

## ***Interactive comment on “Long range transport and fate of a stratospheric volcanic cloud from Soufriere Hills volcano, Montserrat” by A. J. Prata et al.***

### **Anonymous Referee #2**

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Firstly I do not think the authors have addressed my first and primary objection to this paper - that it is a ramble through odd bits of data rather than a coherent exposition. There introduction should make clear what science question(s) the paper is answering and state why this eruption matters. It does - but it is not my job to make the case.

General (in response to the authors numbered points)

1) The authors have missed the point here. What are the movies telling us? This needs to be made clear in the text.

2) The inclusion of the Prata & Kerkmann reference is helpful.

3) I'm sorry localized was an ambiguous word choice. I meant it in the sense of being concentrated in a particular area - albeit one that floats around the globe. As I said, this makes conclusions on global climate incorrect as the radiative forcing is non-linear i.e. a mass of SO<sub>2</sub> in one location does not have the same radiative effect as the same mass spread globally.

4) The sulphate condensed as particles is the primary factor controlling the radiative effect of volcanic eruptions. While SO<sub>2</sub> has a small effect it is not until particles have formed several weeks/months after the eruption that the strongest effects are seen. Depending on the time since eruption the sulphate burden may or may not be a good indicator of the radiative effect. [Aside: AOD is the atmospheric optical depth from gases and particles in the atmosphere. It is not due to 'pollutants' as the authors assert.]

#### Specific comments

1) It doesn't matter what particles are used to calculate the colour of a cloud - provided they are much larger than the observation wavelength and do not have absorption bands in the visible - large particles produce a white cloud through scattering sunlight. The authors can not diagnose ice content from colour no more can you state a tropospheric cloud is ice or water from its colour (you can from other factors).

2) Good.

3) I suggest the authors do some Mie calculations for very large particles. With a bit of tweaking it is possible to reproduce the brightness differences seen here.

4) This is nonsense there is no aspect of the data that provides an unambiguous identification of the components comprising the cloud. The information is not in the data. It can be asserted (as the authors do) based on other measured eruptions but the authors should not state their data tells them this.

5) Good.

6) This should be made clear in the paper.

Technical

1. Quantify!

2. OK.

3. Of course ash is not pollution. It is unfortunate the authors try and defend this poor use of english (I could cite four academic websites that misuse just about any scientific term the author's cared to name!). According to the OED pollution is a physical impurity or contamination especially as a result of human activity. The definition could stretch to volcanic emissions but this is very sloppy and I would suggest the authors reconsider their view.

4. Good.

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Interactive comment on Atmos. Chem. Phys. Discuss., 7, 4657, 2007.

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