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Hydrology and Earth System Sciences Discussions

Interactive comment on "Land surface temperature representativeness in an heterogeneous area through a distributed energy-water balance model and remote sensing data" *by* C. Corbari et al.

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Anonymous Referee #2 Received and published: 11 October 2010 This paper describes investigation of the relationships between land surface temperature predicted from a distributed hydrological/water balance model and remotely sensed surface temperature imagery at different pixel resolutions over a heterogeneous (agricultural) site containing a patchwork of irrigated and non-irrigated fields. In general the paper is clearly written, although in places the phrasing is somewhat awkward or the grammar

is poor. It would be advisable for the paper to be reviewed by a grammarian well versed in the English language. A few of the common phrasing that should be revised is the following:

1)"alternation of irrigated and non-irrigated vegetated field" is not what the landscape is actually (Fig 1)...this phrase would describe more of a "checkerboard" type surface where you would have alternating wet and dry fields somewhat similar in size...instead what they have is more like a "patchwork" or mixture of irrigated and non-irrigated fields differing in shape and size.

Response: In this version of the manuscript this phrase has been revised as suggested by the reviewer using “mixture of irrigated and non-irrigated fields differing in shape and size”

2)Also the phrase "catch" used throughout the paper is not a good word to use in this context "capture" is more appropriate.

Response: In this version of the manuscript the verb catch has been substituted with capture

3)The phrase "peculiar circular shapes" are in fact not all peculiar for irrigated agricultural lands, particularly in the U.S. These are center pivot irrigation systems and are used all over the world.

Response: In this version of the manuscript this has been corrected.

Technical Issues: 4)Under section 4 water balance validation, please specify if the comparisons were made using measured H and LE fluxes closed so that there was energy conservation (residual flux partitioned between H and LE) or not. Also at what model resolution what the output compared to the fluxes and was a flux-footprint run to assign the contributing area to the flux measurements.

Response: In this work measured H and Le fluxes are used without assigning the residual flux partitioned between them to close the energy balance. In fact, for ex-

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ample, part of the residual flux is also linked to the additional storage terms (such as photosynthesis flux, air enthalpy changes) (Jacobs A.F.G., Heusinlveld B.G., Holtslag A.A.M. 2008. Towards closing the energy surface budget of a mid-latitude grassland. Boundary Layer Meteorol. 126: 125-136). FEST-EWB model takes into account these additional storage fluxes. The simulated fluxes used for the comparison with observed ones are taken from FEST-EWB simulation at 10 m spatial resolution.

5)Figure 2 provides no information concerning the scatter in the model-measurement comparison as a function of magnitude. The fluxes should be plotted as X-Y plots with a 1:1 line. Also the difference statistics should be given for nighttime and daytime data separately.

Response: In this version of the manuscript, as suggested by the reviewer, the fluxes have been plotted as X-Y graphs. Only daytime data are used for this comparison due to problems in turbulent fluxes retrieval during stable atmospheric conditions which are typical of night (Wilson et al., 2002). (Wilson K., et al.: Energy balance closure at FLUXNET sites, Agr. Forest Meteorol., 113, 223–243, 2002)

6)Figure 3: The scale (10 degrees) helps to reduce the scatter between remotely sensed and modeled LST. I would separate daytime versus nighttime temperatures. In fact since the variation in nighttime temperatures is minor, the authors should really focus on the differences/scatter between modeled and measured LST during daytime conditions.

Response: In figure.3 the slope of the linear coefficient and R2 are good results and they are not linked to the scale of the plot. Moreover during this experiment only daytime ground measurements were available to the authors.

7)During the study period analyzed, was there irrigation occurring? If so, how did the hydrological/water balance handle this and how were the fields identified? Response: No irrigation was performed.

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8)Under the section 6.1 LST scale of fluctuation, I wonder if the length scale of the field boundaries (i.e., average diameter/radius of the center pivot irrigation fields) is what defines the resolution of scale above which much of the variability is lost. If so, this would a much simpler metric to use than what is presented by the authors.

Response: In this particular situation, where the fields are clearly identifiable, the average diameter of the pivots can be seen as the resolution of scale above which much of the variability is lost. But if a more complex patchwork is analysed, this representative length scale would not be so easy to identify. So the proposed scale of fluctuation is a general methodology to define this scale of variability.

9)Finally, a more interesting analysis would have been to have run the hydrological/water balance model at coarser resolutions (say MODIS 1 km) and see what errors would have been incurred (compared to the model run at high 10m resolution) as a result of having a mixture of surfaces in each modeling grid-box.

Response: This analysis has already been performed. In fact in Figure.4 and Figure.5 land surface temperatures from AHS, MODIS are reported and compared to LST from FEST-EWB run at 10 m and 1000 m for 13th July at 13.45 and at 00.10.

Interactive comment on Hydrol. Earth Syst. Sci. Discuss., 7, 5335, 2010.