Geophysical Research Abstracts
Vol. 16, EGU2014-10511-1, 2014
EGU General Assembly 2014

Revisiting Stratospheric Ozone Changes after the Mount Pinatubo Eruption

Sandip Dhomse, Martyn Chipperfield, Wuhu Feng, Ryan Hossaini, and Graham Mann
University of Leeds, School of Earth & Environment, Leeds, United Kingdom (s.dhomse@see.leeds.ac.uk)

The Mount Pinatubo volcanic eruption in June 1991 injected between 14 and 20 Tg of SO_2 into the stratosphere, leading to significant enhancement in the stratospheric aerosol loading. Satellite measurements suggested nearly similar amount of aerosol were formed in both hemispheres. However, large ozone losses were observed only in the Northern Hemisphere (NH) compared to apparently negligible ozone losses in the Southern Hemisphere (SH). In contrast, most 2-D and 3-D model simulations indicate large aerosol-induced chemical loss occurred in both hemispheres. This inter-hemispheric asymmetry in ozone losses has been remained as scientific puzzle for the last two decades.

We will present the results from updated 3D Chemical Transport Model (CTM) simulations used to quantify the influence of chemical and dynamical process to explain the inter-hemispheric asymmetry in ozone losses following the Pinatubo eruption. The model is evaluated using total column ozone, NO_2 and HNO_3 observations from Network for the Detection of Atmospheric Composition Change (NDACC) stations as well as total column ozone observations from TOMS/SBUV merged data sets. Changes in the vertical profiles of key stratospheric species such as ozone, HNO_3, ClO are evaluated using measurements from Cryogenic Limb Array Etalon Spectrometer (CLAES), Halogen Occultation Experiment (HALOE), Microwave Limb Sounder (MLS) instruments onboard the Upper Atmosphere Research Satellite (UARS). Overall the model simulated changes in ozone, NO_2, HNO_3 and ClO now show excellent agreement with most of the observations. Reasons for the improvements compared to previous model simulations will be discussed. Overall, our recent model simulations indicate a larger role for stratospheric dynamics and a smaller role for chemical loss in both the hemispheres.