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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Satellite observations of stratospheric hydrogen fluoride and comparisons with SLIMCAT calculations" *by* J. J. Harrison et al.

Anonymous Referee #1

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Review of paper "Satellite observations of stratospheric hydrogen fluoride and comparisons with SLIMCAT calculations" by J.J. Harrison et al.

This is a nice and generally well written paper adding more evidence to the role of dynamics for trends of trace gases in the stratosphere. The authors use here observations of the gas HF and its source gases to compare them with results of the SLIMCAT model. As shown in previous papers with a similar purpose, the sophisticated interplay of dynamics and chemistry does not allow to relate observed stratospheric trends directly with tropospheric emission scenarios. Instead, applying a full chemistry transport model as a first step allows to test if or not data are, in a statistical sense, in agreement with a model simulation. The gas HF allows to study this question for a rather long period, as global observations date back to the HALOE instrument.

On the other hand, I have some comments to the paper which the authors may consider for an improved version:

As a major comment, it is somewhat unclear for me what the original contribution of the authors to the content of the paper is. A rather long part of the paper deals with the description of the ACE-FTS HF observations and some discussion of the error budget. Tables 1-3 also add to the impression, that the authors here present for the first time the version 3.0/3.5 retrieval of the HF data. The inclusion of the HALOE dataset on the other hand directs to the presentation of a new combined dataset. Indeed, the authors present here for the first time (as I understand) the GOZCARDS data set of HF, but which is from version 2.2 of ACE-FTS. For the model simulation, there is a similar question if the data presented in the paper are from the same run as used in the paper Harrison et al., 2014, or if a diffferent setup has been used. So my strong suggestion would be to state clearly what original new contributions have been made for this paper and how this differs to previous work.

In this line, the paper is in my opinion undecided over its focus. In case the data are in the focus, I would expect to see more of validation work or the construction of a new combined data set. In case atmospheric processes is in the focus, I would expect to see a deeper discussion of the relation between HF and its direct precursos COF2 and COClF (eg. seasonal plots), as an extension of the correlation plots. In case the evaluation of atmospheric transport is in the focus, comparison with tracers of transport (at least for the model) and their discussion would be necessary.

Minor comments:

As solar occulation data are sparse, there may be selection effects when comparing zonal means from different data sets and model. This effect may be especially important in high latitude spring when strong azonal structures may develop. Does this explain the higher seasonal amplitude at high latitudes? In principle, one could, as a first step, use co-located data from model and observations. Have you checked if this

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would change the trend analysis?

The SLIMCAT model has an upper boundary of 60 km. The stratospheric maximum may not be well presented in the model and HF depleted mesospheric air in polar spring cannot be reproduced by the model. Do you see such effects and does it have any implication for your analysis?

p34380 l 17: In Fig. 6, at 44.5 km model and HALOE converge, esp. at high lat, meaning that they have a different trend. In Fig 7. they seem to agree perfectly. This looks like more than just a bias shift.

p34375 l11: compare lifetime of COClF with p34365 l13. Did you re-determine its value here?

p34371 l24: see Waymark etal., 2013, ANNALS OF GEOPHYSICS, 56, Fast Track-1, 2013; 10.4401/ag-6339

Typos or similar:

p34366 l17: Jungfraujoch observations are remote sensing, too. l23: the "however" sounds strange for me when it relates to the space shuttle.

Interactive comment on Atmos. Chem. Phys. Discuss., 15, 34361, 2015.