

Interactive comment on “Mapping daily evapotranspiration and dryness index in the East African highlands using MODIS and SEVIRI data” by Z. Sun et al.

Anonymous Referee #1

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This paper presents the results of a comparison between daily evapotranspiration (ET) from remote sensing with flux tower estimates of ET in East Africa. This is a relevant topic, because we are still in need of accurate remote sensing products of ET. The authors have a good dataset, and the results of the study are encouraging. The novelty is the combined use of a geostationary (SEVIRI) and polar orbiting satellites (MODIS).

The methodology is clearly described, and the discussion seems correct, but I think that the analysis of the data lacks depth. Flux sites in Africa are sparse, but unfortunately the authors did not fully exploit the data.

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The authors find that remote sensing estimates of daily ET correlate well with ground measurements, but that the remote sensing estimates have a bias of nearly 1 mm d⁻¹. They discuss possible causes of this underestimate. My main concern is that this discussion is only qualitative. For example, they argue that net radiation is underestimated during clouded days. It is not clear if the results presented in Figs 4 and 5 include clouded days. The conclusion is that further research is needed. To my opinion some of this further research should be part of the paper.

The authors identify net radiation, evaporative fraction (EF), and the mismatch in spatial scale as possible causes for the discrepancy between remote sensing and ground based ET. At least two more could be added here: soil heat flux and the assumption that daily EF equals instantaneous EF at Aqua and Terra overpass time.

These five possible errors can relatively easily be quantified and evaluated with the available flux site data. The flux site provides net radiation (probably also 4-component radiation), soil heat flux and latent heat flux. With these data, net radiation, soil heat flux, EF and the diurnal variation of EF can all be compared to their remote sensing counterparts individually. If 4-component radiometric measurements are available at the Fluxnet site, then SEVERI radiation products and LST can be evaluated as well.

Such an analysis presented in one or two additional graphs would give more weight to the paper, and would also give directions to the priorities for further research.

1) Page 6287, Line 5. “we do not have daily ET maps across the East African highlands available...”. But LandSAF provides these maps (<http://landsaf.meteo.pt/>) 2) Page 6289, lines 9-16. It would be helpful to add some key information about the site, like the measurement height, footprint area, instrumentation, canopy height and density. 3) Page 6290, Eqs 1 and 2. In the literature, EF is dimensionless (a value between 0 and 1). In this paper it has the units of (mm m² d⁻¹ W⁻¹) (see Eq 2). This is confusing, because it makes it seem like the units in Eq 1 are not consistent. 4) The right hand side in Eq 1 still needs to be multiplied by 1800 seconds. 5) Page 6294,

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lines 3-6. Is this a general remark, or does it refer to the situation at the flux tower? How much is the space between the trees at the site? See also point 2. 6) Page 6294, lines 3-6, “can be too smaller” -> “can be smaller” 7) Figs 4 and 5. Why are only 16 points plotted in Figs 4 and 5, if 6 months of data were available (or 4 months if the rainy season is excluded)?

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