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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Technical Note: A trace gas climatology derived from the Atmospheric Chemistry Experiment Fourier Transform Spectrometer dataset" *by* A. Jones et al.

A. Jones et al.

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We thank reviewer #3 for his/her helpful comments. We have addressed the comments as listed below.

Jones et al., Technical Note: A trace gas climatology derived from the Atmospheric Chemistry Experiment Fourier Transform Spectrometer data set Jones et al. present climatologies on a monthly and 3-monthly basis for several species measured by ACE- FTS. The ACE-FTS data set and especially the provided climatologies are a valuable data set. However, I have some

constraints concerning the argumentation of the authors on the applicability of these climatologies for model evaluation.

I am afraid that modelers will use these climatologies as sole data set for model evaluation and then state that their models are in good agreement with measurements without discussing the limitations of using the ACE-FTS climatologies for a model evaluation. In such comparisons they only get the rough picture and thus such a comparison would rather serve as a quick check if the model results are on the right track than as a sophisticated model evaluation. Further, I do not really see the point why should one use the ACE climatologies while there are climatologies from other satellite instruments with a much better spatial and temporal resolution. What are the advantages of the ACE-FTS climatologies? Why should one use instead of the ones provided from other satellite groups?

The main advantage in using the ACE-FTS climatology is the number of species available compared to most other satellite instruments. The other published climatologies have a more limited set of species or were produced on a species-by-species basis. The ACE-FTS climatology includes results for fourteen trace gases that were produced with a consistent processing version and are based on measurements from the same time period. In addition, the solar occultation measurement technique makes the ACE-FTS results less susceptible to instrumental changes over the mission lifetime, providing better long-term stability in the measurements.

We have added the following to the introduction:
"This dataset is intended to complement the existing climatologies from HALOE and other instruments (as described above) by providing information for a larger number of species (fourteen in total) in a consistent data set. This will provide a source of data for model intercomparison studies and other atmospheric research projects. For example,

the range of chlorine- and nitrogen-containing trace gases measured by ACE-FTS can provide information about how these species are partitioned within families."

Specific Comments:
- I would suggest to change the title to "Trace gas climatologies....." (thus plural instead of singular) since the authors present climatologies for different species. Further, I would suggest to add "ACE-FTS" in brackets.

We have added ACE-FTS to the title. We have chosen to use the term climatology in the title to be consistent with the HALOE climatology produced by Grooß and Russell (Atmos. Chem. Phys., 5, 2797–2807, 2005).

- p29847,l9: "Quality-controlled climatology": The authors should clarify what they mean with quality controlled.

We have used this term in the abstract to indicate that we have examined the data quality and included this consideration in the preparation of the climatology. As this is described in detail in the text, we do not believe that this needs to be elaborated within the abstract.

- p29847, l9: A vertical resolution of 3-4 km is somewhat sparse, especially, since ACE-FTS is a solar occultation instrument and thus cannot compensate the somewhat sparse vertical resolution with a high spatial (horizontal) and temporal resolution. Therefore, there is the problem of limited sampling. This is quite obvious in the monthly climatologies. How does that affect a model evaluation? How suitable are these climatologies for a "real"model evaluation? In my opinion, only the 3 month climatologies are really valuable for model evaluation (however still with some restrictions).

The vertical resolution (and other characteristics) of the measurements must to be taken into account in any model evaluation. We believe that these climatological data sets are of value for model evaluation and a preliminary version was employed in the recent CCMVal2 project.

- p29848, l7: Unfortunately, all models have some deficiencies and thus comparisons of models with each other in the frame of a model evaluation should always be accompanied by measurements.

We have changed this sentence to:
"This may be done by comparing models to each other, but also needs to be accompanied by comparing model simulations to well-characterized trace gas observations, which are often provided in the form of a climatological average."

- p29848,l28: Why do the HALOE climatologies (e.g. Grooss et al.) look so much better though this instrument is also using the solar occultation technique? Where are the differences in the absolute values coming from?

The HALOE satellite mission was over a period of 14 years from 1991 to 2005, hence there are almost three times as many years of data available. The data coverage of ACE-FTS and HALOE also differs because of the differences in their satellite orbits. The UARS satellite was in a precessing orbit so that, during a given month or time of year, HALOE would measure at different latitudes in each year of the mission. The SCISAT orbit repeats annually so that, for a given month or time of year, ACE-FTS makes measurements at the same latitude each year. The differences between the HALOE and ACE-FTS measurements are discussed in the validation papers (as described in Sec. 2).

- p29849, l23: Why should one use the ACE climatologies though there are

climatologies available from other instruments with a much better spatial and temporal resolution? The authors definitely should motivate that better.

As noted above, we have added additional text to motivate how these climatologies complement those from other instruments.

- 29851 and following pages: How do the differences affect the climatologies? A comparison to climatologies from other satellite experiments would be nice to show how good the ACE-FTS climatologies are despite the limited sampling problem.

A detailed comparison of climatologies was omitted from this article because the ACE-FTS climatology is included within the SPARC Data Initiative assessment (as noted in the response to Reviewer 1) and the following text was added in the results section.

"In addition, the ACE-FTS climatology has been compared with other satellite climatologies as part of the SPARC Data Initiative. The user is directed to the report from this initiative for additional comparisons and assessments (SPARC Data Initiative, in preparation)."

- p29856, l11: Here, the authors themselves state "ACE obtains global latitude coverage over a period of approximately three months". Why then providing monthly climatologies? I do not see any advantage in using these especially since there are a lot of other instruments providing the same climatologies with a better spatial and temporal resolution. Does ACE has a better precision/accuracy or other advantages why one should use these monthly climatologies instead of the ones from other satellite instruments?

For the widest latitude coverage, we agree that the three-month climatologies are best to use. However, in discussions with our colleagues, there was strong interest in having the one-month averages available as well and thus we have done so. It is left to the user to decide which is best for their application and ensure that the measurement characteristics are accounted for in their analyses.

- p29863: I would appreciate that the authors would compare their climatologies to climatologies from other satellite instruments and then discuss the differences as well as the advantages and disadvantages of the different data sets. I know this goes beyond the frame of a technical study, but in my opinion it would be worth the effort to extend the paper into a more scientific paper to better motivate and discuss the appplicability of the ACE climatologies.

As described above, we have chosen to focus this manuscript as a Technical Note because the climatology comparisons and detailed evaluations were being undertaken as part of the SPARC Data Initiative. Within that work there is a focus on understanding the advantages and disadvantages of the different data sets and we choose not to duplicate this information. Within this paper, comparisons done between the HALOE and ACE-FTS climatologies are discussed (at the beginning of Sec. 4) and the differences were found to be consistent with the validation studies.

Figures:
Figure 1 could be improved with using somewhat larger font sizes. The y-axes text has a bad resolution and should be improved as well.

Thank you for this comment. We have revised this figure.

Figures 4-9: The figures are somewhat sad. The resolution is quite coarse and there is so much data missing for filling up a global plot. As stated above

the authors should really motivate why these climatologies could be still of value for scientific studies.

We have chosen to use blocks to emphasize the resolution of the data in the files. A contour plot, as is used in other papers describing climatologies, does not provide this same clarity in the visual representation. As noted above, we have enhanced the motivation for this data set.

Figure 11: I definitely like the three months climatologies most. As stated above I would appreciate a comparison to climatologies from other data sets and a discussion on which information gets lost due to the limited sampling of ACE-FTS.

We have addressed these comments above.

Interactive comment on Atmos. Chem. Phys. Discuss., 11, 29845, 2011.