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Earth System Dynamics
Discussions

Interactive comment on "Contrasting roles of interception and transpiration in the hydrological cycle – Part 1: Simple Terrestrial Evaporation to Atmosphere Model" *by* L. Wang-Erlandsson et al.

Anonymous Referee #3

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This manuscript studies various components of terrestrial evapotranspiration using the STEAM model developed specifically for this study. Unfortunately, the scientific goal of the manuscript is not clear and the reported results are not cohesive. Considerable amount of effort has gone into developing the STEAM model. However, I am not convinced that this model is absolutely necessary because the work could have been done using other models. For this work to be published in ESD, the authors must formulate a science question and simultaneously demonstrate that the STEAM model is necessary and it represents a significant advancement over current modeling capabilities.

Transpiration is a process that accompanies photosynthesis. Jarvis-type empirical schemes do not dynamically represent photosynthesis. Even though these schemes

perform well, they do so when calibrated/tuned with good data. The problem with tuned schemes is that often their predictive capability is poor especially when the climate regime changes. The authors have invested an enormous amount of hard work in developing this model. I am surprised that they chose to use a Jarvis-type scheme instead of a mechanistic scheme like Ball-Berry-Collatz that is based on photosynthesis.

The study ignores surface and subsurface hydrology. That is not desirable but OK because many models do not. However, I believe that all new models on ET should attempt to incorporate this feature because surface hydrology does play a role in ET by changing soil moisture availability, precipitation patterns through soil moisture feedback and by generating mesoscale circulations. At least a discussion of these issues is warranted instead of a blanket statement that these processes are not important.

Many parameters used in the model such as the area reduction factor, dry out parameter, 21 day timescale to calculate leaf area, irrigation efficiency, etc. are assigned arbitrary values. They may be reasonable but these must be supported by citations or physical justifications.

It is not clear if the root depth parameter is relevant in STEAM. Is vegetation seasonality solely represented by leaf area?

The authors correctly point out the limitations of the land use change experiments due to the lack of feedback from the atmospheric component of the hydrologic cycle. In that case, how robust/realistic are the changes in flux partitioning?

Interactive comment on Earth Syst. Dynam. Discuss., 5, 203, 2014.