

Interactive comment on “Volcanic SO₂ and SiF₄ visualization and their ratio monitored using 2-D thermal emission spectroscopy” by W. Stremme et al.

Anonymous Referee #2

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Review of “Volcanic SO₂ and SiF₄ visualization and their ratio monitored using 2-D thermal emission spectroscopy”, W. Stremme, A. Krueger, R. Harig, and M. Grutter

This paper presents an observing system for SO₂ and SiF₄ in volcanic plumes. The system is remote and safe and uses a spectrally resolved multi-pixel detection which can then map the concentration across an extended image. They go on to use consecutive snapshots of the mapped concentration to compute the net flux of SO₂ and SiF₄ from a volcanic eruption. This is clever, novel, and potentially very useful.

General Comments

Looking at the article and supplement as a whole there is a lot, but too much, information that the authors are attempting to discuss. Unfortunately thoughts and arguments are not well developed, they don't seem complete and do not well follow one and other. The result is that the good work that has been done is lost in a general confusion. This could be remedied by splitting the paper into two or rewriting into a more succinct paper. Either might work. The use of the supplemental section only serves to separate what should be better linked information.

A stronger estimate of errors beyond the table of calibration sensitivities is required and this should be in the body of the paper. Error estimates given are woefully too little.

The use of the emission and lunar spectral records is interesting and important. It should be the subject of a separate paper. If then needed as calibration data points for the primary subject of this paper it should be published first.

It is the recommendation of this referee that the paper not be accepted as is.

Technical issues:

P5741 L13 coefficient of correlation – this quantity must be defined in the text or an equation

P5742 L8 location use deg N deg E etc.

P5745 L13 Fore ground temperature is just observing site temperature. Altitude at the plume is more than 1.6km higher why not use a lapse rate adjusted temperature?

P5746 L6 Explain in the text the 'polynomial of order 4' seems a high order for a background especially for retrieving a broad smooth feature.

P5746 L10 Did the authors attempt to fit more than one foreground layer to account for primarily water?

P5747 L16 It is not strictly true that the "images must match the Nyquist"

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P5749 L5 The mass and flux of SO₂ is calculated – this requires an estimate of the volume of the plume where does this come from? Did not see it.

P5754 L14 This sentence is not clear

S11 L124 of course a directly measured temperature would not be assumed

S11 L126 slant column measurements or amounts is really meant?

S11 L127 “appreciated” is incorrectly used

S11 L130 “. . .much more unresponsive” poor and confused wording

S11 L133 “position” or “spot” ?

S11 L146 “For example. . .” is not a sentence

S11 L149 “ more steady conditions. . .” be specific: what conditions and what range constitutes “steady”

S12 L163 “do not compensate” means what?

S13 L173 what is a “noticeable constraint” ?

S13 L180 what does “almost freely adapted” mean?

S13 L186 this sentence is unclear but moreover not enough justification is given to circumvent the OE formalism nor enough information for the reader to fully understand what was actually done.

Plus more

Minor issues:

P5738 L6 “save” should be safe

P5738 L15 “A small. . .” sentence is not clearly understandable

P5738 L24 “imagees “ spelling

P5739 L24 “needs for the” is not correct English

P5739 L24 “requires for a” is not correct English

P5739 L24 “foreground need to be” is not correct English

P5740 L14 define SiF₄/So₂ ratio and stay with the terminology

P5740 L18 “gas with origin” poor English

P5740 L14 “since (McGonigle.” Reference would be better in line or rephrased

P5740 L24 “with statistical” -> with a statistical

P5740 L24 “As a example” -> As an example

P5741 L15 “(in pixels. . .” definition of field of regard should be moved to the first usage of the term field of regard

P5742 L14 “background of” should be background in

P5746 L12 sentence does not make sense

P5746 L27 “of a SiF₄” is not correct

P5747 L9 time derivative

Plus many more

Plots:

Fig 3a and 4 should have the same abscissa range ie the fitted range.

Fig 6,7 Ranges 0 to 7e15 (eg) more tick marks need to be used on colorbars

Fig 8 no colorbar? Needs a colorbar

A plot showing all the interfering species should be included

Fig 11 supp. It is not clear how these curves were derived? How were correlations

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done? “Correlation” is a general term not a mathematical operation.

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