

Interactive comment on “Towards IASI-New Generation (IASI-NG): impact of improved spectral resolution and radiometric noise on the retrieval of thermodynamic, chemistry and climate variables” by C. Crevoisier et al.

Anonymous Referee #1

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Overall comments

IASI-NG is an important new instrument and therefore detailed evaluation of its potential and limitations is much needed and of high scientific significance. This paper addresses its potential very well, but does not discuss limitations. Its natural to focus on the potential gains of IASI-NG but some discussion of the limiting factors, mostly arising from the very large field of view, needs to be added. It is for this reason I have marked scientific significance as good, but scientific quality only fair, because as

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it stands someone unfamiliar with infrared remote sensing could misinterpret the wider significance of the results. I do not believe it was the intention of the authors to mislead anyone, but because these issues are not even mentioned I think there is a high risk of this outcome. There were some errors in presentation but overall it was well written and clear, so I have marked the presentation as good.

I am recommending for acceptance with minor revision because the paper does make a significant contribution and will be of wide interest. This is because I do not think my concern, although major, requires anything more than a short addition to the paper to acknowledge the field of view size issue, and its implications for scene heterogeneity, and the relevance of this to cloud screening / analysis and near-surface sounding. The paper lacks a discussion whether IASI-NG's spectral resolution and lower noise will improve these aspects. Almost certainly it will not, or only marginally compared to smaller fields of view. Many people think this was a missed opportunity going from IASI to IASI-NG so it does need to be openly discussed. The leading scientific Working Group on infrared sounding, the ITWG, has been calling for years for smaller field of view sizes for infrared sounders. Clouds are the biggest issue to solve with any analysis of IASI-type data, so this must be discussed, even if other field of view size aspects (e.g. for the land) are not. I am calling this minor revision, but I do not think the paper should be accepted unless it is added, because it is very important.

Why is this study limited to the tropics? IASI-NG will go into a polar orbit, not a low inclination orbit, so will provide data at all latitudes. Why do you choose only to study the potential in the tropics? Are your conclusions applicable in other areas and if you say "yes" how do you know this?

The guidance asks me to consider some specific questions (starting with "Does the paper address relevant scientific questions within the scope of AMT?"). The answer to all these questions is yes.

Now some specific points

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p11222 paragraph 1: "A negative sensitivity for a gas" Where an increase in gas increases the BT then this is a positive sensitivity (as tends to be the case in the stratosphere). The text needs correcting.

p11222 reference to Figure 2: Figure 2 seems to have a misplaced additional curve, in pink, which could well be aerosol, mostly evident in the LW between 800 and 1200 μm . This just looks like a mistake, its not referred to in the legend or text. Either remove it or say why its there and correct legend.

p11224 equation 4: You do not say what you assumed about Smodel. Is it important, what did you do?

p11225 paragraph 2: You confirm near surface retrievals is a priority for IASI-NG. This makes the comment above about field of view size even more important.

p11226 reference to Figure 3 for noise. Figure 1 shows the noise much more clearly, its hard to see in Figs 1-2 which are very busy.

p11227 reference to Figure 4. Why not show averaging kernels here as this would show if the spectral resolution gain actually improves analysis potential? You already explained why AKs are better to look at, then don't!

p11228 Given this is averaged over a large database of tropical profiles I can not understand the discontinuity in information at 900hPa. Is this because the background error variances changed abruptly at this height? Was your B appropriate to the region you are studying?

p11229 I am not clear whether the near surface benefits here arise from the better characterisation of the surface described later (Figure 10) or whether this aspect and the direct line resolving capability are being considered in isolation. But I am assuming the latter. I think if the surface can be characterised better this is very important for near surface sounding as surface characterisation, at least over land, is a limiting factor. Its why so little IASI is used operationally over land at the present time. It does not

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matter what your line resolving capability is if you can't use the data at all! But if this helps you characterise the surface, and use more data, its potentially becomes very important. These aspects are not particularly well discussed here or later when Figure 10 is presented. It should also be noted that another major reason why so little data is used over land is the impact of surface uncertainty on cloud screening / analysis. As ever with IR sounders clouds is the big issue! The big issue that this paper ignores!

p11230 onwards. Lots of detail here which is fair enough, as its covering many species and examining each in detail. No specific comments, but although its a tiring read to take it in one go, I think its a useful reference work and the length is justified.

Interactive comment on Atmos. Meas. Tech. Discuss., 6, 11215, 2013.

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