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Discussions

Interactive comment on "Evaluation of global terrestrial evapotranspiration by state-of-the-art approaches in remote sensing, machine learning, and land surface models" *by* Shufen Pan et al.

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To Reviewer #1: General Response: We appreciate the reviewer for the positive comments. We have addressed all your comments and cited the references you recommended. Below are the reviewer's comments, followed by our responses and changes in manuscript.

*********** [Reviewer #1 General Comment] The authors provide a nice refresh reviewing global ET data products. Generally, it's a good literature review. Overall, however, the paper is excessively long and unfocused. Basically, the authors took a bunch of data products, calculated different comparative statistics, and discussed some pat-

terns. That said, the title accurately depicts the unfocused nature of the paper, so it should not come as a surprise. The authors did try to throw in some science by looking at controls over ET, but this only served to make the paper even longer and more spread thin. Moreover, this type of product review has already been done by Mueller, Jimenez and others, so the novelty here is light. The science focus and strength are mostly on the land surface models, while the remote sensing is noticeably weak (there might be zero ET remote sensing authors on the list of 15 authors). The balanced title does not reflect the unbalanced paper. In general, I liked the paper as a source for a lit review. [Response] We thank the reviewer for the positive comments. We admit that our paper is long. It is mainly because our study included a plenty of ET products of different types and we reviewed their principles, advantages, disadvantages and future directions. However, we think these descriptions and discussions are necessary because they give readers a comprehensive understanding in the strengths and limitations of each ET model and shows them possible solutions for overcoming the uncertainties identified in our analyses. As you stated, Mueller et al. (2011) and Jimenez et al. (2011) conducted analyses on different ET products. Nevertheless, the focus of our paper is different from theirs. Mueller et al. (2011) mainly focused on comparing IPCC AR4 ET estimates and observations-based ET estimates. Jimenez et al. (2011) mainly focused on the intercomparison of the seasonal variability of different latent heat, sensible heat and net radiative heat fluxes. Little discussion on the source of uncertainty and suggestions for future development was given in their papers. In comparison, our study emphasized on the analyses of uncertainty sources in different types of ET estimations and on the solutions for overcoming these identified uncertainties. In addition, our study incorporated ET estimates from fourteen state-of-the-art land surface models joining in the Trends and Drivers of the Regional Scale Sources and Sinks of Carbon Dioxide (TRENDY) Project, which is our strength over the previous studies. We want to clarify that although there is no ET remote sensing authors on the list of 15 authors, the parts regarding remote sensing-based physical models have similar length with that of land surface models and machine learning algorithms in the text. As a synthesis of ET estimates from different approaches, we didn't focus too much on either land surface models or remote sensing-based models. According to the references you recommended, we added citations and several sentences about the future development of remote sensing based ET models (in Section 4.2.1). "Most existing remote sensing-based ET studies focused on total ET, however, the partitioning of ET between transpiration, soil evaporation, and canopy interception may have significant divergence even though the total ET is accurately estimated (Talsma et al., 2018). In current remote sensing-based ET models, soil evaporation which is sensitive to precipitation events and soil moisture is the part with the largest error, therefore incorporating the increasing accessible satellite-based precipitation, soil moisture observations and soil property data will contribute to the improvement of soil evaporation estimation. Meanwhile, the consideration of soil evaporation under herbaceous vegetation and canopy will also reduce the errors." References Jimenez, C., Prigent, C., Mueller, B., Seneviratne, S.I., McCabe, M., Wood, E., Rossow, W., Balsamo, G., Betts, A., Dirmeyer, P. (2011) Global intercomparison of 12 land surface heat flux estimates. Journal of Geophysical Research: Atmospheres 116. Mueller, B., Seneviratne, S.I., Jimenez, C., Corti, T., Hirschi, M., Balsamo, G., Ciais, P., Dirmeyer, P., Fisher, J., Guo, Z. (2011) Evaluation of global observationsâĂŘbased evapotranspiration datasets and IPCC AR4 simulations. Geophysical Research Letters 38. Talsma, C.J., Good, S.P., Jimenez, C., Martens, B., Fisher, J.B., Miralles, D.G., McCabe, M.F., Purdy, A.J. (2018) Partitioning of evapotranspiration in remote sensing-based models. Agricultural and Forest Meteorology 260-261, 131-143.

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