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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Sulphur dioxide as a volcanic ash proxy during the April–May 2010 eruption of Eyjafjallajökull Volcano, Iceland" *by* H. E. Thomas and A. J. Prata

Anonymous Referee #1

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Review of manuscript " Sulphur dioxide as a volcanic ash proxy during the April-May 2010 eruption of Eyjafallajökul Volcano, Iceland" by Thomas and Prata

The manuscript discusses the satellite measurements of the ash and sulphur dioxide during the recent eruption of the Icelandic volcano. The paper is well written and the topic is is very current and important as the volcanic eruption closed the European air traffic for several days and caused significant financial losses to the aviation companies. The paper shows how different satellite instruments detected the ash and sulphur dioxide and in particular shows that there were differences in their distributions during the eruption. This is very important for the aviation. Also, the paper concludes that,

in particular, the satellite measurements in UV are important for detecting the SO2 plumes from volcanoes due to their sensitivity of the lowest layers. Even though the paper does not show major new findings the topic is very relevant and the results are important, therefore, I suggest that the paper is published after taking my comments into account.

Main Comments:

The paper does not go deeply to the various differences of the measurement techniques, but simply studies the differences by comparing visually the estimated plumes. A deeper analysis on the differences between the measurement techniques would make the paper stronger. Now it speculates that IASI and AIRS are not sensitive to the SO2 at lower layers. Would it be possible eg to compare GOME-2 and IASI SO2 quantitatively by showing the differences or some measures of differences (see also below last comment)?

Also, I think that it would be useful to include a bit more discussion about the general accuracy of the SO2 and ash satellite measurements. Also the effect of clouds vs SO2/ash plume could be discussed. The results and observed differences could be also compared to the expected accuracy.

Minor comments:

P-7762 L-8: unclear what the saturation means here and how it affects the measurements.

Section 2.1. Ash retrievals: Is there some information about the accuracy of the SEVIRI instrument and reference?

Section 2.2 SO2 retrievals: Is there some information about the accuracy of the IASI, OMI, GOME-2 SO2 measurements and references? How do eg clouds affect the measurements.

P-7764 L-27: Last sentence is a strong point and it is strongly related to the sensitivity

and accuracy of the satellite measurements. It also emphasizes the need of careful validation of the satellite measurements to confirm that when the satellites do not see anything it also means that the values are below the flight safety ash concentration thresholds. These points could be discussed more.

P-7764 L-21. Could you, please, clarify if (and what?) data was included in the VAAC model?

Figure 5: Since the OMI data is missing (row anomaly) below the track of the CALIOP at the orbit 14:34 it might be more informative to use OMI data from the previous orbit (about 100 min earlier). Also, the lower row of CALIOP measurements need more clarification.

Figures in general: The labels should be larger in all figures.

It would be good to analyze also the differences between the measurements more quantitatively (GOME-2 and IASI, AIRS and OMI). This might not be totally straightforward but it would be very useful. However, some indicators like size of the spatial distribution, maximum values, distribution of values etc could be analyzed and compared.

Interactive comment on Atmos. Chem. Phys. Discuss., 11, 7757, 2011.