

Interactive comment on “Retrieval of Canopy component temperatures through Bayesian inversion of directional thermal measurements” by J. Timmermans et al.

J. Timmermans et al.

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This seems to be a good and useful approach to estimation of canopy temperature using multi angular radiance observations, and provides a useful assessment of the value of the approach.

Thank you very much for your compliments and suggestions. I hope to answer any questions you have posted by you.

My main concern relates to the use of single values for sunlit and shade temperatures for leaves. At least for the leaf temperature components it is usual for the range of 'sunlit' temperatures to be 5-10C on sunny days, for stressed plants with partially closed

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stomata this range can be even larger up to 15 C. There is similar, though slightly smaller variation for shaded leaves. The authors should at least comment on this problem and possible solutions/implications.

The inversion that is performed only takes into account a single temperature for those components. We believe that the retrieval of the contact temperatures for different components was already a significant step in the right direction. We fully agree however with your comments about the variation between temperatures of sunlit leaves as well as a spread between the temperatures of shaded leaves. This can be solved by running the inversion over the complete SCOPE model.

The presented inversion has been performed on the (thermal) radiative transfer sub-model of the SCOPE model. SCOPE is able to calculate the spread in temperature for the different components through an iteration process, by finding the thermodynamic equilibrium between incoming and outgoing radiation and evapotranspiration. However to use the complete SCOPE model for the sensitivity analysis and case study would take a lot of computation time. The paper will be adjusted to report the described limitations more carefully.

Although I eventually understood the paper and the terminology used, I found it a little opaque and I feel that the authors could have a go at clarifying the paper and the figures - for example the authors appear to be suggesting that success rates of 1 (the green areas on figures?) indicate some success in retrieval. They can't mean it can they?

A success rate of 1 indeed does not mean a successful retrieval. However it also does not mean a deterioration of the a-priori values. We have concluded therefore that the method can be used, without deteriorating previously made calculations. We will adjust the document to make this more clear.

I hope this answers the questions you have, however if you have more questions please feel free to ask them. with kind regards Joris Timmermans (on behalf of all authors)

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