

The amended version of the paper has done a lot to address my major concerns. The new version has greater clarity regarding the authors aim and has improved the description of the method and its performance. I think for the most part it does now serve as a proof of concept of this technique. I feel there are some minor issues that the paper would benefit from addressing before publication that I detail below.

Minor points:

In response to comments made about the original paper the authors have expanded the introduction. The additions are welcome and go some way to improving the clarity of the paper. However the introduction now runs to over 170 lines of text, is somewhat rambling and contains a significant amount of material not relevant to the studies presented here. I suggest it would be improved and made more relevant to the work at hand by omitting the 32 lines from line 13 on page 3 to line 15 on page 4 which relate entirely to the value that only direct measurements of the FIR provide and are not relevant to the simulations provided here. At least this section could be shorted to a line or two along the line of "FIR observations have the potential to provide unique information about the effect and distribution of atmospheric water vapour and the radiative influence of cirrus cloud as well as providing unique information for model validation refs"

Page 9 lines 22-13 suggest changing:

"The IASI Flight Model 2 (FM2) instrument is onboard the MetOp-A satellite launched by EUMETSAT in October 2006 which operates in a sun-synchronous orbit." to "The IASI Flight Model 2 (FM2) instrument on the sun-synchronous MetOp-A satellite was launched by EUMETSAT in October 2006"

I suggest changing Page 12 line 4 'modelling uncertainties' to 'reconstruction uncertainties' to make clear it is not the LBLRTM model errors you are discussing but the correlation method errors.

Whilst figure 4 would suggest the picture to be more favourable in the shorter wavelength range I suggest for completeness that figures 5 and 6 should include additional panels for the corresponding plots for the 2760 to 3000 cm^{-1} spectral region.

Page 12 lines 5 to 9. Figures 5 and 6 are welcome additions elucidating the fidelity of the reconstruction to the simulations. Although good to see the RMS is a property of the distribution of scenes within your sample which is not required to represent the relative frequency of scenes in the real world and also essentially something that is minimised by the regression to determine the reconstruction coefficients. It doesn't greatly inform on how errors present in an individual spectra, or classes of spectra, which is really the quantity of interest for how these reconstructions will be used. Can I suggest the addition of example reconstruction differences for a few selected instantaneous cases e.g. thick high cloud, thin high cloud, tropical clear-sky, mid-lat clear sky, low cloud, or rms for classes of scenes 'high cloud', 'low cloud', clear sky. To put the reconstruction fit error in context it would also be useful to show or discuss the comparative contribution of the IASI noise error on the reconstruction both on each spectral point and integrated over the reconstructed region bearing in mind that a single IASI wavelength may be used to infer several reconstructed point leading to spectrally correlated errors in the reconstruction.

Page 18 lines 19 to 28. It is stated that "in the subtropical subsidence regions there are some negative values of CINLR in the FIR, meaning the average all-sky radiation is more than the average

clear-sky at these wavenumbers". A possible explanation given is ".. the FIR is more sensitive to a false diagnosis of a cloudy sky pixel as clear than the whole spectrum overall.". I think it would be helpful to explain the imagined phenomenon further, what sort of undetected cloud is likely to have this larger effect in the FIR? Is it at all conceivable that differences between the model and IASI could cause this effect in the reconstructed spectra?

The alternative explanation that it could be that the cloudy cases are in fact associated with drier air is interesting. Given these are reconstructed spectra from information in IASI, presumably a retrieval from the IASI data could verify this fact. I'm not suggesting this is done here, but a discussion of this fact here would I think highlight the usefulness of the reconstruction tool for highlighting possibly significant phenomena that can then be investigated in more detail by a more rigorous retrieval on the IASI data.