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Hydrology and Earth System Sciences Discussions

Interactive comment on "Integration of vegetation indices into a water balance model to estimate evapotranspiration of wheat and corn" *by* F. L. M. Padilla et al.

Anonymous Referee #1

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General comments

This research tests the option of using VI and RS data to estimate evapotranspiration by a model. I must say that the model description is very poor and it was hard to understand what the authors tried to say/show in many places. To my regret, this manuscript is not suitable for publication as it is. It needs a major revision, and some points must be first clarified. If I understand correctly, it would be extremely difficult to accept some of the author's conclusions.

Specific comments

One major problem I found is inherent within the model assumption. Authors chose values for some parameter (P. 8637 & Table 1) that are far away from the normal growth conditions. The maximum effective root depth was 1.25 m, and from my experience, root can reach even 2 m (if there is water in that layer). More important, the minimum effective depth which the seed can extract water to germinate was 40 cm. As seeds are sown in 2-3 cm, I cannot understand why do they need 40 cm of water to germinate. In addition, in the wilting point, the soil water content is not 0, crops can absorb water from soils even when the soil water content is below the wilting point. Lastly, why the TEW was only 24 (Tab. 2). Hence, all the whole work results are questionable.

The second major problem I found is inherent with the satellite data. Authors wrote that 8 and 7.4 ha fields avoiding edge effect (P. 8638, L. 10). However, it will be depend on the field shape and orientation. This problem even increased with Landsat 7 ETM+ scan line corrector malfunction. It would be better to exhibit how many pure pixels are available for each field by image.

The third major problem I found is inherent with the field canopy reflectance measurements. There are no data about the ASD height above the ground/canopy, and the included area within the field of view. If I assume working 1.5 m above ground, the spectral sampling procedure seems to under-sample the canopy. For maize, the diameter of field of view of the spectrometer at 1.5 m above the crop is 0.66 m which is less than the row spacing (0.95 m?). As the crop grows, the altitude decreases to 0.3 m and the field of view is only about 0.13 m which is much less than the row spacing. If the optic is positioned directly over the row, the spectra are biased toward the vegetation. Thus, multiple observations spanning several rows are required to estimate true canopy reflectance when the diameter of the field of view is less than the row spacing (e.g., Agronomy Journal 74:744-751, 1982). Similarly, does sonic anemometer, hygrometer and the net radiometer locations were fixed z=1.5 m, or above the canopy (P. 8640, L. 19-20, 24). If it was above the canopy, how often along the growing season was the placement changed?

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The last major problem is with data analysis. SAVI index values were averaged for each day of measurements (P. 8639, l. 24-25), and only up to 11 measurement days have been done (Table 3). So, where did all the data points included in figures 2 & 4 come from? Furthermore, SEP data must be added for both figures 2 & 4, and for model estimations figures 3 & 5.

Technical corrections

P. 8634, L. 18-20: The authors ignore the saturation problem that limits LAI estimation by the common VI.

P. 8635, L. 21: "This coefficient" – which one? Reader does not have to guess.

P. 8636, L. 21: "fc" – what does this stand for? Reader does not have to guess.

P. 8636, L. 23: " fcmax is the fc" – not clear.

P. 8637, L. 13: replace "period, " with "period respectively, ".

P. 8638, L. 6: add botanical names.

P. 8638: add precipitation and temp data for the experiment seasons.

P. 8639, L 15: ASD sampling interval is not 1 nm!

P. 8640, L 16: delete space, replace "(Radiation" with "(Radiation".

P. 8641, L. 1-7: too many terms without explanation. What are "rainy days"?

P. 8641, L. 8-12: doesn't belong to M&M.

P. 8641, L. 19-28: What did the weighing lysimeter contain, bare soil or crop? If a crop, how did authors take crop weight into account?.

P. 8641, L. 28: What are "rainless days"?

P. 8642, L. 3: Aren't these calibration sites?

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P. 8643, L. 3-8: can authors relate it to the ASD FOV?

P. 8643, L. 15, 27: I don't agree with "good agreement" and "reasonable agreement". At least the SEP for corn must be too high.

P. 8644, L. 1-4: Why? Why does model accuracy decrease with uniform and organized irrigation?

P. 8644, L. 10-11: Why?

P. 8645, L. 4: Only 2 t per 600 mm of rain?! What happened in the field? What limits production? I'm not sure that we can learn from this field.

P. 8645, L. 19: "without any loss" - exaggeration!

P. 8652: Add two columns- DAE (days after emergence); Pure pixel no.

P. 8653: delete table 4.

P 8654: Start the sentence with a word, and explain what is (5-4-3).

P 8656 & 8658: Start figures with DAE=1. How much rain fell prior DAE (or DOY)=1?

P 8659: Add corn phenology data, and increase wheat phenology data resolution.

The bottom line is that this manuscript is not suitable for publication as it is now. Authors are welcome to submit an improved version for reviewing.

Interactive comment on Hydrol. Earth Syst. Sci. Discuss., 7, 8631, 2010.