Hydrol. Earth Syst. Sci. Discuss., 10, C434–C436, 2013
www.hydrol-earth-syst-sci-discuss.net/10/C434/2013/

Hydrology and Earth System Sciences Discussions

Interactive comment on "Using a thermal-based two source energy balance model with time-differencing to estimate surface energy fluxes with day-night MODIS observations" *by* R. Guzinski et al.

Anonymous Referee #1

Received and published: 21 March 2013

General remarks:

The authors present surface energy fluxes estimates based on Dual Temperature Difference (DTD) model using MODIS day-night observations, instead of normally used geostationary satellites data. A new method for estimating nocturnal energy fluxes and a scheme for adjusting Priestley-Taylor parameter were joined used to estimate regional energy fluxes. Reasonable accuracy was achieved when compared with flux tower observations. Generally, the paper is well written, the study is well designed and the subject is of interest of HESS readers. I only have a few major remarks that are

shown as follows.

1. Based on the modified DTD model, the authors use Day-night MODIS temperature as inputs, aiming to reduce model sensitivity to errors in absolute temperature retrieval. The present research is the first time to use DTD model with polar satellite based night-day MODIS LST observations. My major concern is whether the proposed method really or to what extent reduce the model sensitivity to absolute measurements of LST. Because the DisALEXI model mentioned in the introduction has similar TSEB scheme as the authors' method. When using polar satellite based observations as inputs, typical root-mean-square-deviations in comparison with tower flux measurements of H and λE are 35 - 40 W/m2 over a range in vegetation cover types and climatic conditions (Anderson et al., 2011). But from the validation results shown in the present paper, I did not find great improvements of the proposed method. In order to show the advantages of the modified DTD model, the authors could think about carrying out some comparison studies between these two models in the future.

2. On the basis of ground –based observations, the authors elaborated the impacts of nocturnal flux on daytime sensible heat flux and concluded that the night time fluxes can be ignored when using MODIS LST (Section 4.2, Table 3, Equation 18). My concern is which equation you used for doing the above analysis: Eq. (5) or Eq. (17)? The authors stated in section 2.4 that the VZA changes with different polar satellites overpass and modified Eq. (5) to Eq. (17), where parameter f(θ) are calculated using different VZA (Eq. 2). If the authors used ground-measurements to conduct these analysis, how do you consider the impact of VZA? It would be more direct if the analysis was carried out using MODIS measurements rather than ground measurements.

3. It is very interesting to find that the authors have carried out the sensitivity analysis to consider uncertainties in flux estimates related to the accuracy of LST observations ($\pm$5 ËŽC). But I do not understand why these analysis were based on original DTD model(Eq.5 and Eq.6), rather than the modified scheme (section 2.3) proposed by the authors?

Specific comments:

P1912, L16. Since the fluxes were only modeled when MODIS LST products were of highest quality, I suggest the authors at least list the number of sample days used for HOBE sites and AmeriFlux sites in Table 1.

P1928, L1-L2. As stated in the paper, evaluating DTD model during growing season, senescence and the combined period was one of the aims of this paper. I am wondering how the authors separate them? Please elaborate the exact time periods of them in the corresponding part of the paper.

P1941, L1. If the authors mention two tower sites here, then it is better to show them in the figure (top left).

Reference: Anderson, M. C., Kustas, W. P., Norman, J. M., Hain, C. R., Mecikalski, J. R., Schultz, L., González-Dugo, M. P., Cammalleri, C., d'Urso, G., Pimstein, A., and Gao, F.: Mapping daily evapotranspiration at field to continental scales using geostationary and polar orbiting satellite imagery, Hydrol. Earth Syst. Sci., 15, 223-239, doi:10.5194/hess-15-223-2011

Interactive comment on Hydrol. Earth Syst. Sci. Discuss., 10, 1897, 2013.