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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.

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Dear Authors and editor

With great interest I read the discussion paper by Wang-Erlandsson et al. Unfortunately the paper makes the description of the evaporation process rather complex and difficult to follow. Perhaps because the processes are obscured by concentrating on stocks rather than on the physics of the fluxes themselves.

My main concerns are:

1) pg 211, ln19: because over 24 hours it is small, ground heat flux is neglected. The

former is true but the latter does not follow. Energy goes into the soil during the day, thereby making it unavailable for evaporation and releases it at night when stomata are closed and evaporation is zero.

2) Eq. 6. This equation describes the soil moisture decreasing velocity (as a combined effect of infiltration and evaporation). This highly empirical relationship is actually based on observations from just 3 locations in West Africa (Pellarin et al., 2013). In reality this relationship is also sensitive to solar radiation, wind speed, and the presence of vegetation amongst other things. I think scientific justification is needed here to apply such a locally derived equation at a global scale.

3) Eq. 7 to 10. I worry about this set of equations as they seem to ignore the need for energy to be conserved. The net radiation can only be used once. Is energy conserved in these equations when they are taken as a set?

4) pg 216, ln 18 and Eq 7: "The storage capacity determines the maximum water availability for the evaporation flux of concern." If I understand this statement and the Eq. 7 correctly the daily evaporation of intercepted water cannot exceed the canopy storage capacity? This can only be true if the evaporation during rainfall is zero. It is well established by measurement (e.g. by Bowen ratio and eddy-covariance measurements), and can be predicted by theory (i.e., the physics-based Penman-Monteith equation with above-canopy met data) that evaporation from a wet canopy is considerable (generally about 0.2 mm per hour). Thus, if I understand this correctly then it follows that the rest of the paper is based on a false premise and is therefore flawed.

I sincerely hope the authors could clarify these points and I'm looking forward to the authors' response

Best Regards

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References

Pellarin et al., 2013, A simple and effective method for correcting soil moisture and precipitation estimates using AMSR-E measurements, Remote Sensing of Environment, 136: 28-36.

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