In the following, the *reviewer's original comments are presented in italics*, the authors' responses as well as references to the new manuscript version are in standard font, and the **reviewer's new remarks are displayed in bold**.

Major issues:

1. *Please provide a sample input file for the thermal spectrum and cloud file as well. From the information provided in the manuscript it is not possible to reproduce the results.*
We followed this remark and now provide an additional example input file for the thermal-infrared wavelength range. Input files for clouds can easily be created using the libRadtran manual and do not require an example. The idea of providing an example input script is to be transparent and to provide a guideline that might be used as a template by a reader, and not to provide a copy and paste ready model configuration.
The results provided in the look-up table, which is intended for public use, contain incorrect results for more than 50% of the cases: Varying surface albedo has been neglected for the clear-sky thermal irradiance simulations, affecting the upward, downward flux (Fup_tir, Fdn_tir) as well as the net radiative effect (RE_net) for all cases with surface albedo > 0. For a given surface temperature, the results have constant values for all albedo values in [0.15, 0.3, 0.6, 1.0], whereas they are expected to vary with surface emissivity (= 1 – albedo), see libRadtran manual for reference. Assuming the results and figures presented in the manuscript rely on the same database, they will have to be revisited as well.

1. *How is the optical thickness computed/derived? From libRadtran directly, or using the approximation provided by Eq. 10?*
All values of cloud optical thickness were directly extracted from the libRadtran verbose files. The ice cloud optical thickness τice at 550~nm wavelength is directly obtained from the libRadtran verbose output using optical properties of droxtals.
The optical thickness for a given IWC and effective crystal radius will vary across ice crystal habits. If the optical thickness is determined only for droxtals and assumed constant for plates and column-aggregates, this approach will lead to incorrect results for these other habits.

Other technical issues to be addressed:

2. *Line 112: Please explain why REPTRAN "coarse" mode is justified for this application and show that it provides sufficient resolution compared to "medium" and "fine" mode (if needed, consult with libRadtran team). REPTRAN 'coarse' provides a spectral resolution of 15 cm^{-1}, which corresponds to $\Delta\lambda$ =0.41nm (at 550 nm) and $\Delta\lambda$ =3.5 µm at (50 µm).*
We would like to direct the Referee to Fig. 3.7 on page 47 of the libRadtran Documentation (version 2.04). Figure 3.7 shows the different spectral resolutions of REPTRAN coarse, medium, and fine. As given in these examples, the resolution 'coarse' resolves the major features of the spectrum and, therefore, we argue that coarse is sufficient for broadband irradiance simulations. We further argue that the 'coarse' resolution is sufficient for broadband irradiance applications while acknowledging that higher spectral resolutions are

required for spectrally resolving radiance simulations. Furthermore, when calculating solar, TIR, and net radiative effect as differences between cloudy and cloud-free simulations, effects and potential errors from molecular absorption and due to the choice of spectral resolution from libRadtran partially compensate.
http://www.libradtran.org/doc/libRadtran.pdf (last access: June 28th, 2023)
Please provide quantitative info about the bias introduced by choosing REPTRAN coarse vs. fine, as well as by limiting the thermal spectrum to 75,000 nm instead of 100,000 nm – both on the solar, thermal, and net radiative effect. It would be sufficient to run one simulation based on an extreme case of parameters (for which the largest effect is expected). This information is important for potential future users of the look-up table results.

Minor issues:

3. *Please use the official description as provided in Yang et al. 2013 when referring to these ice crystal properties. It is not clear which ice crystal shapes and roughness levels are used in this study. Yang et al. 2013 provide each habit in 3 different roughness levels. The sample input file hints at the choice of "moderately rough aggregates of 8-element columns". Please double-check throughout the manuscript.*
Aggregates consisting of '8-element-columns' were used from Yang et al. (2013). This has been clarified in the manuscript in Sec. 2.2 Radiative transfer simulation set-up. Later in the text the term 'aggregates' is used synonymously for '8-element-columns'.
Please use the full term "moderately rough aggregates of 8-element columns", "8-element columns" is not specific enough in this case, since there are three different roughness levels provided by Yang et al. 2013 (see original comment above).
This applies in a similar way to Figure D1: Please change "8--column aggregates (called 'aggregates' thereafter)" to "aggregates of 8-element columns with moderate surface roughness (called 'aggregates' thereafter)".
Please double-check throughout the manuscript.

4. Lines 146-152: Several airborne in situ measurement campaigns that targeted cirrus and contrails imply that aggregates are the dominating ice crystal habit (Liu et al., 2014; Holz et al., 2016; J.rvinen et al., 2018). For example, Järvinen et al. (2018) found that 61 to 81 % of the sampled ice crystals were aggregates with a rough surface. Such ice crystals are also assumed in current remote sensing applications of ice cloud, e.g., in the re-defined ice optical properties used by the Moderate Resolution Imaging Spectroradiometer (MODIS) Collection 6 product (Yang et al., 2013; Holz et al., 2016;Platnick et al., 2017; Forster and Mayer, 2022). Therefore, we selected 8–column–aggregates as the primary ice crystal habit.
Please double-check the literature, the references here are still not correct: Järvinen et al. 2018 report that 61 to 81% of the sampled ice crystals were found to be *complex* [meaning they had featureless phase functions; they do not mention *aggregates* here]. Later, they state that "severely roughened column aggregates" are found to best represent their observations. MODIS Collection 6 assumes severely roughened 8-element column aggregates as well. Forster and Mayer (2022) found mixtures of severely roughened (~60%) and smooth (~40%) 8-column aggregates to best match observations of (thin) cirrus. In fact, the latter more closely motivates the use of

moderately rough 8-element columns in this study. Please note that the optical properties of aggregates closely resemble those of their components (e.g. the asymmetry factor of aggregates of columns is similar to that of individual columns), so it is important to be specific here about the type of aggregates, as well as the degree of surface roughness (cf. comment #4 above).

5. *Table 3 states "Molecular absorption: Fu and Liou (1992, 1993)". This is inconsistent with the earlier statement of REPTRAN. Please correct/clarify.*
   The table has been corrected according to the Referee's comment and we have replaced the former citation with the Gasteiger et al. (2014) reference.
   Please add REPTRAN (Gasteiger et al, 2014) to the table.

6. **The sample libRadtran input file for the thermal-infrared specifies the solar zenith angle, which does not have any meaning in this spectral range. Even though this won't have any impact on the simulation results, please remove this line as it potentially confuses future readers/users.**

7. *Compared to Meerk.tter et al, the visualization here is dominated by the parameter range for reff, making it almost impossible to visually resolve variations in F_net, tir, sol for the remaining variables.*
   We partly agree with the Referee and elongated the figure to improve the legibility of the figure. However, the large bar from R_{eff} in relation to the other bars is also a direct indicator of the relevance of each parameter considering the typical parameter range. Consequently, the importance of each individual parameter, in relation to the others, is directly visible in the figure.
   A log scale would help here, or interrupting the y-axis at -400 W/m2 (solar) -200 W/m2 (net).