**Atmospheric
Measurement
Techniques
Discussions**

Interactive comment on "Microwave radiometer to retrieve temperature profiles from the surface to the stratopause" *by* O. Stähli et al.

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Answer to Phil Rosenkranz

Dear Phil Rosenkranz

Thanks a lot for the helpful and constructive comments.

In Sections 3.5 and 3.6, the a-priori temperature covariance matrix Sa is specified as exponentially decreasing off-diagonal. What are the advantages or disadvantages of this synthetic correlation in the retrieval compared with using a-priori statistics, e.g. from radiosondes, as done with ASMUWARA (Martin et al, 2006)?

===Answer: Martin et al. 2006 used an a-priori matrix with off-diagonal elements for

the tropospheric retrieval based on statistics from radiosondes. Applying the same approach to our tropospheric and stratospheric retrieval sometimes led to oscillations and choosing an exponentially decreasing covariance helped in this context. Furthermore the radiosonde reach only an altitude of about 30 km. It is not straightforward to merge the empirical Sa with a synthetic one for higher altitudes. To avoid this problem, and to have a coherent approach for Sa at all altitudes, we selected to apply a parametrized Sa. In addition some care is needed when using sonde data to derive Sa. One must make care that seasonal and annual changes do not influence Sa, as that generates correlations in Sa what is not favorable for retrievals. If taking sonde data over a season, or longer, without any "de-trending", it will seem that there are correlations throughout the troposphere and stratosphere, but that reflects seasonal changes, not correlations valid for a single measurement.

In Section 5, the authors mention that the tropospheric profile and stratospheric profile were retrieved independently and then merged to produce the data in this paper (presumably Fig. 6). How was the merging done?

===Answer: Yes, that is correct. At the moment we retrieve the tropospheric and stratospheric retrieval independently. The merging were done in a way that we use the tropospheric data from ground to about 14 km and the stratospheric data from 14 km to 50 km in Fig. 6. Because of the different time resolution we had to adapt the stratospheric data to the time axis of the tropospheric data. There was an interpolation in time necessary. Fig. 6 is used as an overview of the dataset and for a qualitative discussion. We will describe this in more detail in the final paper.

Minor comment: In the captions to Figs. 12, 17, and 19, it would be clearer to say that the dashed lines indicate plus and minus one standard deviation around the mean.

===Answer: We agree. We will change the captions in the final paper.