



## Comment on **essd-2020-377**

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Referee comment on "Observations of the downwelling far-infrared atmospheric emission at the Zugspitze observatory" by Luca Palchetti et al., Earth Syst. Sci. Data Discuss., <https://doi.org/10.5194/essd-2020-377-RC1>, 2021

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Review of "Observations of the downwelling far-infrared atmospheric emission at the Zugspitze observatory" by Palchetti et al.

A field campaign to measure the downwelling far-IR spectrum at the Zugspitze observations and ancillary information is presented in the manuscript. It is a timely campaign for the community given the ongoing far-IR mission implementations in both U.S. and Europe. High-quality far-IR ground measurements with sufficient ancillary information are extremely scarce, which hinders various efforts related to the satellite mission implementation. Because of this, the data described here will be precious to the community.

The manuscript is well organized and well written. I only have a few minor comments.

1. In Table 1 or the text, it would be useful to provide more instrument specification information—for example, the size of the field of view (FOV) for the FIRMOS and E-AERI. The NeSR for FIRMOS is presented in Figure 6, but no info about NeSR of E-AERI. Knowing the NeSR for both instruments will be of help to interpret Figure 7. Also, if the NeDT (Noise equivalent brightness temperature) can be given for the convenience of readers, it will be useful too for cross-literature comparisons.

2. The difference presented in Figure 7 is interesting. There are definitely some spectral features in the difference, which might suggest the frequencies of the two spectra are not perfectly aligned. FIRMOS and E-AERI are two FTS but with different spectral resolutions. It is well known that the instrument FOV can affect the spectral radiance measured by FTS (the off-axis contributions), which makes the comparison of spectra from different instruments challenging. A non-symmetric varying rectangular window can model this FOV

effect on the frequency scale (see Bell 1972, Iacono & Clough et al., 1996). For FIRMOS and E-AERI, depending on their FOV size, the frequency scale shift is likely slightly different. But such a small shift in frequency can contribute to the not-small difference in spectral radiances shown in Figure 7. I am wondering whether this has been taken into account in the comparison.

#### References:

Bell, R.J., *Introductory Fourier Transform Spectroscopy*, 329 pp., Academic, San Diego, California, 1972.

Iacono, M. J., and S. A. Clough (1996), Application of infrared interferometer spectrometer clear sky spectral radiance to investigations of climate variability, *J. Geophys. Res.*, **101**(D23), 29,439– 29,460.

3. Some acronyms in Table 1, such as PTH, PTHW, and SSA, can be written in full names instead of abbreviations. Though they are all defined in the text, it will save readers' time if full names are given in the table.