

Interactive comment on “Observations of volcanic SO₂ from MLS on Aura” by H. C. Pumphrey et al.

Anonymous Referee #2

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General:

The paper is the first one describing the dataset of SO₂ volume mixing ratio profiles retrieved from the AURA/MLS instrument. Several major volcanic eruptions have been identified to be the cause for enhanced SO₂ vmr values. Volcanic SO₂ eruption masses and lifetimes could be derived. In spite of the different sampling geometries the SO₂ masses fit quite well to results from nadir sounding satellite instruments. Further a comparison of single column data with co-located OMI observations has been performed.

A general point which I miss, is a discussion of the estimated errors of the MLS SO₂ data and a comparison with the validation results. This might indicate whether there are other error sources which have not been taken into consideration for estimating errors. This would be valuable information for data users to decide whether estimated

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errors from the data document could be used.

Since the paper presents a completely new and important dataset of SO₂ observations, I strongly recommend publication after consideration of the general and specific comments below.

Specific:

P7884L13 ‘The agreement is good’

Could you state this more quantitatively? (e.g. within ...%...)

P7885L1 ‘A volcanic eruption is the only such process that is of any importance.’

This statement is very strong. However, what about heavy fire events (pyroconvection)? Also there are discussions about how much water vapour reaches the stratosphere via strong convection. The Asian monsoon circulation is a further mechanism to transport pollution relatively fast to high altitudes. These processes should be mentioned and references given.

P7885L15 :

There are also papers describing height information retrieval from IR-nadir sounders: e.g. Carboni et al., Atmos. Chem. Phys., 12, 11417–11434 and Clarisse et al., Atmos. Chem. Phys., 14, 3095–3111, 2014.

P7888L7:

In Fig. 4, the 46.4 hPa data seem to be most heavily influenced by the seasonally varying bias problem. Is this the feature which is described here? However in Fig.11 lowest values of total mass in the background seem to be reached by mid of 2008 while the vmr values at 46.4 hPa seem to have a maximum in Aug/Sep?

P7891L19 ‘Both the latitude range and the highest pressure used in the vertical integration are chosen separately for each eruption.’

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What have been the criteria for the selection of the latitude range and the pressure?

P7894L4:

Can the SO₂-background offset of the 240GHz channel be identified in all three channels? How different is it between channels?

P7896L10 'The agreement between MLS and OMI is good':

Could these results be discussed a bit more quantitatively? What are the biases (standard-deviations) of the difference between the two instruments? Do these differences fall within estimated errors of the MLS SO₂ product?

Technical:

P7919, Fig.15, caption 'This is really more like an estimate of the column above 121 hPa':

Such a discussion should better appear in the text rather than in the Figure caption.

P7901L11: 'Version 2.2 Level 2 data quality and description document':

Should this not read: 'Version 2.2 and 2.3 Level 2 data quality and description document' ?

Interactive comment on Atmos. Meas. Tech. Discuss., 7, 7883, 2014.