

Interactive comment on “Retrieval of three-dimensional small scale structures in upper tropospheric/lower stratospheric composition as measured by GLORIA” by M. Kaufmann et al.

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We thank the reviewer for carefully reading the manuscript, his/ her positive feedback, and his/ her constructive, and helpful comments and suggestions. We considered them point by point as illustrated below.

COMMENT: I also downloaded the Kleinert et al. (2014) paper and after browsing it I was still a little uncertain as to the discussion near the end of page 4239 and the beginning of page 4240. It seems like some averaging is done. Is this done before or after the Fourier Transform is taken? Is a final image a two dimensional data set

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with one dimension being the vertical spatial dimension and the other dimension the spectral dimension? This could be made a little more clear. Is a spectral window a single wavenumber or are the plots in Figure 6 the average radiance over a spectral range?

REPLY : We added some explanations in the text: "" Although the Fourier transformation is initially applied to all individual detector pixel, only the mean value for each detector row is used in the subsequent level-2 processing. No averaging in the vertical direction of the image is applied. That makes the detector look like a one-dimensional array, which registers a full spectrum in each pixel during an interferometer sweep. ""

COMMENT: Is the wind speed significant for the tomographic results in the second campaign? I would like to see a paragraph that tells me the measurements are made significantly close together in time such that the wind speeds of up to 45 m per second don't affect the requirement that each retrieved value remains constant over the entire duration that it is measured.

REPLY: This is a very good point. Indeed the horizontal wind speed is rather large during the tomographic measurement. The wind is nearly entirely in east-west direction. Assuming a wind speed of 40-50 m/s, an air parcel travels about 150~km during the course of the tomographic measurement, i.e. it crosses the entire area covered by the measurement. Fortunately, the filament observed by GLORIA is primarily aligned in north-south direction; accordingly the smearing in zonal direction over the measurement time is not critical here. We plan to consider advection in future data versions, as demonstrated in the retrieval study by Ungermann et al. [AMT, 2011]. We added some explanation regarding this point in the paper.

COMMENT: Why isn't temperature plotted in Figure 16?

REPLY: The temperature distribution is rather smooth in the vicinity of the filament. Temperature differs by about 1K inside and outside of the filament, only. This is generally in line with the assumption, that the filament is a consequence of chaotic advection

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and not of adiabatic movements. We address this point in the corresponding chapter.

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