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Hydrology and Earth System Sciences Discussions

Interactive comment on "Estimation of evapotranspiration from TOA radiances in the Poyang Lake Basin, China" *by* J. Peng et al.

Anonymous Referee #2

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The manuscript describes a very important topic which is related to the retrieval of spatially distributed evapotraspiration(ET) by employing the relationships of a satellite derived scatter plot of surface temperature(T_s) versus a vegetation index (VI), the so-called "triangle method". Herein, the authors specifically proposed the use of the top of the atmosphere radiance (TOA) in deriving ET, which is seldom documented before. In general, the paper is well structured and written, and has useful contribution to practical applications of the widely used triangle method to estimate surface fluxes. I believe this work is original and fairly creative and it is worth to be published on top journal HESS. Before the paper can be considered finalized, I would like the authors to incorporate the comments listed below.

General comments:

1. Is the proposed method only applicable for MODIS data or also suitable for other sensors data (e.g., AVHRR, MSG-SEVIRI)? In practical applications, multiple satellite platforms are used to estimate surface fluxes for different research goals. But the net radiation estimation schemes described in the paper seems to be developed exclusively for MODIS data. If so, I suggest the authors clearly state this point in the paper especially in the title (. . . from **MODIS** TOA radiances. . .).

2. Using TOA radiance instead of satellite derived products to estimate surface fluxes sounds encouraging. It could eliminate the complicated atmospheric corrections. In my opinion, the feasibility of using TOA radiance is due to the scaled temperature (T_{max} -T_s)/(T_{max}- T_{min}) based on triangular contextual space. Such a normalized temperature could minimize the influence of absolute value of surface temperature, induced by atmospheric conditions and sensor viewing angles, on ET estimates. It would be better if the authors consider doing a sensitivity analysis to explore how sensor characteristics and atmospheric variables influence the final results. It is always important to know which parameters exert the greatest influence.

3. The authors stated in the paper that the validation of EF is the true validation of the triangle method for ET estimates. It is true, since the net radiation is calculated using different schemes in the paper. The estimation of net radiation using remote sensing is relatively accurate and easy. But I am not convinced that the authors attribute the uncertainties in EF estimation only to the assumption that the instantaneous EF is representative to the daily EF. Have you validated this assumption using ground-based measurements and then drawn this conclusion? Maybe it is one of error sources but surely not the only one. For example, the uncertainties could come from the influence of topography (altitude and terrain orientation) (Carlson, 2007), the size of the domain, and the determination of the

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theoretical warm and wet edges (Long et al. 2012). I suggest the authors to rephrase this part.

4. From the results shown in Table 4 and Figure 5, the paper concluded that TOA-based estimates perform better than products-based products. But the conclusion is too strong considering the small differences between them. From this point of view, the conclusion of "TOA-radiance based estimates are comparable to products-based products, and it is feasible to estimate surface fluxes using TOA radiance" sounds more reasonable. So I suggest the authors modify the corresponding parts. Besides, the study area where it is implemented is not well chosen. The use of limitation data for validation does not permit robust evaluation of a new method. Given that the MODIS data have high temporal and spatial resolution, it seems possible to combine the method with other experimental sites. Since the proposed method is very interesting, the authors should consider conducting additional validation (maybe at a later time) for different surface and climate conditions.

Specific comments:

P10964, L22-L24. The statement of "...avoid uncertainties associated with the satellite derived products...." is not suitable. Avoid complex atmospheric corrections or complexity seems more reasonable. Do not mention "its accuracy is slightly higher", just Go.

P10966, L7. One reference to Jiang and Islam should be sufficient, since it involves the same research.

P10966, L21. Use satellite sensors in place of remote sensors.

P10966, L25-L26. Include the update references about ET estimates using triangle method.

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P10967, L24, L27. It is suggested to further improve the text by establishing a systematic use of past and present tenses (e.g., using past tense for the executed analysis steps, and present tense for the generic findings).

P10968, L1-L5. In my opinion, these lines are unnecessary.

P10971, L12. Change “triangle space” to “triangular space”.

P10973, L1. Just use acronym TOA is enough, since TOA has already defined in section-Introduction.

P10975, L12-13. The sentence “using local near noon EF represent all-day. . . incurs. . . ” is not correct English. Rephrase it.

P10976, L15. I would rename this to “Study area and data collection”.

P10980, L1, L12. “Figure” and “Fig” are mix used. Not only here, but also other parts in the text. Use the same format of in the paper.

P10987, Many references are lack of DOI number. Provide them.

P10997, Figure 1 seems like a synthesized form of previous works of Lambin and Ehrlich (1996) and Sandholt et al. (2002). Add references here.

References:

Carlson, T.: An Overview of the "Triangle Method" for Estimating Surface Evapotranspiration and Soil Moisture from Satellite Imagery, Sensors, 7, 1612-1629, 2007.

Long, D., Singh, V. P., and Scanlon, B. R.: Deriving theoretical boundaries to address scale dependencies of triangle models for evapotranspiration estimation, Journal of Geophysical Research: Atmospheres, 117, DOI:10.1029/2011jd017079, 2012.

Lambin, E. F., and Ehrlich, D.: The surface temperature-vegetation index space for land cover and land-cover change analysis, International Journal of Remote Sensing, 17, 463-487, DOI:10.1080/01431169608949021, 1996.

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Sandholt, I., Rasmussen, K., and Andersen, J.: A simple interpretation of the surface temperature/vegetation index space for assessment of surface moisture status, Remote Sensing of Environment, 79, 213-224, DOI:10.1016/s0034-4257(01)00274-7, 2002.

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