

Interactive comment on “One-dimensional models of radiation transfer in heterogeneous canopies: A review, re-evaluation, and improved model” by Brian N. Bailey et al.

Anonymous Referee #1

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General comments

This work provides a review and comparison of radiation interception models applied to heterogeneous canopies. The authors compare results from models of varying complexity to data simulated using 3D leaf-resolving model. Though limited to having no scattering, and no diffuse radiation, through the comparison, the authors provide better understanding of the effects of model assumptions and inputs. A generalized model is also proposed and shown to perform well compared to other models considered.

Specific comments

This work mainly focuses on between crown heterogeneity. Cases simulated mainly
C1

explores densely clumped vegetation with open canopies. Cases 1 and 2 especially focuses on isolating the effects of crown scale clumping. However, heterogeneity with in the crown warrants more discussion. While case 5 using realistic canopy structure includes sub-crown scale clumping, its effects seems overshadowed by the significant crown scale clumping. For example, how will the models behave for a not very dense forest ($LAI < 2.5$) but with mostly closed canopy?

The Leaf angle distribution function (G) is also an important canopy structural characteristic. All cases presented (except 6 perhaps?) use $G=0.5$. How will other G functions affect results?

Technical corrections

Line 76: should be $l(r;s')$ to be consistent

At Line 94, $ah=L$. While L is listed in Table 1, please include the physical representation of L (LAI) here for clarification.

Figure 8 caption: Error in legend label for Ni10_P. Document shows 'Ni10_P ((eLine));'.

Interactive comment on Geosci. Model Dev. Discuss., <https://doi.org/10.5194/gmd-2019-305>, 2020.