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Interactive comment on "Validation of IASI FORLI carbon monoxide retrievals using FTIR data from NDACC" *by* T. Kerzenmacher et al.

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We would like to thank the reviewer for the time and effort spent on reviewing and for the suggestions and comments given. We considered carefully the points presented and give a point-by-point response below. The Reviewer's comments are repeated followed by our responses. The page and line numbers quoted refer to line numbers given by the reviewer.

3975 – Line 25 There are a fair number of references for MOPITT dated after 1995, (see http://www.acd.ucar.edu/mopitt/mopitt_ref.shtml) This reviewer would recommend that the authors familiarize themselves with some of the more recent ones for a better appreciation of the present state of the MOPITT instrument.

A more recent reference (Fortems-Cheiney et al., 2011) has been added.

3976 – Line 15-20. It would perhaps be worth noting what George et al found for the SH. The lack of comment on the SH is noticeable (see section 4 of the George paper cited)

We added the SH results from George et al. The text now reads: "Comparisons between the CO columns of the different instruments show av erage discrepancies of about 7% in the Northern Hemisphere and the equatorial region and of about 11% south of 15 S. In case of strong CO concentrations (e.g. forest fires), the discrepancies can be as high as 17 % with IASI being larger."

3978 – Line 1 FORLI-CO uses look-up tables for what? There are various ways in which look-up tables might be used to accelerate a retrieval – needs to be specific as to the methodology.

The following sentence has been added to make this clearer: "The FORLI LUTS are absorption cross sections at various pressures (on a logarithmic grid), temperatures (on a linear grid) and humidity. For CO, these cross-sections are calculated on the spectral range 2128-2206 cm^{-1}, larger that the one used in the retrieval, and with an oversampling 10. More details are given in Hurtmans et al.,. "FORLI radiative transfer and retrieval code for IASI, Journal of Quantitative Spectroscopy and Radiative Transfer, Volume 113, Issue 11, July 2012, Pages 1391-1408" "

3981 – This reviewer had difficulty following the methodology for correcting for altitude. There is mention of partial columns, but these are not defined. An equation or a figure or an example could be introduced to help elucidate the argument more clearly. This was the point that this reviewer found most difficult in the paper.

A new figure (consisting of Fig. 1 and Fig. 2) has been added to explain the altitude correction. The text has been changed: “To do this the IASI a priori profiles in partial column units were used to calculate two partial columns (Fig. 2(a) indicated in red and in yellow). One partial column, the adjusting partial column, in the altitude range between the FTIR and the IASI ground level altitudes (Fig. 2(a) red) and another one in the altitude range of the lowest FTIR partial column (Fig. 2(a) yellow). The latter was used to calculate the ratio between the a priori partial columns and the FTIR partial column to scale the adjusting partial column. The scaled adjusting partial column was then added to the FTIR partial column profile when the IASI altitude range is larger than the FTIR altitude range. Because the IASI and FTIR data are on different grids, a combined grid has been used to do these calculations.

On the contrary, if the FTIR profile covers a larger altitude range than the IASI measurement the FTIR profile is cut to fit the altitude range of IASI (Fig. 2(b)).”

3984 Line 21 – what is an “ideal” averaging kernel for the ground-based measurements?

This has been clarified, the sentence now reads: “Assuming that the ground-based averaging kernels are almost ideal (i.e. they are about one at all altitudes), Eq. (27) from Rodgers (2003) can be reduced to: (...)”

Figure 6 is intriguing, but difficult to interpret reliably. This reviewer is not an expert in statistics but it would appear that if this is a normal distribution (no guarantees of that) for every value of the random error (horizontal cut in figure 6) about 2/3 of the comparisons should be blue and 1/3 red. According to the text, approximately the reverse is true. (the paper states that 69% of differences are “significant” - presumably outside a 1-sigma criterion) This would imply that the total error is about double that calculated from the random error. Further from Figure 6 it appears that this error is not a function of the known random error as the red "blob" where most of the measurements occur is not highly structured in the vertical.

We agree with the reviewer, that if the random error estimation is correct then the total errors must be about double of the one calculated by the random error. It is true that the this error is not highly structured in the vertical.

One possible error source is alluded to - viewing the same air mass. (page 3986 line 23). It should be remembered that IASI has a range of viewing geometries from its large swath, including some fairly long slant paths, and the FTIR instruments are constrained to follow the sun vector for their air mass, so the combination of the viewing directions might make some difference in the air mass sampled even if the IASI pixel is nominally centred on the FTIR and the timing is perfect.

The text on page 3986 line 23 has been ammended: "For the individual comparisons one should not forget, that we are looking at two different sounding geometries (IASI has a large range of viewing geometries; FTIR instruments follow the sun vector for their air mass) and besides co-location, that IASI has large pixel sizes and that the two instruments are thus unlikely to probe exactly the same air mass (within a given pixel IASI even sees an average of concentrations), therefore the differences of individual comparisons may still be partly attributed to real CO variability."

Interactive comment on Atmos. Meas. Tech. Discuss., 5, 3973, 2012.

