

Interactive comment on “Renewed methane increase for five years (2007–2011) observed by solar FTIR spectrometry” by R. Sussmann et al.

Anonymous Referee #1

Received and published: 23 November 2011

The paper presents averaged mixing ratios of CH₄, measured using solar absorption FTIR spectroscopy at Zugspitze and Garmisch. The interannual trend of CH₄ is well known from in-situ observations. However, the results presented here are total column observations, therefore the data are somehow new. Furthermore, the ground-based data are suitable because they can be compared to greenhouse gas observing satellites, as SCIAMACHY and GOSAT, which comprise a very similar viewing geometry.

The paper might be worth to be published, but there are a few major concerns which need to be considered.

1. The introduction refers to the paper by Sussmann et al. (2011) and it is written there: ‘MIR-GBM v1.0 was shown to eliminate H₂O/HDO-CH₄ interference errors down to the ≈0.1 % level at the wettest sites.’ I did not find the number 0.1% in the paper cited. As

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far as I see the precision is given to be 0.3% and the seasonal bias to be 0.14%.

2. In the introduction it is mentioned that another goal of this paper is to further validate the retrieval strategy presented in Sussmann et al. (2011). The authors repeatedly stress that their retrieval scheme MIR-GBM v1.0 is able to generate consistent trends for Garmisch and Zugspitze, whereas other recipes would fail. We miss any direct proof of this claim in the manuscript. In our feeling, the authors should present the time series derived with other recipes and should prove by direct intercomparison that the trends derived with MIR-GBM v1.0 are significantly different and more consistent between Zugspitze and Garmisch than results by other common retrieval setups. Since so far the paper gives only one Figure, there is enough space for such comparisons.

We do not understand why a trend of H₂O at Zugspitze is expected to induce different CH₄ trends between Garmisch and Zugspitze. Even if a retrieval suffers from H₂O interference, this part of the H₂O column change is nevertheless small and common to both sites. Again: please provide a direct intercomparison of the trends derived with different retrieval setups to prove the far-reaching claims concerning the MIR-GBM v1.0 setup ("0.1% H₂O/HDO interference error at the wettest sites").

3. In the chapter: 3.2 Validation and consistency with other results it is written: Development of MIR-GBM v1.0 (Sussmann et al., 2011) was motivated by the finding that the standard retrieval strategy used within the NDACC network until then was subject to H₂O-CH₄ interference errors ranging up to 5 % at high-humidity (low-altitude) sites like Garmisch. This statement gives the impression that results from all low altitude sites will be wrong by up to 5%. I think this statement cannot be concluded in such a general way.

4. The breakdown of the whole time series into three periods is bit artificial. Therefore it is not meaningful to give the trend numbers for the three periods with upper and lower limit and their confidence interval.

5. The discussion gives the statement: 'Having in mind that atmospheric chemistry

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models can hardly infer large year-to-year changes in OH concentrations (Dentener et al., 2002), OH loss may be assumed to play a minor role in the recent methane increase.' I do not agree, the fact that models can hardly infer large OH changes to not allow concluding that the OH loss may be assumed to play a minor role.

6. The whole chapter on the impact of tropical wetlands on the methane trend is in my mind not completed. The discussion based on ECMWF precipitation and temperature data is not sufficient. A discussion like this should be much more detailed and include model studies, in-situ data, and total column data from other sites. This chapter does not fit to the rest of the paper, and I suggest to remove it.

Reference: Sussmann, R., Forster, F., Rettinger, M, and Jones, N.: Strategy for high-accuracy-and-precision retrieval of atmospheric methane from the mid-infrared FTIR network, *Atmos. Meas. Tech.*, 4, 1943–1964, 2011, www.atmos-meas-tech.net/4/1943/2011/, doi:10.5194/amt-4-1943-2011.

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