Geophysical Research Abstracts
Vol. 18, EGU2016-17538, 2016
EGU General Assembly 2016

The influence of meteoric smoke particles on stratospheric aerosol properties

Graham Mann (1), James Brooke (2), Sandip Dhomse (1), John Plane (2), Wuhu Feng (1), Ryan Neely (1), Chuck Bardeen (3), Nicolas Bellouin (4), Mohit Dalvi (5), Colin Johnson (5), and Luke Abraham (6)

(1) School of Earth and Environment, University of Leeds, Leeds, U.K., (2) School of Chemistry, University of Leeds, Leeds, U.K., (3) National Center for Atmospheric Resarch, Boulder, United States of America, (4) University of Reading, Reading, U.K., (5) UK Met Office, Exeter, U.K., (6) Dept of Chemistry, University of Cambridge, Cambridge, U.K.

The ablation of metors in the thermosphere and mesosphere introduces a signficant source of particulate matter into the polar upper stratosphere. These meteoric smoke particles (MSP) initially form at nanometre sizes but in the stratosphere have grown to larger sizes (tens of nanometres) following coagulation. The presence of these smoke particles may represent a significant mechanism for the nucleation of polar stratospheric clouds and are also known to influence the properties of the stratospheric aerosol or Junge layer.

In this presentation we present findings from experiments to investigate the influence of the MSP on the Junge layer, carried out with the UM-UKCA composition-climate model. The UM-UKCA model is a high-top (up to 80km) version of the general circulation model with well-resolved stratospheric dynamics, includes the aerosol microphysics module GLOMAP and has interactive sulphur chemistry suitable for the stratosphere and troposphere (Dhomse et al., 2014).

We have recently added to UM-UKCA a source of meteoric smoke particles, based on prescribing the variation of the smoke particles from previous simulations with the Whole Atmosphere Community Climate Model (WACCM). In UM-UKCA, the MSP particles are transported within the GLOMAP aerosol framework, alongside interactive stratospheric sulphuric acid aerosol. For the experiments presented here, we have activated the interaction between the MSP and the stratospheric sulphuric acid aerosol. The MSP provide an important sink term for the gas phase sulphuric acid simulated in the model, with subsequent effects on the formation, growth and temporal evolution of stratospheric sulphuric acid aerosol particles.

By comparing simulations with and without the MSP-sulphur interactions we quantify the influence of the meteoric smoke on the properties of volcanically-quiescent Junge layer. We also investigate the extent to which the MSP may modulate the effects from SO_2 injected into the stratosphere from volcanic eruptions. Powerful eruptions injecting the sulphur into the mid-stratosphere may be particularly influenced by the interactions with MSP since the sulphuric acid droplets tend to evaporate at that altitude, with subsequent particle formation at high latitudes then being modulated by the presence of the MSP.