Atmos. Chem. Phys. Discuss., 13, C845–C847, 2013
www.atmos-chem-phys-discuss.net/13/C845/2013/

Atmospheric Chemistry and Physics Discussions

Interactive comment on "Uncertainties in modelling the stratospheric warming following Mt. Pinatubo eruption" *by* F. Arfeuille et al.

Anonymous Referee #2

Received and published: 29 March 2013

The Pinatubo eruption of 1991 provides an invaluable test for better understanding the volcanic impact on the Earth system. The paper compares several approaches for calculating of the Pinatubo aerosol optical characteristics and discuss their impact on the stratospheric volcanic heating due to aerosol absorption in Infra Red (IR). I appreciate that the authors did step forward using the improved SAGE-ASAP extinction data set. I think this has a good promise. However, the study in parts is misleading. The authors focus on aerosol IR effect and do not discuss the aerosol Short Wave (SW) effect. As a result the SW aerosol properties might be erroneous, but 30% of stratospheric heating is coming from SW absorption in Near IR. They did not present any calculations of aerosol heating rates, and aerosol effect on radiative fluxes. The discussion of stratospheric temperature response is largely incomplete, does not include all data sets, does not exclude the QBO effect. I would suggest the authors to thorough test the radiative code in their own model and present these results before blaming radiative codes in all other models.

Comments:

P3, L17: This is incorrect. See figures 6, 8, 10 in the paper. P3, L18-19: Incorrect. St98 used Claes-Isams data to estimate effective radius and width of the distribution. P3, L29: We know that the models have to be compared using the same aerosol data set. P4, L1-5: GFDL CM2.1 and CM3 produced excellent response to stratospheric forcing. P4, L20-22: Lidar measurements could differ by an order of magnitude from best collocated SAGE observations. Lidar retrievals require aerosol size distribution, which is largely unknown. P6, L3: It is two times less SO2 in comparison with the other estimates. P12, L8: This is incorrect. P12: Where is the description of the forth method? P14, L. 10-15: What is the difference in terms of heating rates? P14, L. 22-24: The 1.024 um to IR extinction ratio is a derived value, does not explain anything. P16, L. 2: It is not boundary conditions. P.16, L 6-19: The description is too sketchy. You, probably, show the result of both solar and IR heating, right? What are the solar heating rates in SOCOL? What are the IR heating rates in SOCOL? P17, L1-10: Thermal response and radiative forcing associated with a particular aerosol data set is an important information for the data set assessment. Both solar and IR effects are important and have to be balanced. You have to provide your radiative forcing and total spectral optical depth to make it clear what you are doing. You can not just blame raditive codes. Some models, like CM2.1 and CM3, did excellent job reproducing observed stratospheric temperature response. P.17, L13-14: Sato's data set provides data from 1850. It is good to have Pinatubo period to be consistent with the rest of the data set. So please do not be in a hurry to dismiss this useful piece of work.

Finally, the ST98 extinctions are plotted on a number of figures in your paper. These data are not available from the original Stenchikov et al. (1998) paper. What is this? Why these data are not properly referenced and acknowledged?

ACPD

13, C845–C847, 2013

Interactive Comment

Interactive comment on Atmos. Chem. Phys. Discuss., 13, 4601, 2013.

ACPD
13, C845–C847, 2013