

## ***Interactive comment on “Long-range transport of volcanic aerosol from the 2010 Merapi tropical eruption to Antarctica” by Xue Wu et al.***

**Anonymous Referee #1**

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The Editor will have to decide if there is enough new science here to accept this paper. The paper needs some revisions, but the question is whether it is important science.

This paper is well written and presents a new analysis of the poleward transport of the Merapi sulfur. But I'm not sure what is surprising in the conclusions. It is already known that stratospheric sulfur from volcanic eruptions gets transported to the poles, as we find it in ice cores. Is it that so little of the sulfur made it to the poles? Are there any observations to validate the model simulation? Fig. 7 (confusing because the units are not defined) actually shows that the aerosol load was reduced at the South Pole.

I am also confused about the initial stratospheric transport of the volcanic plume. If there was a westerly phase of the QBO, why was the transport toward the west?

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I am confused by the discussion of transport barriers on page 12. The authors say there are PV boundaries, but never explain how this works nor what values of PV are used. Then they use potential temperature values to define transport boundaries. They have to explain how this works and make clear what “boundaries” are and why they chose the values of PV or potential temperature for those boundaries.

It is not clear to me how the values of 8800 tons of sulfur (and are they sure this is S, and not SO<sub>2</sub> or SO<sub>4</sub>?) and 4% were derived for transport into the south polar cap. The figures did not show much arriving south of 60°S at all.

The authors need to address the 56 comments in the attached annotated manuscript, paying particular attention to issues with the figures.

Please also note the supplement to this comment:

<https://www.atmos-chem-phys-discuss.net/acp-2018-332/acp-2018-332-RC1-supplement.pdf>

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Interactive comment on Atmos. Chem. Phys. Discuss., <https://doi.org/10.5194/acp-2018-332>, 2018.

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