Stratospheric Background/Control Multi-model Study
Jason English, Debra Weisenstein

Overall objective: Inter-compare & evaluate ability of multiple models to represent the stratospheric background sulfur budget.

Approach
1. Run 10 year simulations with year-2000 monthly-varying SSTs/seaice and anthropogenic SO_2 emissions, climatological volcanic SO_2, 510 pptv OCS, and model-dependent DMS emissions.
2. Save consistent model output and compare to agreed-upon observations.
3. Based on each individual model, decide whether to conduct process studies; e.g. Precursor gas emissions & chemistry (SO2, DMS, OCS, H2S, CS2, H2SO4, OH); Aerosol microphysics (Nucleation, growth, coagulation*, sedimentation, deposition, aqueous formation, scavenging); or Dynamics (convection, circulation, aerosol heating, strat-trop exchanges). *coagulation processes may include Brownian, gravitational, van der waal's forces, Born repulsion.*

Modeling output: (Monthly Mean; retain each model's native rectangular grid)
2D: AOD (525nm, 1.02, 3.46, 5.26), tropopause height, TOA/surface SW/LW all-sky/clear-sky radiative fluxes
3D: OCS, SO2, DMS, H2S, CS2, H2SO4, N2O, OH, O3, HNO3, NO, NO2, N2O5, T, P, specific humidity, potential T, geopotential height, winds, nucleation rate, growth (cond/evap/coag), and sedimentation, H2SO4 weight % and density, aerosol dry and hydrated mass, number, surface area, and effective radius, extinction (525nm, 1.02, 3.46, 5.26).
4D: Aerosol dry and hydrated mass and number across bins. Or to save space: # particles >0.01, 0.15, 0.30, 0.49, 0.78 um. (*For modal models, each group translate # and width to a bin size distribution).*
Budgets: Integrated P/L in trop and strat for OCS, SO2, H2SO4, total aerosol (nuc, cond, evap)

Emissions Datasets:
SO2 (Smith et al., 2011), OCS (510 pptv), DMS (TBD). CS2 and H2S are optional

Observations to compare:
OCS vs N2O Toon balloon data, SO2 aircraft compilation (Thornton et al., 1999), H2SO4 aircraft and balloon (see English et al., 2011), SAGE v7 extinctions and effective radius, HALOE extinctions, aerosol size distribution (Deshler et al., 2003; Lee et al., 2003), aerosol mass vs N2O (Wilson et al. 2008), aerosol number (Brock et al., 1995; Heintzenberg 2003). All but HALOE are presented in English et al., 2011.

Timeline
1. Agree on final list of emissions datasets, observations to compare with, standard model output (June 2014)
2. Do control runs and submit model output (2nd half 2014)
3. Evaluate model output (late 2014/ early 2015)