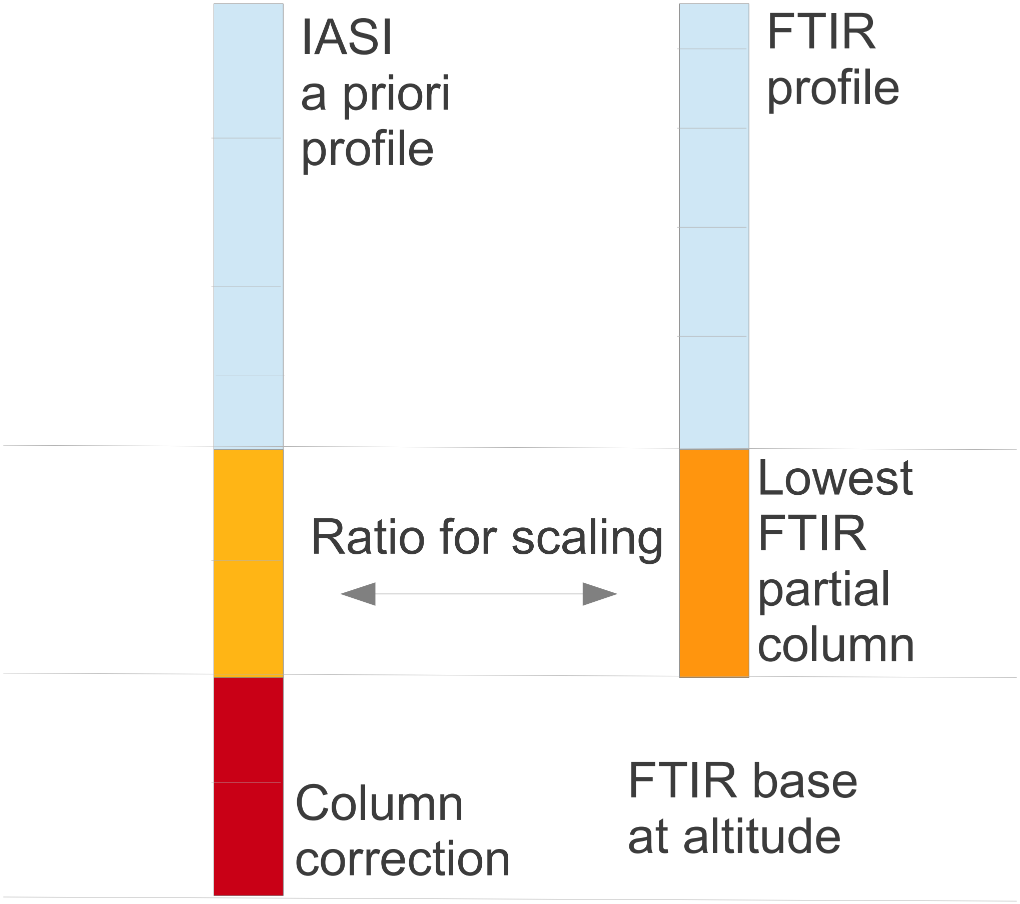

Fig. 1.

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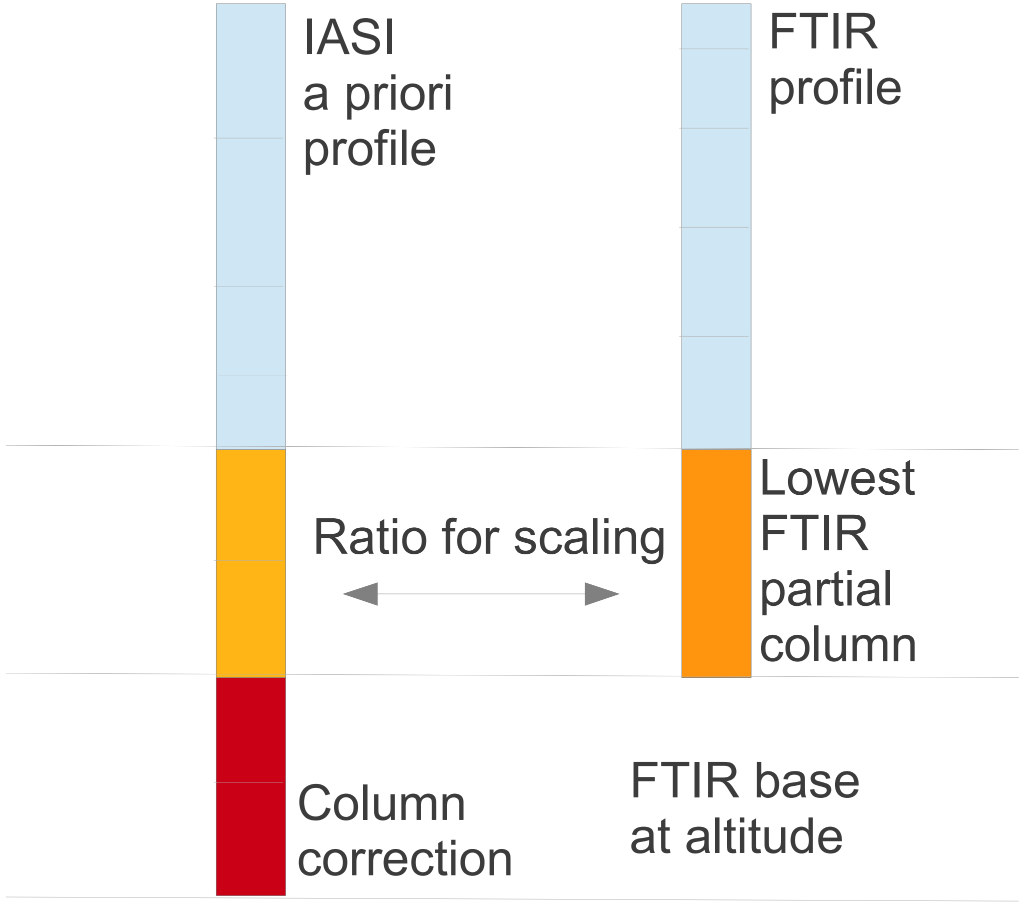

Fig. 2.

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