

Interactive comment on “Retrieval of sulphur dioxide from the infrared atmospheric sounding interferometer (IASI)” by L. Clarisse et al.

Anonymous Referee #3

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This paper describes an SO₂ retrieval scheme for space-based infrared sounding instruments such as IASI on MetOp-A, designed for near real-time volcanic cloud measurements. It is a useful contribution that describes the theoretical basis of the algorithm, the applicable range of SO₂ columns, the associated errors, and the sensitivity of the retrieval to ash and ice in the volcanic cloud. I can recommend publication after attention to the following mostly minor issues:

P7242, L7: 500 hPa is a pressure level not an altitude; convert to approximate altitude?

P7242, L21-2: list references in chronological order (unless AMT policy dictates otherwise).

P7243, L2: change 'space' to 'satellite', also on line 4.

P7243, L4: can use 'IR' instead of infrared hereafter.

P7243, L13: the wording here suggests that TOMS is still making measurements, but the final TOMS mission ended in 2005.

P7243, L21: change to 'For an overview of satellite instruments capable of...'

P7243, L25, 29: for the benefit of non-spectroscopist readers, it might be useful to give wavelengths for the SO₂ absorption bands in addition to wavenumbers.

P7244, L7: although it is pointed out later on, it would be worth also stressing here that all IR measurements require thermal contrast between the SO₂ plume and the underlying source of radiation.

P7244, L21: '...using high spectral resolution instruments...'

P7244, L23: I'm not sure that the time constraints are that significant these days – except when retrievals are required in 'near real-time' for hazard mitigation.

P7245, L21: need to explicitly state here that T_c is cloud temperature, and also that T_s is measured brightness temperature.

P7249, L20: there is a very minor discrepancy between the 0.15K error for channel set 1 given here and the 0.14K given in Table 1 as the standard deviation.

P7251, L8: remove parentheses and use 'quiescent' or 'passive' instead of 'quiescence'.

P7251, L14: I think 'uniformly' should be 'uniform' – meaning no spectral dependence in ash absorption across the v₃ band? The authors could also comment on the effect of ash composition here.

P7251, L19-20: should be 'optically thick'. 'Lower lying thin to medium optically thick' is a bit of a mouthful – perhaps replace with 'Low-altitude aerosol layers of low-to-medium

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optical thickness...’?

P7251, L21: by ‘close’ I presume you mean just below the SO₂ cloud?

P7251, L28: switch to wavelength here is inconsistent with wavenumber used elsewhere.

P7252, L18-19: instead of ‘atmosphere’ I would use ‘UTLS’. There have been some large effusive eruptions that emitted large quantities of SO₂ into the lower troposphere.

P7253, L2-4: Full sensor names should be given, if not given earlier, and whether they operate in the UV or IR.

P7253, L10: I think the Bobrowski et al. (2010) reference refers to GOME-2, not OMI SO₂ columns.

P7253, L15: ‘injection altitude’.

P7253, L24: ‘shear’.

P7254, L17: ‘gridding’.

P7254, L22: use ‘2011’ instead of ‘this year’.

P7254, L22: change to ‘...each releasing large amounts of SO₂.’

Fig. 2: please also give equivalent altitudes for the pressure levels, for the benefit of volcanologists.

Fig. 5: the parts of this figure overlap a bit and need some adjustment. Also, I think the ‘ $\times 10^4$ ’ on the pressure axis should be ‘ $\times 10^2$ ’

Fig. 9: label the color bars (I presume it is SO₂ column in DU). It is also not clear what altitude is assumed for the displayed SO₂ columns?

Fig. 11: surely this image shows more than just the ‘maximum observed SO₂ columns’ for the 20 May – 30 June 2011 period, as stated in the caption. It seems to be a

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composite of all IASI SO₂ retrievals in this period.

Fig. 12: could dates be provided for each panel in this figure?

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