Atmos. Meas. Tech. Discuss.,
doi:10.5194/amt-2016-206-RC2, 2016

Atmospheric Measurement Techniques Discussions
Open Access
EGU

Interactive comment on "Improving automated global detection of volcanic SO_2 plumes using the Ozone Monitoring Instrument (OMI)" *by* V. J. B. Flower et al.

Anonymous Referee #2

Received and published: 15 September 2016

General comments

This paper presents a new technique in order to detect volcanic SO2 eruptions from satellite UV data, that allows monitoring of volcanoes even in remote regions. A set of volcanic eruptions detected in OMI data together with a control data set has been selected and a logistic regression model has been trained, that is able to distinguish real volcanic eruptions exceeding an integrated SO2 emission mass of ∼400 tons of SO2 in a 2x2deg region around the volcano. The advantage of this model is that even weak eruptive or degassing events can be detected and that no background correction needs to applied or that threshold values need to be defined above which an eruption is detected. The paper is well written and the procedures and methods applied are well

Printer-friendly version

Discussion paper

outlined and I would recommend it be published in AMT after some minor revision

Specific comments

I would suggest to slightly change the title of the paper, since it gives the reader the feeling that a detection method to detect volcanic SO2 plumes on a global scale is presented in this paper. However, the method presented is only suitable in the vicinity of volcanoes to detect eruptive events and not e.g. to monitor SO2 plumes in general, as other works do (e.g. Brenot 2014). Only at the very end of the paper in Sect. 5 this is clarified. As a suggestion I would simply replace the word 'plumes' by 'eruptions' in the title and also clarify this in the abstract.

On which assumption is eq 1 based on? Was it found by testing? Can it be improved and does the choice e.g. of the denominator have an impact on the analysis? I can image that during explosive events or after dispersion of the plume the M1 region contains much more signal than the M2 region, severely affecting the value of M3. . .

The authors have chosen TRL OMSO2 data for their analysis. Choosing the TRM or STL product would provide a dataset with much less noise. Since the difference in the different products should only be a different scaling factor (or AMF) , in my opinion choosing e.g. the STL product would decrease the amount of false-positive detections. This is one reason, why Brenot 2014 has also chosen this plume height product (as described in Sect. 1.1). The authors themselves state in Sect 4.4 that a product with lower noise should result in lower detection limits - so I was wondering, why this hasn't been done, or at least, analyzed what the effect would be.

Before the modelling procedures are described in great detail in 2.4, I am missing some basic introduction beforehand why this model has been chosen. The way in in which the paper is currently organized and written, the reader gets an overview of the data collection method and the plume quantification, which is very good and detailed, but then section 2.4 immediately starts off with the description of the software package and the logistic regression model. It took me a while until I understood why this is done

. . . hence some words before that this technique is chosen, and first a training has to be conducted and then the model can be applied to other datasets is needed in my opinion at the beginning of 2.4. Currently, up to section 2.3 the paper reads as if only a simple threshold criterion is used to detect volcanic events, after the correction of the background noise using the M3 model.

There are some points not (or only shortly) discussed in the paper, which could be potentially interesting and should be further analyzed from my point of view: - Does the effect of instrument degradation (and hence choice of the training dataset) has an effect on the analysis and training of the model? I.e. what would happen if I train the model only with data of a specific time frame?

- When the model is trained using only a single volcano, the detection limit should decrease. Would this be an option for the monitoring of selected volcanoes?

- What is the impact of cloud screening? During the selection of volcanic events for the training dataset, were there only eruptions chosen with no cloud cover? Is there a limit on the cloud cover or cloud pressure limit for this method in order to detect degassing events?

- What is the effect of using a different SO2 product (e.g. TRM or STL) ? See my point above. . .

Interactive comment on Atmos. Meas. Tech. Discuss., doi:10.5194/amt-2016-206, 2016.

Printer-friendly version

Discussion paper