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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Revisiting the Agung 1963 volcanic forcing – impact of one or two eruptions" *by* Ulrike Niemeier et al.

Anonymous Referee #2

Received and published: 3 June 2019

Overview: The manuscript by Nemeier et al. aims at clarification of the stratospheric aerosol forcing after Mt. Agung eruption in 1963. Authors use a climate model with interactive aerosol microphysics and simplified stratospheric chemistry and look at the differences between runs specifying the eruption as a single injection and as two injections, with the latter being more precise but mostly not considered in previous studies. The results of ensemble simulations are compared to each other and to the available limited observations. Authors demonstrate that the two-injection scenario provides about 10% lower signal in different aerosol parameters and is in a better agreement with temperature observations.

The manuscript is well written, methods are clear and sufficient for the paper goals. Even though the model (as any other model) has some limitations, they are fairly dis-

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Discussion paper

cussed and don't reflect on the main conclusions. The results are important for clarification of the historical volcanic forcing and also present an interesting example of the stratospheric aerosol layer behavior for future studies. I suggest to publish this paper after addressing few minor comments.

Comments:

P3L7: Not clear which ocean you used - was it a climatology or historical variability.

P6L14: 10% difference in the stratospheric vortex zonal wind speed is not so small to be so easily discarded, given that you already noted the traces of stronger meridional transport. Was it statistically significant? Was the change in stream function also around 10% or negligible?

P8L4-7: It is a bit incorrect to compare rather short-term effects after eruption to the long-term forcings from ozone and anthropogenic aerosols without specifying this difference.

P9L18: Too high wet deposition or gravitational sedimentation? Wet deposition implies precipitation, which occurs in the troposphere and is already quite fast compared to the stratospheric aerosol lifetime. In your case it looks more like a quicker sedimentation from the stratosphere to the troposphere.

P11L2-4: Mount Bingar data agrees better with the model than the Aspendale data only in the first months, while later (months 6,8,10) it is the other way around.

P13L24-28: First you say that 10% justifies no importance and then the opposite. I would suggest rephrasing it in a simpler non-contradictive way, because your main message is still that it is important and actually does not require a lot of efforts to apply.

Interactive comment on Atmos. Chem. Phys. Discuss., https://doi.org/10.5194/acp-2019-415, 2019.

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