

Interactive comment on “The added value of a visible channel to a geostationary thermal infrared instrument to monitor ozone for air quality” by E. Hache et al.

Anonymous Referee #1

Received and published: 15 April 2014

Review of “The added value of a visible channel to a geostationary thermal infrared instrument to monitor ozone for air quality”

In this manuscript, E. Hache et al. report on a detailed sensitivity study investigating the benefit of including a vis channel to a geostationary satellite TIR instrument aiming at measuring ozone for air quality applications. The study is performed by generating radiances based on a full week of hourly 0.5×0.5 degree CTM calculations over Europe, applying a simple instrument model and then performing retrievals on the simulated measurements. Two cases are compared, one having only a TIR instrument and a second, where an additional grating instrument covering the Chappuis bands is

Full Screen / Esc

Printer-friendly Version

Interactive Discussion

Discussion Paper



included. The retrieved O₃ fields are compared to the original model data and correlations and standard deviations are computed for both the surface values and the column in the lowest km. The degrees of freedom for signal are also computed and situations over land and sea are compared. The results show a general improvement of the ozone retrievals during daytime when including the vis instrument and also superior performance when generating warnings for exceeding of AQ thresholds.

The paper is clearly structured, well written and describes a systematic and focused study which fits well into the scope of AMT. The methods used are appropriate and the results interesting and convincing though maybe not too surprising. I therefore recommend the paper for publication in AMT but only after my concern (see below) has been addressed adequately.

Major comment:

The only real concern I have about this study is that it leaves the reader with a too optimistic view of the benefit a visible channel might have for a real instrument. This is because a number of important factors introducing uncertainties in the results have not been covered in this study and are not discussed appropriately in the manuscript:

- As mentioned in the manuscript, clouds and aerosols are not taken into account in the simulations. In real applications, both might well be major problems and the possible effects of them and their different impact on TIR and visible observations need to be discussed at least qualitatively.
- It is interesting to note that so far there is no publication applying ozone retrievals in the Chappuis bands to nadir satellite observations although such data is available since the launch of the GOME instrument in 1995. The reason are strong interferences from spectral signatures of surface and vegetation properties in this spectral range. As long as this problem has not been solved, adding a vis channel to a TIR instrument adds little to O₃ retrievals. This point should at least be

Full Screen / Esc

Printer-friendly Version

Interactive Discussion

Discussion Paper



mentioned.

- While statistical errors have been taken into account in the simulations, the effects of mismatches between cross-sections, surface albedo and BRDF or ground scene coverage in the two spectral bands are not mentioned at all. However, none of these quantities is known to a percent level and this will introduce systematic and non-negligible uncertainties in real data. I therefore think such effects need to be discussed.
- A lot of the discussion deals with averages over all daylight hours for a full week. It would be interesting to see a figure similar to Fig. 7, but for an individual 1 hour time step. As discussed in the introduction, for air quality applications weekly averages are not really appropriate.

Minor points:

Page 1648, line 9 – it might be worthwhile to also mention biogenic precursors which increase at high temperatures

Page 1660, line 14: compare to => compared to

Interactive comment on Atmos. Meas. Tech. Discuss., 7, 1645, 2014.

[Full Screen / Esc](#)[Printer-friendly Version](#)[Interactive Discussion](#)[Discussion Paper](#)