

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

Anonymous Referee #2

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General comments

The manuscript by Ellsasser et al. makes an interesting and useful contribution to the burgeoning literature on using UAVs to measure ecosystem properties and processes, in this case measurements of surface temperature for use in models of the surface energy balance to predict spatial variations in the latent heat flux and for comparison to eddy covariance-derived estimates of the same.

The appendix describing the various energy balance/ET models should be better integrated with the main body of the manuscript, and as noted below some of the model equations need more clarification. In general, a reader should not have to read other

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previous papers to understand the approaches tested here (e.g., see my comments below regarding lines 174-175).

I agree with the other reviewer that more discussion of the various uncertainties in EC-derived ET need to be discussed. While it is the reference method here it is also subject to many uncertainties.

The writing is generally fine but there are a few very awkward sentences that I suggest re-writing (see below).

Specific comments Lines 90-91: “the hottest and a group of coldest pixels in the image” – This is not an independent clause as it is missing a verb

Lines 105-107: This sentence is confusing and needs to be re-written.

Line 110: replace “presented” with “current”

Line 147: Quote the manufacturer’s measurement uncertainty here, as you also discuss it later when mentioning thermal cameras. The true uncertainty is surely closer to 1-2 K for cameras like this.

Line 164: Provide the assumed surface emissivities used in each model and component

Lines 174-175: Need to better explain this approach. P-T is usually used to predict LH fluxes not SH fluxes.

Lines 196-207: Do these models assume a closed energy balance? If so how does that affect your estimates?

Line 219: Was this an aspirated measurement of Tair?

Line 222: These are IRTs not thermal cameras, so you do not know exactly which canopy elements you are measuring! Were they capturing only leaves all of the time? Also, what surface emissivity was assumed for these measurements of surface tem-

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perature? Did you correct for the influences of reflected longwave radiation, relative humidity, distance to object, etc? And what are measurement uncertainties of the IRTs?

Line 229: Describe the Bowen ratio closure method in more detail.

Line 247: “systematic”

Line 273: I think you mean “alive”

Lines 278-286: As noted above these measurements were not made with thermal camera but with IRTs. Please update.

Line 280: Is the 122 number based on 2 maps/flight?

Line 293-294: Is this peak SW measured during the flight or average SW?

Line 295: By “canopy air temperature” do you mean the T_{air} measured at 22m?

Line 302-303: This is an awkward sentence – rewrite.

Line 303: The first time you cite Fig. A3 you need to discuss why modeled R_{net} is so poor.

Line 304: Replace “congruence” with “agreement” or “fidelity”

Line 307-308: Perhaps this poor agreement in morning and late afternoon is not surprising since the dATTUDUT method is based on modeled R_{net} ..?

Line 308-309: It's worth breaking out the description of the performance of the TSEB-PT estimates into a separate sentence. Are these estimates uniformly higher than the EC estimates or only during part of the day?

Lines 335-336: Seems like this sentence is missing a word or two.

Line 352: I'm unclear what you mean about the X-level for the bias in EC reference fluxes.

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Lines 405-406: Are you referring to the slope in this sentence?

Lines 455-457: Well before this discussion of errors you should define what you mean by proportional versus continuous errors.

Line 500: Replace “results in” with “predict”

Line 503: eliminate comma after “both”

Line 520: Which edge? Computer or edge of study area?

Line 542: Replace “cameras” with “IRTs”

Line 565: How are the surface epsilon (emissivity) terms estimated? Do they vary spatially across the image?

Lines 579-580: Show the equations for calculating radiometric LSTs.

Line 588: I assume this (P_o) is a shortwave albedo?

Line 600: This model assumes cloud-free conditions (with a constant transmissivity)?

Line 605: Is that supposed to be an epsilon symbol as in equation 2?

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