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Hydrology and Earth System Sciences Discussions

Interactive comment on "Determining irrigation needs of sorghum from two-source energy balance and radiometric temperatures" *by* J. M. Sánchez et al.

Anonymous Referee #2

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General remarks: The authors describe the implementation of a surface energy balance model to compute evapotranspiration (ET) over a sorghum experiment in Barrax, Spain in 2010. Surface and sky temperatures were continuously measured throughout the growing season, although notably absent were data in the sparse growth phase. The study has some interest for investigators interested in water use for biofuel crops.

The stated objectives for the manuscript are to show the potential for a simplified energy balance scheme previously reported by the senior author, and to demonstrate the value of land surface temperatures for ET estimation under all weather conditions. Although the manuscript is clearly written, it falls short on meeting these objectives. In the first instance, there is insufficient supporting material to describe what has already been done for the simplified approach, and what is still needed. In the second instance there is scarce information about variable weather conditions aside from two illustrative cases (DOY 185, 236). What would be more significant would be an assessment of ET modeling accuracies for different weather cases.

A significant shortcoming that can be corrected is the insufficient detail and motivational material for the study. There are now quite a few surface energy balance studies in the literature spanning a range of spatial resolutions. The case that needs to be made is why thermal infrared data are superior to what one can do with approaches such as FAO-56. Notably missing is the prime rationale for thermal data: detection of water stressed vegetation. If your vegetation canopies are not water stressed, simpler assessments of canopy cover , coupled with Penman-Monteith modeling ought to predict water use reasonably well. Thermal monitoring is now used in at least one commercial product, this needs some recognition.

The manuscript title suggests that irrigation scheduling is a background goal, but there is nothing in this study that discusses forecasting; this is all retrospective, or at best near real time.

Use of a crop growth regression model is not very satisfactory , you'd be better off using crop coefficients or heat units (easily measured).

Details: Abstract: l 13: resulted in Last sentence too vague and uninformative.

Introduction: L 21: particularly important

L 25: 'energetic crops' is awkward, how about crops with high biofuel potential?

L 26: change relevant to alternative

P3939, L1: Production of biofuel crops…that might compromise water conservation strategies.

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8, C2590–C2593, 2011

Interactive Comment

L 4: crop is key to providing growers

P 3940, L 4: models may solve some of these limitations (I think J. Norman claims it is in fact solved, but current experiments indicate otherwise)

L 6: No segue into this section? Why do we want to use STSEB? What are the alternatives? Study site and materials:

L 24: how does this yield compare with typical values for the region/globally for forage sorghum?

P 3942, L 6: scale's beams?

L 14: The resulting data were compiled..

L17: an older thermocouple model? Please verify field of view, newer models have half-angles of 18 and 22 degrees.

Model description: Eq. 2: what isn't mentioned (but should be) is that you can't get Tc and Ts uniquely from one view angle without an additional assumption. That assumption is critical to whether or not the resulting temperature provides any stress related information. The original Norman/Kustas model uses Priestley Taylor.

P3944: L 8: resistance units inverted

Modelled ET A big reason for remote sensing for ET estimation is detection of early season water use. By the time the crop is at full cover the amount of water needed for the crop is known quite well. So missing the early season is a big drawback.

L 23: compromised

P 3948, L 9: where are the predictions?

Fig. 6: If you intend to do regression analysis, the deterministic component needs to be on the x-axis, the stochastic component on the y-axis. As shown here, they are reversed and need to be switched.

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