**Atmospheric
Measurement
Techniques
Discussions**

Interactive comment on "An effective method for the detection of trace species demonstrated using the MetOp Infrared Atmospheric Sounding Interferometer" *by* J. C. Walker et al.

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1   Replies to general comments

We thank the referee for their comments which we found very useful.

RC: "*However, they mention that some quantitative information might be retrieved. To be able to judge on this, it would be good if more quantitative comparisons with results of a full retrieval could be provided in the case studies*".

AC: This would be very interesting for ammonia, and would be a good idea for a future study of the capabilities of the ammonia detection. For a worthwhile comparison of ammonia against existing quantitative retrievals, more work would be needed to clarify the effects of the assumed profile shape and effects of thermal contrast on the estimated total column. Comparisons of the scene over India, for which quantitative estimates exist in the literature, suggest that the detection method significantly overestimates the column during the day, but not at night. This suggests that thermal contrast with the surface would need to be characterised somehow before a more quantitative analysis could be performed. This could perhaps be accomplished using information derived from ECMWF analyses to scale the apparent column, to provide a better estimate of the actual column amount. A quantitative estimation of the total column amount for SO_2 is unfeasible due to the large uncertainty on the vertical distribution of the volcanic plume. The method as it stands is only really suitable for detection, and so would not be suitable for a quantitative comparison against a full retrieval in the current paper.

RC: *p. 4536 l. 10: 'spectral offset' It should be clarified that this is wavenumber independent.* AC: It is now mentioned that this is wavenumber independent in the text.

RC:*p. 4536, l.28: 'where a uniform brightness temperature perturbation (1K) us applied for all channels". Can you explain a bit better. It sounds that, in order to calculate K, you perturb the brightness temperature..*

AC: We do perturb the brightness temperature to calculate the jacobian. The jacobian is then a m×2 matrix with one column consisting of the effect of the perturbation to SO_2 at each spectral point, and the other column consisting of a 1 K perturbation at each spectral point. This is made clearer in the amended version.

RC:*p4544, .1:'An an −> An'..* AC: Done.

RC: *p.4544 l. 1: An appropriate viewing angle correction was applied to the measured spectra before application of the filters. Could you describe this in more detail'.*

AC: The filters created using the modelling method are constructed assuming a direct nadir viewing geometry. The viewing angle correction is then necessary to correct for the extra-path length viewed through the atmosphere for the sideways views. In a plane-parallel atmosphere, this can be done by scaling by the secant of the satellite nadir angle i.e., the angle at the satellite between the vertical and the sideways view. We have used a slightly better approximation whereby the measurements are scaled by the angle between the vertical at the surface and the satellite, which also takes some account of the extra increase in path length due to the curvature of the Earth. We have added the formula used to correct for the viewing angle in the amended paper.

RC: *p4544, l.14: Which spectroscopy have you used for SO2 and NH3? Can you explain how spectroscopic errors in target and interfering species (e.g., H2O-continuum) would affect your method.*

AC: We have used the spectroscopic data contained in the HITRAN 2008 database for SO2 and NH3. Spectroscopic errors in contaminants have some effect on the modelling method, whereby S_y^{tot} is computed using a radiative transfer model which relies on a spectroscopic database. These errors were not included because they are small compared to the effects of climatological uncertainties in abundance and so the effect is not noticable. Spectroscopic errors should not affect the ensemble method, since this uses a set of real spectra to compute S_y.

RC: *p4552, l. 5: indicate indicate −> indicate.* AC: Done.

RC: *p4552, l. 28: to to −>to.* AC: Done.

Interactive comment on Atmos. Meas. Tech. Discuss., 3, 4531, 2010.