Dear Dr. Ehrlich,

thank you for the explanation concerning the inclusion of corrections in the text, that we have carried out trying not to further burden the manuscript.

- Reviewer 1: Could you explain in more detail (more quantitatively) the accuracy of your clear-sky detection method?....
Please provide at least the conclusions and major results of your additional study and discussion in the manuscript (would fit into section 3).

The answer was summarized in the manuscript as in the following (line 181-200 of the manuscript):

The choice to use the one-hour interval for the definition of clear sky is based on a preliminary analysis of the database, and it is in line with the approach followed by Dupont et al. (2008) who used hourly lidar averages, for comparing clear sky values derived from shortwave and longwave measurements with those derived from lidar measurements.
To evaluate the sensitivity of the implemented methodology to identify clear sky cases in the presence of thin cirrus clouds, both the IBT and the DLI were simulated for cloud-free conditions and with an homogeneous cirrus cloud, by means of the MODTRAN5.3 radiative transfer model (Berk et al., 2006). Different cloud optical thickness values were assumed, from 0.03 to 5, both in winter and summer conditions. The results of simulations are presented and discussed in the supplementary material. In general, the simulations highlighted the greater sensitivity of the pyrometer measurements compared to those of the pyrgeometer, particularly for low values of IWV. Based on our simulations a cirrus cloud with optical thickness of 0.1 covering homogeneously the sky in winter, induces an increase in the IBT e DLI signals compared to those for clear sky condition of 11.3 K and 2.7 W/m^2 respectively, corresponding to a percentage increase of 7.1% for the IBT and 1.6% for the DLI. For a similar summer case there would be an increase of 5 K and 2.7 W/m^2, respectively, corresponding to a percentage increase of 2.6% for the IBT and 0.97% for the DLI. These results confirm that the applied methodology is accurate enough to evaluate cases of ZCSC, even for cirrus clouds with optical thickness lower than 0.08-0.1. It should be noted that cirrus clouds of this optical thickness covering uniformly the sky induce variations in the DLI that are lower than the uncertainty of the DLI measurements, i.e. ±5 W/m^2, confirming that our clear sky methodology is sufficiently accurate to identify the DLI variation induced by clouds. The results of our simulations agree with those presented by Dupont et al. (2008), who highlighted that the DLI clear sky detection algorithm derived from DLI measurements perform correctly for cloud optical thickness of 0.3 or less, also evidencing that tall, thin clouds may not be detected by pyrgeometer measurements.

Furthermore, part of the answer to reviewer 1 was also added to the other supplementary material under the title "On the sensitivity of the implemented clear sky retrieval on the presence of the thin cirrus and the relations between zenith clear sky and clear sky".

- Reviewer 2: Section 6.2: can more details be provided on the procedure to estimate the optimized coefficients? Please do so in the manuscript and not only in the replies.

The reply was summarized and insert in the paper as follow (lines 348-356 of the manuscript):

To estimate the coefficients of the formulas using data measured at THAAO, the functions of the IDL® Software version 7.1.2 were used. Table 2 lists the functions used for each formula; details of the functions used can be found on the web page https://www.nv5geospatialsoftware.com/docs/routines-1.html. All DLI formulas are derived by emissivity parameterizations except for ID#13, ID#16, and ID#17; with the exception of these cases, the emissivity was first calculated, and the performances were then obtained by comparing the measured and parameterized values of the DLI. Taking into account the size of the database, the functions were applied without considering any uncertainty in the measurements.

Table 2. List of the function of IDL® Software used to derive the THAAO optimized coefficients.

ID# formula	*IDL function*
All ID# except those listed below	*LADFIT*
ID#11	*POLY_FIT*
ID#16 and ID#17	*REGRESS*
ID#7 and ID#12	*CURVEFIT*

- Reviewer 2: Section 7, general comments: based on the analysis and conclusions of the paper, two points can be raised and maybe deserve a word of conclusion from the authors...
Again, include your discussion of the replies in the revised manuscript.

We have discussed the points highlighted by the reviewer 2 introducing at the beginning of the conclusion the following short discussion concerning the estimation of DLI and its dependence from the measured parameters (lines 437-448 of the manuscript):

In clear sky conditions the DLI is determined by the atmospheric concentration of greenhouse gases (mainly water vapor) in the lowest atmospheric layers and by their radiant temperature. The most reliable estimate of DLI is obtained by accurate measurements of the water vapor and temperature profiles, e.g. from radiosounding, used as input for radiative transfer models: however, this methodology is unpractical for large datasets, thus the need for DLI parameterizations.

The existing formulas need to be tuned to the environmental conditions of the application region because DLI estimate not from atmospheric profiles, but from proxies, such as screen-level measurements (e.g. air temperature or/and water vapour partial pressure) and/or integrated water vapor, were derived for a range of site-specific meteorological conditions. The effectiveness of each formula therefore depends on the representativeness of the parameters it uses to represent the atmospheric vertical profile and on its ability to simulate the emission processes in the lower layers of the atmosphere, which determine the DLI value. From this perspective formulas derived from the use of radiative transfer models are therefore expected to have more general validity than purely empirical ones.

In the conclusion we have also pointed out the role of the parameters used in the formulas and the applicability of the obtained results in other sites/conditions, see author's track-changes file (in particular see lines 492-496 of the manuscript)

The analyses carried out on two different meteorological years indicate that the optimization of a formula carried out on one year is applicable to different years producing an increase in RMSE of ~1-2 W/m^2 depending on the selected formula; these results are strictly valid for the database used. This analysis suggests that for other sites the formula optimised on a reference year can be applied to other years with similar variability of atmospheric conditions, with an expected small increase in RMSE.