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Atmospheric Measurement Techniques Discussions

Interactive comment on "Improved retrieval of SO_2 from Ozone Monitoring Instrument: residual analysis and data noise correction" *by* H. Yan et al.

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In their manuscript "Improved retrieval of SO2 from Ozone Monitoring Experiment: residual analysis and data noise correction", Yan et al. report on an improved residual correction for OMI SO2 measurements. The correction is based on the median correction already applied in the operational OMI SO2 product but uses a smaller latitude window. The authors demonstrate the effect on 4 days of data before the row anomaly affected OMI data and conclude that their corrected values are in good agreement with the operational product. They then demonstrate that for two more recent days from January 2009, their correction significantly reduces artefacts present in the operational product since the appearance of the row anomaly.

The OMI SO2 product is very valuable for SO2 emission studies and air quality research, in particular over China. The two examples of corrected data shown in the

paper indicate significant improvements, and therefore this method would be worthwhile to be published (and to be applied to the operational OMI data).

Unfortunately, there are several serious problems with the current manuscript:

1. The paper needs significant copy editing to improve on the English – in some parts, it is really difficult to understand what the authors have done
2. The methods used and the thresholds and criteria applied need to be described much clearer and more details need to be given. Some examples are
   - p 983, l8: "because of the invalid values. . ." – what are invalid values?
   - p 983, l9: "the nearest neighbour interpolation method" – is that linear interpolation from the neighbouring wavelengths or what is meant here?
   - p 985, l27: "when the selected pixels are near the terminator, we decrease the residual correction area" – what is "near the terminator" – 85° SZA? What is "decrease the residual correction area" – by how much?
   - p 985, l28: "bad pixels determined by residuals are filtered" – what are bad pixels, and how are they determined?
   - The entire discussion of the residuals for different latitude windows is difficult to follow and needs to be rewritten.
3. I'm not really sure I fully understood the method, but my understanding is that the main difference to the operational product is just the use of a 10° latitude band for the median background instead of the operationally used 30°. If that's the case, this is a small change and it should be stated clearly that not a new method was developed but rather one parameter of the existing method was tuned.
4. The reason for using a large latitude window in the first place is that a small latitude window has the risk of removing not only artefacts but also reducing the

high SO2 values resulting from volcanic eruptions or pollution. This turns out to be the case as can be clearly seen in the comparison of the operational and the new data set – the latter is smaller by 20 – 40 % for the 2008 cases and also clearly lower for the 2009 examples. This is a serious problem and has to be discussed in detail. It would also be very useful to have the 1:1 line in the correlation plots as then the change in absolute values will be apparent.

5. The discussion of other error sources both with respect to irradiance and radiance errors as well as in the conclusions chapter is very superficial and in my opinion does not go beyond what other studies have already reported earlier (and more clearly).

6. The figures are very small and difficult to read at least in the printout

In summary, I think that the results look promising and are worth publication but the paper needs major rewriting for contents, clarity, and English before it can be considered for publication in AMT.

Interactive comment on Atmos. Meas. Tech. Discuss., 5, 979, 2012.