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

W. Verhoef

VERHOEF@ITC.NL

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Thanks a lot for your helpful comments.

Regarding the issue of investigating the separate errors for the four components, we agree that this could be done, but we did not include this in the paper, since we feared that these results would not have general significance because of the nature of the optimisation method. For example, since the method minimizes the overall error, one may expect larger errors for components which are less frequent, such as the soil parts in case of a high LAI, or the shaded leaves in case of a low LAI. So, one may expect that the error distribution over the different components would be highly dependent on

the LAI. When a similar retrieval method was applied to the estimation of leaf chlorophyll content from optical top-of-canopy observations, it turned out that retrieval of leaf chlorophyll was inaccurate at low canopy LAI, and much better at high LAI. This is also according to expectations, given the properties of the optimisation method.

Regarding the model-inherent error, this is a very interesting issue, but it was considered to fall outside the scope of the present paper. Two possible sources of model-inherent error come into play here:

1) the error due to the assumption of homogeneous component temperatures; this is actually related to the abstraction level of the model. One may expect that sunlit leaves in particular will display a whole range of temperatures, depending on their orientation with respect to the sun. The abstraction level of 4SAIL is such that the average sunlit leaf temperature is assigned to all sunlit leaves. This introduces errors with respect to reality at the micro scale, but this does not mean that at the macro scale these errors are still playing a significant role.

2) the model-inherent error in radiative transfer calculations. Since the calculation of the single scattering contribution is very accurate, and multiple scattering in the thermal domain is a very small contribution to the total, we may expect that this error is small.

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