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Atmospheric Chemistry and Physics Discussions

Interactive comment on "A new insight on tropospheric methane in the Tropics – first year from IASI hyperspectral infrared observations" *by* C. Crevoisier et al.

Anonymous Referee #1

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General comments

The paper "A new insight on tropospheric methane..." by Crevoisier et al shows first upper tropospheric methane retrievals from the IASI instrument. Even though the paper nicely illustrates and characterises the IASI retrievals, I think that the title and abstract actually promise more than the paper delivers. This is not meant in terms of retrieval properties but in terms of insight into atmospheric methane.

What do the authors exactly mean by "new insight" in the title? A new retrieval with new data or truly new insights into tropospheric methane sources not yet published from SCIAMACHY or AIRS? I would propose to change the title in order to be less misleading (or to give valid reasons to keep it as is).

Similar in the abstract: "In addition to bringing a greatly improved view of methane distribution...". Improved with respect to what? It sounds a little exagerated to me, also because the Xiong reference about the Indian monsoon plume (ACP) was completely missing (indicating that some literature research on the degree of novelty of the proposed new insights was missing).

Further: Maybe I overlooked it but I couldn't find a statement about the exclusion of land pixels. Please elaborate why only ocean pixels are analysed, especially due to the fact that this greatly hampers insights into methane surface sources.

The authors conclude an accuracy of about 16 pppbv which is derived from the the RMS of methane measurements in 5by5 degree grid boxes. Hence, I would consider it precision and not accuracy. Systematic errors are obviously much harder to identify and quantify.

Choice of retrieval window: It seems that only the strong Q-branch is fitted which is known to exhibit strong line-mixing effects. Is this considered in the retrieval and if not, how is it expected to impact the retrieval? Are there sensitivity studies?

Apart from the overstated insights into atmospheric methane in the tropics and the major comments described above, the paper provides 1) a good description of the retrievals, 2) a first outlook on what can be expected from IASI and is well written and structured. The paper is well suited for a IASI special issue in ACP.

In order to be accepted, the overstated statements should be adjusted, the comments above clarified and the following specific comments considered:

Specific comments

- **Introduction, line 15** "... sources and sinks are not as well understood as those for CO2" This is a rather vague statement. I would say that we have a better idea about methane sinks than about CO2 sinks. Location and intensity have also been derived in the past (eg from SCIAMACHY and ground based obs). Even though these are still not fuly certain, the main uncertainty in the global methane budget is certainly the partition among source types. I would also completely

omit a comparison with CO2 (What did you want to imply? That CO2 is already well understood (which it isn't).

- **Introduction, line 18** Please add Bergamaschi et al (JGR, 2007) at this point
- **Page 6857, line 27** "... would in principle fill this gap" They do already as shown by inversions presented in Bergamaschi et al 2007, Meirink et al 2008 and Frankenberg et al 2008. If only ocean pixels are provided in this study, many important gaps still remain.
- **Page 6858, line 21** "... our presently quite limited knowledge of its tropospheric distribution". Again, I consider this an exaggeration, given previous results from the ground-based stations as well as SCIAMACHY and AIRS. What did we gain from IASI specifically (as opposed to previous work)?
- **Page 6863, lines 6-8** The authors say that retrievals are insensitive to the lower troposphere and the tropopause. There is currently another IASI paper on ACPD (Characterization of methane retrievals from the IASI space-borne sounder, Razavi et al). They present total column retrievals. Could you elaborate on the differences in sensitivity in the retrieval schemes (if there is one)?
- **Page 6866, line 24** What is a "systematic" aircraft measurement?
- **Page 6869, line 23** "bias" sounds judging (ie either model or IASI is supposed to be wrong, not clearly stated here). Better talk of differences.
- **Page 6870, line 4** "too weak convection in the model" Very vague and unsubstantiated. To support this statement, MOZART should be confirmed to agree at the surface with eg GMD-stations. As I understood, the MOZART fields are based on a pure forward model run and are not optimised wrt ground based measurements. Hence, no conclusion can be drawn whether there are biases in a priori emission inventories or model convection parameterisation.

- **Page 6870, line 12** "much lower than observed by Frankenberg" How do you derive this conclusion if there is no quantitative comparison (and no land pixels)? SCIAMACHY and IASI are hard to compare owing to different sensitivities. A statement like this, however, is not possible/valid.
- **Page 6872, line 22+** Accuracy: As said before, I would consider this a precision estimate as it describes random errors within a grid cells.

Interactive comment on Atmos. Chem. Phys. Discuss., 9, 6855, 2009.