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Comment

Interactive comment on “Trace gas measurements from infrared satellite for chemistry and climate applications” by C. Clerbaux et al.

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Initial comments on

Trace gas measurements from infrared satellite for chemistry and climate applications
C. Clerbaux, J. Hadji-Lazaro, S. Turquety, G. Mégie, and P.-F. Coheur Atmos. Chem. Phys. Discuss., 3, 2027-2058, 2003

General Comments

The authors provide an excellent review of the state of the art of satellite-based measurements of atmospheric trace gases that are important for climate and chemistry. The approach is to analyze the IMG data to predict what we will be able to learn from future missions. To this end they do a good job of reviewing the important aspects of the problem. Table 2 gives a nice summary of the measurement goal for each species

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and the current capability.

Retrievals of surface temperature, O₃, CO and CH₄ from a set of IMG spectra taken in early April 1997 are presented. It appears they can meet the required precisions for measuring tropospheric CO and methane from IMG data, but the other species will be difficult.

There needs to be some error analysis so that the results can be put in context. Potential error sources could be surface temperature, temperature and water vapor profiles, potentially heavy aerosol loading, limited vertical resolution (overestimate minima and underestimate peaks, finite spatial resolution. The significant error sources for each species need to be identified and assessed, with a total error budget given.

Overall, this is a very interesting paper and an excellent review of the topic. In my opinion, this paper is clearly worth publishing. The authors should however take a more quantitative approach, to make it more clear what the predicted measurement capabilities are for IASI and to what extent they will meet the science goals set out in Table 2.

Specific Comments

Section 2 There are two bands used, one with 0.07 cm⁻¹ resolution and the other with 0.2 cm⁻¹ resolution. What are the signal-to-noise ratios for each band, and what will it be for IASI?

Section 3.2 HITRAN and GEISA are mentioned as candidate linelists. Which linelist was used in this work?

Section 3.2.1 A 10% error in the water profile coupled with uncertainty in the surface temperature could have a substantial effect on retrieving trace gas species. Has this been investigated and if so, what is the upper-bound of this error source.

Section 3.2.2 Would a volcanic eruption at the level of Pinatubo cause problems for retrievals of any of the species?

Section 3.2.3 Is 1% precision for a 500 km/15 day average CO₂ measurement good enough to help resolve the discrepancy between the measured and modeled carbon budget? Table 2 indicates the answer is no.

Section 4.3 I have to admit that I had difficulty understanding what was done regarding the CO retrievals and model runs, and don't fully appreciate what is being shown in Figures 7 and 8. This might be clarified if possible.

Technical Corrections

2032 Line 9: uses -> use 2032 Line 23: extend -> extent 2037 Line 4: volcanoes -> volcanic

The conclusion has numerous grammatical errors, and needs to be more carefully edited.

2040 line 4/5: the study made also use of -> the study also made use of 2040 line 5: sensors, as -> sensors, such as 2040 line 9: gases as CO₂ -> gases such as 2040 line 10: omit scales 2040 line 20: lower -> higher??? 2040 line 20/21: at the notable exception -> with the notable exception 2041 line 1: are -> is 2041 line 8: new concepts of satellite -> new satellite concepts

Interactive comment on Atmos. Chem. Phys. Discuss., 3, 2027, 2003.

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