

The authors have made a number of significant changes to the paper. There are some minor changes that can still be made. The authors should describe the I_d index more fully in this manuscript, in order to make the paper more self contained.

More importantly, since the CO₂ line mixing fixes are important both from the point of view of temperature sounding, and global retrievals of CO₂, it is imperative to validate the spectroscopy used in the forward modeling. In view of the authors interactive comment published May 22, 2009, I recommend rewriting the manuscript to include this new and relevant information before accepting for publication.

pg 9649, line 3 : need to fix the sentence “in-situ (truth) data have been derived” as you seem to be implying that your retrievals are “truth.” Would be more appropriate to say eg “we have retried atmospheric sounding based on ECMWF as a first guess.”

pg 9653, line 15 : “high resolution infrared radiances”. Also, most of the sentence following this one has already been stated previously.

pg 9654 lines 14-18 : may want to state what those spectral bands can be used for eg 1010-1080 cm⁻¹ for ozone, 1450-1600 cm⁻¹ for water vapor etc

pg 9655, Eqn 5 : the defn of $F = f^2 O$ is an interesting way of parameterizing forward model error. It seems you vary “f” in space or time (also depending on your first guess)... could you extend this to wavenumber region, by always starting outwith eg ECMWF as a first guess? This may be another way to show where eg spectroscopy needs to be improved. However, you would also need to somehow separate the spectroscopy errors from the modeling errors.

pg 9657, line 3 : presumably you also have the scan angle correction

pg 9657, line17-22 : may want to reorder the figures so reader does not need to jump from Fig 2 to Fig 5.

pg 9658, line 1 : mention units for standard deviation

pg 9658, line 3 : please explain the constraint (Chevalier database) and how this constraint is implemented

pg 9658, line 28 : should go into a little more detail about what you mean by methodology of averaging kernels and its relevance here. Especially since you straightaway mention the I_d index. Reading pg 9659, this seems similar (or gives similar results to) the degrees of freedom of signal, from 1D variational retrievals.

If you have done similar simulations for AIRS, may want to mention how the values in lines 15-17 compare.

pg 9662, line 15-18 : if $f^2 \simeq 0.96$ how does this mean the forward model noise is about half the radiometric noise?

pg 9664, line 5 : Could remove the sentence “An analysis that is not ...”

pg 9664, line 12 : rewrite “whereas heavily insists” with eg “but depends strongly on”

pg 9664, line 17 : “much little role” replace with eg “smaller” pg 9664, line 23 : remove “altitude” as this is implicitly included with pressure

pg 9666, line 1 : replaces “deserves as” with eg “is” Overall, J.-M. Hartmann also has a set of line mixing coefficients that one could try for your forward model, and L. Strow/DeSouza-Machado have a compressed CO₂ database which includes line mixing which could be used for comparison. I see that the authors have published an interactive comment about including σ -IASI v11.3 including Hartmann’s line mixing? If so, please include a reference and rewrite the paper as necessary, as mentioned at the beginning?