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Atmospheric Chemistry and Physics Discussions

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

Anonymous Referee #2

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This study presents FTIR measurements of total column CH4 using absorption lines in the mid IR. The measurements are used to study recent trends in the CH4 growth rate. Ground-based measurements of total column CH4 provide highly valuable information for the validation of satellites and models, and with the growing size of the network also about variations in the atmospheric abundance of CH4. In my opinion, the most important contribution of this study is that it quantifies the accuracy that can be achieved using mid IR retrieval. The actual trend information that is obtained, however, is of limited interest in light of what is known already from the surface networks and SCIAMACHY. Although it is clear that the measurement can resolve the growth rate variations in the past decade, the uncertainty margins are still rather large, precluding a more detailed interpretation. With some modification, as detailed below, I think it is worth publication. In particular, some further effort will be needed to bring it into the

scope of ACP (rather than for example AMT).

GENERAL COMMENTS

To be able to judge the performance of the FTS measurements a more detailed validation is needed. For example, it is known that the observed trends vary regionally. For example, in the case of the NOAA surface network there is a clear difference between sites in the Southern and Northern Hemisphere. The presented comparison with the surface network is very indirect in the sense that global values are given for time periods that cannot directly be compared. In Table 2 zonal mean estimates are given for SCIAMACHY. It is possible that its data coverage does not allow, for example, a Europe-specific estimate. An attempt in that direction would nevertheless be useful. What is needed in my opinion is a way to compare uncertainties for the different measurement types. It is unclear why no number is given for SCIAMACHY. The numbers listed for NOAA (in the text) are difficult to compare since they represent the network average. An attempt in this direction would help to judge the performance of the FTS. It is unclear why the near IR measurements at Garmisch are not used for comparison, which seems a rather obvious candidate. It would be interesting to know how near IR and mid IR compare, regarding both the size and the uncertainty of the derived trend estimates. Besides a quantification of the relative performance of these techniques, this analysis may also further support the conclusion regarding the role of water vapor, which currently lacks sufficient quantification. It is mentioned that a water vapor trend has been observed. However, it is unclear what would be to size of the error in CH4 depending on the mid IR retrieval strategy. Without this information it is impossible to judge the value of comparing Garmisch and Zugspitze.

The discussion about what is known about the CH4 growth rate seems to be rather out of proportion, considering the new evidence that is brought in by this work. In my opinion it should be considerably shortened. In particular the meaning of the second paragraph of page 30765 is unclear. Usually precipitation anomalies, which are the dominant driver of methane emissions from tropical wetlands, show highly irregular

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patterns. It is not clear what kind of analysis is performed here, but to conclude something from precipitation maps is certainly a non-trivial task. Else, the part starting with "According to different possible interpretations" (page 30766) is really too vague and seems to simplify the methane cycle to fossil fuel use and droughts only. Unfortunately, reality is far more complex than that.

SPECIFIC COMMENTS

Page 30759, line 6: GWP is dependent on more factors such as lifetime of the molecule and, more importantly in this context, the position of absorption lines in the spectrum. Chemically, CH4 and CO2 differ by much more than only symmetry. CO2 has strongly saturated absorption lines, but outside the atmospheric window. This, in my opinion is as important as the symmetry argument raised here.

Page 30759, line 18: The papers by Rigby and Montzka actually do point to a possible role of OH, however, it is difficult to judge the value of MCF measurements in recent years because of its decreasing abundance in the atmosphere. This, however, does not exclude a possible role of OH.

Page 30760, line 7: The suggestion is made that a single FTS could replace several in situ measurement sites. The sensitivity of surface sites to fluxes and their representation of larger scales vary greatly from site to site. Therefore, I would have been surprised if Olsen and Randerson made such a claim, which indeed I was unable to find (Olsen is spelled without 'h').

Page 30760, line 16: A reference is needed for the 5% error.

Page 30764, line 26: The fact that OH doesn't show a high variability in CTMs doesn't necessarily mean that this possibility can be excluded in the real world.

Interactive comment on Atmos. Chem. Phys. Discuss., 11, 30757, 2011.

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