

Interactive comment on “Uncertainties in using remote sensing for water use determination: a case study in a heterogeneous study area in South Africa” by L. A. Gibson et al.

Anonymous Referee #2

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hessd-7-6581-2010: Uncertainties in using remote sensing for water use determination: a case study in a heterogeneous study area in South Africa by Gibson et al.

This paper considers the uncertainties of using remote sensing for determining the latent heat using Modis data. Generally, this paper covers a very interesting and scientifically relevant topic, but it feels that the authors could have done more. To my opinion, only a small selection of parameters was identified that contribute to the uncertainty of ET (evapotranspiration) computations and no real uncertainty analysis was made using

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for instance error propagation or Monte Carlo (MC) simulations. You have sensitivity of the model for errors in the estimation of remotely sensed variables such as LST, albedo, NDVI, etc. In addition there is the uncertainty in auxiliary data such as met data, topography, heterogeneity in the area, etc and its mutual interaction among the different variables. This is something that can be identified with a MC approach. I also miss in the introduction the larger frame (reference to literature) on model parameter uncertainty identification (for instance Beven 2006, J. Hydrology) and there is a vast lack of situating the results presented by the authors in the large frame of literature.

So I would urge the authors that they put their results in a wider perspective and include some analysis and paragraphs on error retrieval of the model and then zoom in to the results presented in this version of the manuscript. They should at least extend their discussion paragraph. I would use a more specific title, telling the reader what the paper is really about. This title is too general. Consider next suggestion “Identifying uncertainties in the derivation of evapotranspiration using the SEBS model: a case study in a heterogeneous study area in South Africa.

Some minor things:

- Line 10, p6584: “The calculation of ET revealed that the total annual ET calculated using the Surface Energy Balance System (SEBS) model for the study area exceeded the total rainfall for the same area and time period”. It is not complementally un-logical in the case that irrigation practice occurs (using water from other and remote parts of the country or deep groundwater).
- Line 5, p6588: which products of MODIS are used in this text?
- Line 22 p6590: “It can therefore be said that the sensitivity of daily ET to $E(T_0 - T_a)$ is dependent on the land cover being studied and may also be dependent on the calculated $(T_0 - T_a)$ itself.” Perhaps more fundamental also on the pixel size (MODIS vs MSG)?

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- Equation 2, p6592: how is the quadratic function justified?
- Where are the explanations of variables used in Equation 3? This equation is just one approach of calculating soil heat flux (cfr Basstiaanssen et al, 1998, J Hydrology).
- Line 20, p6591: “At AQUA overpass, when the soil of the field validation site is shaded, there is a much better agreement between field validation (approximately 3–15% of net radiation) and the SEBS results (approximately 5% of net radiation) for soil heat flux.” Why is that? Because shadow may create a false idea of the pixel being covered by vegetation? In other word, the model acts as if this pixel is composed of vegetation? Suggestions?
- Line 1, p6593: The question remains then how much vegetation cover affects the ET outcome of the model? Is this sentence “Fractional 5 vegetation cover is calculated outside of SEBS and care should be taken in the choice of formula as the variation in ET as a function of f_c has been demonstrated” not forcing an open door? Also the sentence “The uncertainty in the calculation of the sensible heat flux introduced by uncertainties in displacement height and the height of wind speed measurement should be carefully considered and addressed since errors in the calculation of the sensible heat flux will be propagated through the model and eventually influence the final ET calculation.” on Line 20p6594? How large are the errors one can expect?
- Check the manuscript to be sure that numbers and units are separated with a whit space (cfr line 4, p6594);
- Avoid the multiple use of the word “opportunity” in l25p6596, 13p6597, 18p6597.
- References cited in the text should be ordered chronological and then alphabetical.
- I can recommend next paper of Verstraeten et al. (2008) in Sensors since it reviews some methods for retrieving ET and soil moisture at different observation scales and also includes a small discussing on error analysis and uncertainty. It probably gives you some other references that you can consult and/or cite.

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- So as to conclude: what kind of specific (not general) advice can you give readers when they want to use SEBS with respect to errors and uncertainty?

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