

Reply to Anonymous Referee #2

We would like to thank the anonymous referee for his/her positive comments and the useful remarks, which helped to improve the manuscript. Our point-by-point responses to the comments are given below in blue.

General Comments

In this new study Doniki et al. discuss the calculation of instantaneous radiative kernels (IRKs) for hyperspectral infrared nadir sounders. In particular, IRKs for tropospheric and total column ozone measurements by IASI/MetOp-A are discussed. The paper presents a new method for calculation the IRKs, which is shown to be more accurate (removing biases up to +/-25%), but also more computationally expensive than the anisotropy approximation. First results with the new method for 12 days in the year 2011 are presented.

I found that the scientific analysis of this study is sound and that the presentation of the paper is clear. Minor comments and suggested technical corrections are listed below. The paper fits in the scope of ACP. The results are likely of interest for a broad community, including radiative transfer and retrieval experts, but also climate modellers seeking to validate radiative forcing calculations with their models. Therefore I would recommend the paper to be published.

Specific Comments

p21183, 112-113: How many profiles are remaining after cloud filtering and a posteriori quality checks? Is the remaining part still globally representative?

As it can be seen in Fig. 4 and 5, where we present the clear-sky tropospheric and total LWRE respectively (raw data, i.e. no gridding applied, each dot corresponds to an observation), we have different views for morning and evening overpasses, and the globe is covered sufficiently in both views. The white spaces represent either not covered areas or areas over which the observations were removed by one of the quality flags. A typical day contains around 500,000 clear-sky observations, which we believe are representative for the global clear-sky LWRE. In case a day has notably few observations, we avoid using it. For example, in Sect. 5.2 and in Fig. 6, 7 and 8, where we present the annual variation based on a single-day per month data, for the months of

November and December we have switched to the 16th of the month, as for the 15th no global coverage was achieved due to IASI technical incidents and after flag application (see subsection 5.2, page 21195, line 1-2).

p21185, l9: it might be good to properly define the range of spectral integration here and in other places/equations to avoid confusion between integration over the 9.6 micron ozone band and the full spectral range?

We thank the referee for pointing this. According to this remark, we have changed the following equations:

- Eq. (2)
- Eq. (5)
- Eq. (6), where again $\nu_1=985 \text{ cm}^{-1}$ and $\nu_2=1080 \text{ cm}^{-1}$
- Eq.(7)

Technical Corrections

p21181, l23: onboard _the_MetOp-A

The referee is correct and the issue is fixed. The manuscript now reads "... onboard the MetOp-A and B satellites, ...".

p21188, l11: nadir -> with respect to nadir / the nadir direction (?)

The manuscript has been changed to "... averaged per 10° viewing angle bins with respect to nadir for one day, ...".