Comments

P8 line 16: The averaging kernel plot is not very helpful. You should distinguish the kernels for each level somehow.

P11 line 9: Clarify what you mean by DOFS here. For a column retrieval, the DOFS cannot be greater than unity, because there is only one variable. I presume you are plotting the monthly average of the DOFS for the profile retrieval at each location.

P11 line 12: I notice that the reduced CO in North and South America corresponds to the location of mountains. Also the Himalayas. Is the surface height likely to be the main reason for the reduction?

P11: What differences would you expect between MOPITT and IASI on the basis of their respective averaging kernels for total column?

P12 line 13: "except over Antarctica" where MOPITT DOFS are close to zero, indicating that it is returning just a priori.

P13 lines 14-17: Please explain in more detail how the grid conversion is carried out. E.g:
-MOPITT uses pressure levels. I presume you interpolate log(VMR) linearly in log pressure. You should say so.
-IASI uses 1 km layers. Is the mixing ratio assumed constant within each layer?
-I see that the temperature profiles come from different sources. Does this matter?
Do you take the IASI prior ensemble of profiles, convert them to the MOPITT 10 level grid using an intermediate 35-level grid, and then compute their mean and covariance matrix? I don't understand the point of division by (ln(10))^2 at all.

P14 para ending line 4: Is this behaviour as expected on the basis of the a priori and averaging kernels?

P16 line 12: A similar question applies here - what is expected on the basis of the averaging kernels?

P17 line 14, re fig 9: As a general indication it would be helpful to have the error variance plotted on thse figures, for comparison with the profile scatter. Maybe plot noise and smoothing error separately.

P18 lines 1-4: Examining the averaging kernels would help.

P18 lines 13-14: It would be helpful to see the profile smoothed by the averaging kernel *as well*, to see if the behaviour of the retrievals is as expected.

Figs 10-13: It would be helpful to have the total column operator plotted to compare with the column averaging kernel.

P21 line 12: It leads to clear improvements in the *comparison* of MOPITT with IASI. This is not necessarily the same as an improvement in the *quality* of the retrieval. It conceivably could be

better to carry out IASI retrievals with the variable MOPITT a priori.

P21 line 18: how about: “but *as expected* the shape of the profile differs”?

Section 4: On the basis of this study have you got any conclusions/suggestions about how to proceed to establish a long term data set?

Trivia

P2 line 11: “Invariant” is a technical term with a standard mathematical meaning, which is not the meaning intended here. “Fixed” or “constant” would be preferable.

P2 line 20: remove one of “and” or “also”

P4 line 17: x_a is and “expected” profile rather than a “mean” profile.

P9 line 2: The tense of “accumulate” is wrong, and “respectively” is in the wrong place:
“The MOPITT and IASI missions have now accumulated 15 and 7 years respectively of…”

P9 line 10: “amount of information” is the wrong quantity — it implies “information content”. It should be “degrees of freedom”, or “number of independent pieces of information”.

P18 line 13: “where” should be “were”.