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Biogeosciences Discussions

Interactive comment on "Predicting evapotranspiration from drone-based thermography – a method comparison in a tropical oil palm plantation" *by* Florian Ellsäßer et al.

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Peer review for the manuscript: Predicting evapotranspiration from drone-based thermography – a method comparison in a tropical oil palm plantation by Ellsasser et al

The manuscript under consideration reports a 9-days study of surface temperature measurements over an oil palm plantation in Indonesia using a thermal camera mounted on a drone. The authors used the temperature data to calculate the latent heat flux using three different models, with/out radiation inputs, and showed good agreement between one of the models and the latent heat estimated from an eddy-covariance (EC) calculation based on an on-site flux tower. The drone-based temper-

ature calculation is more flexible than the EC, also providing spatial information at high resolution.

This is a very nice paper reporting an elegant study. The text and figures are carefully prepared and nicely presented. I have only a few questions and suggestions:

1. Considering the rather narrow variation in air temperature over the tropical plantation, would you think that the fact that the study was performed at this site is a challenge? Or rather an easier case? I think that this point is touched upon, but further discussion would be appreciated.

2. Considering the aggravating situation of deforestation in the studied region, and the implications on surface warming (L110-113), it would be highly interesting to make a comparison study between the palm plantation and the natural rainforest. I assume that the higher spatial heterogeneity in the latter would offer a better test case for the spatial distribution of ET (Fig. 5). Can the authors include such information?

3. It would be good to include in the paper some information on the measured air-surface temperature differences as function of time and space.

4. With 90% canopy cover, LST is mostly that of the leaf surfaces, i.e. reflecting the process of evaporative cooling of leaves by transpiration. Can the authors report these (evapo)transpiration values? A value is given in L360. Why are the units mm h-1 m-2? I thought that the mm already includes the area consideration (i.e., 1 mm = 1 L m-2).

5. By using the EC data as absolute reference, the text seems to assume that the EC data are independently true. However, the EC is also an estimate based on an indirect measurement. If there are any additional measurements that could further constrain these data, it would be very helpful. Regardless, the text should be adjusted to reflect that two estimates are compared, rather than an estimate to a direct measurement.

6. In case that one doesn't have radiation measurements, would the DTD model be the best option to make use of the thermal information? In L400 the authors should note

that such sensors must be tested independently in a separate study.

7. The authors discuss measurements in drier sites. It would be interesting to compare these results with measurements of palm water-use and its effect on temperature. Below are a few studies on date palm, evidencing the high transpiration rates in a plantation, and the effect on temperature in an urban context.

8. Finally, another potential comparison could be made with a study of transpiration of forest trees estimated by spatial temperature data from a thermal camera (see reference below).

Sperling, O., Shapira, O., Cohen, S., Tripler, E., Schwartz, A., & Lazarovitch, N. (2012). Estimating sap flux densities in date palm trees using the heat dissipation method and weighing lysimeters. Tree Physiology, 32(9), 1171-1178.

Potchter, O., Goldman, D., Kadish, D., & Iluz, D. (2008). The oasis effect in an extremely hot and arid climate: The case of southern Israel. Journal of Arid Environments, 72(9), 1721-1733.

Potchter, O., Goldman, D., Iluz, D., & Kadish, D. (2012). The climatic effect of a man-made oasis during winter season in a hyper arid zone: The case of Southern Israel. Journal of arid environments, 87, 231-242.

Lapidot, O., Ignat, T., Rud, R., Rog, I., Alchanatis, V., & Klein, T. (2019). Use of thermal imaging to detect evaporative cooling in coniferous and broadleaved tree species of the Mediterranean maquis. Agricultural and forest meteorology, 271, 285-294.

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