

## ***Interactive comment on “Linearization of the effect of slit function changes for improving OMI ozone profile retrievals” by Juseon Bak et al.***

### **Anonymous Referee #1**

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The paper applies a linearisation of the ISRF for the retrieval of ozone profiles from OMI measurements. The linearisation approach was introduced by Beirle et al., 2017 (BE17 hereafter), which is referenced appropriately. However, the authors should generally specify more clearly which steps are adopted from BE17, and what are original/new ideas/methods/results of their study.

The adaptation of the ISRF parameterization for radiances seems to be new and interesting. However, there are some complications which have to be investigated in detail and discussed thoroughly. I recommend publication in AMT after these major revisions have been made.

1. Irradiance vs. radiance

BE17 presented the ISRF parameterization for a fit of a measured irradiance to a high-resolution solar atlas. In the current study, the authors apply the parameterization to radiances. This implies that the PAs depend on the Ozone column, and the spectral structures are different for each satellite pixel! This is not clearly stated in the manuscript and should be quantified (i.e. compare the PAs for high/medium/low ozone). Other absorbers have the same effect, i.e. the spectral patterns of the PAs depend e.g. on the strength of the Ring effect (thus on clouds!). This has to be discussed.

2. The abstract is contains some statements which are not supported by the presented data:

a) Abstract, first sentence: "reduces the spectral fit residuals caused by the slit function errors". Please add a figure of the spectral analysis with and without PAs in order to substantiate this statement.

b) End of abstract: "Comparisons with ozonesondes demonstrate substantial improvements with the use of PAs". In fig. 10, I see almost no difference, and particularly no "substantial improvements", no matter which function is used nor whether PAs are included or not. Obviously, there are systematic differences remaining compared to Ozone sondes which are not related to the ISRF parameterization.

3. How do the derived ISRFs look like, and how do they compare to the prelaunch measurements performed for OMI?

Fig. 5: What is the meaning of the sum of PAs? Each PA has to be scaled by the respective  $\Delta p$ . Thus the spectral patterns must not just be added!?

Fig. 5: The 1st order spectra look wrong. According to Eq. 9, they are 0 in the center of the wavelength window and increase towards the edges (compare Fig. 10 in BE17). The presented spectra look the other way round.

Fig. 9: Specify the time range of the presented data.

Fig. 10: The unit on the x axis must be DU per km or per vertical layer. Please specify.

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Fig. 10: Abbreviation "MB" is not defined.

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