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.

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We thank the reviewer for the feedback. Please find the answers to the raised points below.

While the paper focusses on the a dual source method, a small overview of current one-source initiatives should be provided for, as there are currently several large scale

initiatives that investigate the use of one source models.

Although the main focus of this paper is a two-source model we will briefly mention one-source models in the introduction.

In my view the most important part, namely the adaptation of night time fluxes, should be put more clearly forward, in terms of positive impact and negative impact. In both the summary and the conclusion more focus is put on the scheme for estimation the green vegetation fraction. You state that on page 1916 (paragraph 4.2) that when nocturnal fluxes are modeled, the accuracy of the instantaneous values of H are improved, but the accuracy of day- time values of H are decreased. This is one of two reasons that you omit in the final version of the algorithm the calculation of nighttime fluxes. However no explanation is given why this discrepancy is their from a physical aspect. A more critical view of this discrepancy is required. In addition the differences here are shown in percentages while a RMSE value might also be very illustrative. You attempt on page 1917 a sen- sitivity analysis with a temperature bias of 5 degrees. However there is no explanation why this particular value is used. Considering a smaller bias might cause the full version not to revert to Eq 6 in case of positive bias. Also the information you provide on P1910 that lower errors occur at night time that on day time is not used here.

Regarding the representation of night fluxes we did not provide the actual RMSE improvement since the nocturnal flux measurements are quite small and so the RMSE improvement also appears to be small. In this case we think that it is more illustrative to present the percentage improvement. However, it might be useful to show the rough numbers for the actual RMSE decrease and we will include them in the discussion. We also briefly describe the reason why this increase in accuracy of nocturnal fluxes does not translate to increase in accuracy of day time fluxes on P1917, L1. This explana-

tion is not physically based but model based and we will attempt to make it clearer. In the sensitivity analysis on P1917 we chose 5 degrees as this represents the extreme case of bias. We agree that it might be informative to also conduct this analysis with smaller biases, and different biases during night and day, so we will extend this part of the study to show the results of biases of 1 and 5 degrees. We will also put more emphasis on the nocturnal fluxes in the conclusion.

Finally, the discrepancy between $f_{g,observed}$ and $f_{g,vi}$ (shown in p1915) is not mentioned within the conclusion, while and consequently a better accuracy is proclaimed than achieved in the final version of the algorithm.

We mention the sub-optimal performance of $f_{g,vi}$ versus $f_{g,observed}$ in section 4.3 on P1920, L2-L6 by presenting the improvement in estimated fluxes if $f_{g,observed}$ is be used instead of $f_{g,vi}$. Also in section 4.1.1 we use $f_{g,vi}$ at all the sites except for BV where both $f_{g,vi}$ and $f_{g,observed}$ are used. Therefore the improvements shown in this section should be representative of improvements in the final version of the model, using MODIS data, which also uses $f_{g,vi}$.