Answers to Reviewer 1

1. Treatment of Vegetation

Is it possible to test the accuracy of LAI and LAD estimation for the vegetation patch case (shown in 2.3.2)? In my understanding, there are some assumptions or parameterizations (e.g., λ_{LAI} in equation 2) that have been made to obtain profiles of LAI and LAD values. To present the validation result can be useful to show the robustness of the process that the authors proposed. Additionally, the estimation of vertical profiles of LAD is a little unclear. Both equations (3) and (4) estimate LAD(z), but I cannot understand which value was used. Can users select these two equations for estimation?

Thank you for pointing out this important issue. A systematic and detailed study of the LAI and LAD of different tree species is very involved. This includes the scanning of trees with with an airborne or terrestrial Lidar device, the processing of the resulting point cloud, and the derivation of LAI and LAD. The latter step needs to include corrections for areas that were not (fully) reached by the laser scan (occlusion). Thus, such work is out of the scope of this paper and we have to build on the few existing papers with general statements, in particular Markkanen et al. (2003) and Lalic and Mihailovic (2004). Yes, the user can choose which LAD profile to use in palm_csd. We adjusted the text to be more explicit:

"Depending on the user's choice, one of the following continuous vertical LAD profiles is assumed for each identified vegetation patch pixel:..."

The linear relationship between LAI and vegetation height in (2) was used in Vogel et al. (2025) and is supported by a study of Zhang et al. (2019). We added the latter in the discussion:

"Zhang et al. (2019) showed for a forest in northeast China that LAI tends to linearly increase with tree height, among other variables, which justifies our approximation in (2) to a certain extent."

We plan to extend the species-dependent treatment of trees by using allometric functions, as mentioned in the discussion. We added a potential source of these functions to further elaborate on this aspect:

"In addition, we also plan to extend the tree database with species-dependent allometric functions (e.g. Moser-Reischl et al., 2025) to more realistically represent trees of different ages."

2. 2D and 3D building treatment

The authors mentioned the plan to support the 3D building input. I think that it should be helpful to add some explanation of the limitations that users encounter when using 2D data. For example, authors have said that the current version already supports a bridge-like structure, but can the 3D data further support more complicated building shapes? Also, authors mentioned that building parameters can be given for individual buildings and based on a 2D raster, but can the 3D data further support more complicated parameter distribution?

Please consider adding an explanation of the current parameter settings provided via 2D building data, especially its limitations, and the future parameter setting plans via 3D building data would be helpful to users.

Thank you for pointing out our shortcoming. Yes, with a full 3D building data input, more complicated structures would be possible, which is supported by the recently extended urban canopy radiation scheme RTM. The assignment of single building surface parameters will depend on the capabilities of the 3D building data format. We added this information to the discussion:

"Currently, as of version 25.10, palm_csd creates building data from 2D input data only. For standard buildings, this means that only 2.5D structures can be generated, i.e. buildings with horizontally varying height but without vertical gaps or holes. The only exceptions are bridge structures. Here, however, the structural depth is constant for each domain and input data is usually not readily available. For both building and bridges, building surface parameters can only be assigned for ground floor, above ground floor and roof levels (see Table 2a and 2c). Support for fully 3D structures including downward-facing surfaces was recently added to PALM's default radiation scheme for the urban canopy, RTM (Radović et al., 2026). Thus, for future versions of palm_csd, we plan to add support for the input of 3D building data, e.g. in the CityGML format (Open Geospatial Consortium, 2023). In particular, parameters for the newly developed cut-cell method will be implemented once it is fully evaluated and documented. Currently, only PALM-GEM can generate the required input parameters but also requires the set-up of a PostgreSQL database on the system. For our extension, the per-surface definition of building surface parameters will depend on the capabilities of the input format and the availability of tools to define these parameters in a 3D way. Note that it is not planned to extend palm_csd with a graphical editor for input data."

3. Please consider adding some explanation on *residential_1951_2000* at L.115.

Thank you for your advice. We added some information:

"If the building type is not given, it is set to `residential_1951_2000` with building surface parameters representing residential buildings built between 1951 and 2000."

4. Please consider adding some explanation on the meaning of *_2* adding to the parameter name at L.129. Does it mean the second roof layer?

Thank you for carefully checking the parameter names. Yes, `_2` means the second roof layer as explained in this sentence:

"For example, setting the `building_heat_conductivity_wall_roof_2` attribute or supplying the respective raster data will set the heat conductivity of the second roof layer with the first layer being the outermost layer."

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