**Response to Reviewers: CPC revision**

Note, reviewer comments are included with responses in blue text.

**Reviewer 2**

The authors have adequately addressed the reviewer's concern and significantly improved the quality of the manuscript and the software. The reviewer recommends acceptance for publication.

**Reviewer 3**

The authors have responded to this reviewer's comments and have revised the manuscript substantially. There are still a few issues that need to be resolved before it is accepted for publication.  
  
1) The capabilities and limitations of RadLib should be more clearly articulated. For example, different property models have different temperature ranges of applicability. While the authors specified what happens if the simulation temperature goes beyond the appropriate temperature range, they should comment or provide some recommendations on the appropriateness of the choice of the property model. For example, WSGG model has a valid temperature range of 300-2400 K, and RadLib caps the absorption coefficient values at the respective bound if the simulation temperature is beyond this range. Can the authors provide some guidance on what is the error expected from such a strategy of allowing simulation to continue at ranges beyond the valid range of the property model? If the user knows that the simulation temperature is beyond 2400 K, is it recommended to use WSGG?    
Also, what is the applicable range of pressure in the models implemented?   
Related to this, on repeated readings, this reviewer felt a table to list the range of applicability for each model may be useful for understanding the capabilities of RadLib at-a-glance for an user.  
  
2) Please rephrase and, if possible, simplify the sentence on lines 82-86 ("Radiation property models, including those implemented in RadLib, are typically developed using ... correlations and modeling assumptions [4].") It is difficult to understand what exactly the authors are trying to convey in this sentence.  
  
3) Line 92 - 95: "Modern band models .. cant lose accuracy when applied to nonhomogeneous media and may still require large numbers of RTE evaluations [1]." Should this be "<can> lose accuracy when applied …"?  
  
4) In Figure 2, Example S5: Do "n=2" "n=4", etc mean the number of bands in RCSLW? It needs to be clarified. Furthermore, can the authors comment on the physical significance of RCSLW n =1 and how is this different from PM which uses a spectral average value?

Yes, “n=2” etc. refers to the number of gray gases in the RCSLW model. This has been clarified in the figure caption. For “n=1”, the RCSLW model considers one gray gas as well as a clear gas representing transparent windows in the spectrum. This is different than the PM model, which does not separately consider the clear gas. Furthermore, the PM model computes a weighted average absorption coefficient using the Planck function at the given temperature, which is different than the RCSLW model for one gas, which is described in the paper.  
  
5) In Figure 2: This is a kind of cosmetic request, but still if the legends and symbols can be made consistent it will be easier to read.

We have revised the figure as requested. All subplots now use consistent line styles. Figure 3 is also consisten with Fig. 2.  
  
6) In lines 499-501: Please clarify the sentence, "The PM absorption coefficient is 27.4 atm−1 m−1 , which results in a calculated optical thicknesses of 0.09 and 0.36 m in the thick and thin layers, respectively." Optical thickness is a dimensionless quantity, it cannot be 0.36 m. The thicknesses of layers are changing in S2, so what do these 0.09 and 0.36 refer to?  
  
7) In Section 5.1, please clarify which files and functions belong to FDS and which to RadLib. For example, in line 544, "This was done by editing the radi.f90 file." By looking at the f90 extension the readers can guess that radi.f90 is part of FDS and not RadLib. But then in the next sentence, there are references to A\_WSGG and KAPPA\_WSGG functions. Are these part of FDS?  
  
8) In lines 562-564: "The FDS default model uses a single gray gas with a composition and temperature dependent absorption coefficient computed from RADCAL." Is this equivalent to the PM model in RadLib? If so, a comparison with PM from RadLib and FDS default will be a good validation. Also, what RTE solver does FDS default use?  
  
9) In Section 5.2 can the author comment on the computational cost of RadLib-coupled FDS runs? Some quantitative information on the computational cost of using RadLib for a coupled run will be very useful. For example, the authors can compare the cost of the same FDS configuration simulated without any radiation, with RadLib, and with the FDS-default model.  
  
10) Line 624: "At present, it includes three major radiation property models - Planck Mean (PM) absorption coefficients using the optically thin approximation, the weighted sum of gray gases (WSGG) model,..." PM can be used with any RTE solver in principle, not just with optically thin approximation. Is there any limitation within RadLib of using PM only with optically thin approximation?

**Note to the Editor: Additional Revisions**

In addition to the revisions made to address specific reviewer concerns, minor revisions have been made in an effort to increase the clarity and readability of the paper text. They are listed here. Line numbers refer to the revised document. Edits for proofreading and/or grammatical correctness are not noted here unless significant changes were required to address the error.

|  |  |  |
| --- | --- | --- |
| Line(s) | Section | Revision notes |
| 21-22 | Program Summary | Added reference to FDS example. |
| 59-63 | 1 | Run on sentence rewritten; no content changed. |
| 87-95 | 1 | Combined two paragraphs into one; the extra line splitting the paragraphs was a typo, as the two paragraphs were never meant to be separate. |
| 115-120 | 1 | Paragraph reorganized to sound less disjointed and provide a better transition between sections; content remains unchanged. |
| 375-426 | 3 | Installation instructions and description of installation directory contents heavily revised for clarity of communication; software itself has not changed. |
| 433-442 | 3 | Revised to clarify optional function parameters and return values; prompted addition of gas species lists to Table 1, which was requested by Reviewer 3. |
| 555-557 | 5 | Added concluding sentence to paragraph that summarizes conclusions regarding model choice for sooting flames. |