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Hydrology and Earth System Sciences
Discussions

Interactive comment on "Evaluation of an extreme-condition-inverse calibration remote sensing model for mapping energy balance fluxes in arid riparian areas" *by* S.-H. Hong et al.

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The authors present an application and evaluation of SEBAL for the semi-arid riparian regions in the Rio Grande Basin of New Mexico. This is an interesting repetitive application and evaluation of SEBAL model in the riparian areas.

Answer: Thank you.

Major Comments:

Page 13483-line 1: Unlike NLDAS and LIS, SEBAL and METRIC do not require land cover maps: Please could you discuss how you will estimate the surface roughness

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without landuse and land cover maps.

Answer: We have inserted in the paper that an alternative for estimating surface roughness without land use and land cover is to use expressions that relate the NDVI to the momentum roughness length. See, for example, Eqs. 30-34 in Allen et al. (2007) or Eq. 24 in Bastiaanssen et al. (1998). Note that the ASCE guidelines use Leaf Area Index as an indication for surface roughness. This solution became widespread, and is now considered also by FAO in their international guidelines of crop ET.

Allen, R. G., M. Tasumi, and R. Trezza (2007), Satellite-based energy balance for mapping evapotranspiration with internalized calibration (METRIC) - Model, Journal of Irrigation and Drainage Engineering, 133, 380-394. Bastiaanssen, W. G. M., M. Menenti, R. A. Feddes, and A. A. M. Holtslag (1998), A remote sensing surface energy balance algorithm for land (SEBAL): Part 1. Formulation, J. Hydrol., 212-213, 198-212.

I don't see any relation of LIS and NLDAS with this paper. Author added unnecessary NLDAS and LIS in this paper. Methodology, application and science behind NLDAS and LIS is way different than SEBAL and METRIC.

Answer: We fully agree with your comment on NLDAS and LIS. Reviewer 1 made a similar comment. We have removed any reference to NLDAS and LIS in the manuscript.

Section 3.2 closure forcing: Please could you put reference or criteria for 65%-110% energy balance closure, or maybe refer this paper http://www.sciencedirect.com/science/article/pii/S0168192302001090.

Answer: Thank you for steering us to this excellent reference. We amended this section as follows: "If the sum of H and LE, before correction, was less than 65% or greater than 110%of the available energy (Rn -G), the data were not used in our analysis. Wilson et al. (2002) found the average energy balance closure at FLUXNET sites to be between 53 to 99%. Since their numbers represent average closures and since data points at the lower end of the range raise greater concerns for data quality, we chose

to shift the range up."

Section 3.4 page 13495-line 4-5: There are several types of footprint models. Initially, simple two-dimensional analytical footprint models for neutral atmospheric conditions were developed. Have you developed or used in this study?

Answer: This section was misleading and did not contribute to the paper. Therefore, the following sentences were deleted: "There are several types of footprint models. Initially, simple two-dimensional analytical footprint models for neutral atmospheric conditions were developed (Gash, 1986; Schuepp et al., 1990). Later, the analytical footprint model was improved to account for atmospheric stability conditions (Horst and Weil, 1992; Hsieh et al., 2000)." We did not develop, but use a footprint model as explained in this sentence: "The footprint flux, F(x,zs) [–], along the upwind direction, x [m], measured at the height zs [m], suggested by (Hsieh et al., 2000) is used in this study."

Therefore, the use the average H and LE values of the 25 pixels surrounding the EC tower pixel is considered to be the best option for the comparison of daily ground measurements and SEBAL estimates. Please could you discuss how you come up with exact 25 pixels surrounding the EC tower?

Answer: Thank you for catching this inaccuracy. We have made a correction: "the 24 pixels surrounding the EC tower pixel".

There are major problems in the paper. 1. Energy balance closure 2. Comparison of Energy balance parameters consistently shows underestimation and overestimation of parameters (Rn, G, H, and LE) what should the reader believe 65% energy balance closure or the remote sensing model (15% error).

Answer: The 15% error is between the closed energy balance terms (corrections made for H and LE) and the remote sensing model. We believe the reviewer misinterpreted our analysis. Energy balance closures – while not desirable and not explainable – are commonly observed (Wilson et al. 2002). On many days the closure error was

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small (see Figure 1). The commonly agreed upon method to correct energy balance is to force energy balance closure using the Twine method that is used by many researchers. Because of the sometimes rather large energy balance error we changed the original title of our article from “Validation of . . .” to “Evaluation of . . .”

Please also note the supplement to this comment:
http://www.hydrol-earth-syst-sci-discuss.net/11/C6816/2015/hessd-11-C6816-2015-supplement.pdf

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Interactive comment on Hydrol. Earth Syst. Sci. Discuss., 11, 13479, 2014.

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