precursor gaseous sulphur species.

One component of SSiRC involves an intercomparison "ISA-MIP" of composition-climate models that simulate the stratospheric aerosol layer interactively. Within PoEMS each modelling group will run a "perturbed physics ensemble" (PPE) of interactive stratospheric aerosol (ISA) simulations of the Pinatubo eruption, varying several uncertain parameters associated with the eruption's SO_2 emissions and model processes.

A powerful new technique to quantify and attribute sources of uncertainty in complex global models is described by Lee et al. (2011, ACP). The analysis uses Gaussian emulation to derive a probability density function (pdf) of predicted quantities, essentially interpolating the PPE results in multi-dimensional parameter space. Once trained on the ensemble, a Monte Carlo simulation with the fast Gaussian emulator enabling a full variance-based sensitivity analysis.

The approach has already been used effectively by Carslaw et al., (2013, Nature) to quantify the uncertainty in the cloud albedo effect forcing from a 3D global aerosol-microphysics model allowing to compare the sensitivy of different predicted quantities to uncertainties in natural and anthropogenic emissions types, and structural parameters in the models.

Within ISA-MIP, each group will carry out a PPE of runs, with the subsequent analysis with the emulator assessing the uncertainty in the volcanic forcings predicted by each model.

In this poster presentation we will give an outline of the "PoEMS" analysis, describing the uncertain parameters to be varied and the relevance to further understanding differences identified in previous international stratospheric aerosol assessments.