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Hydrology and Earth System Sciences Discussions

Interactive comment on "An application of GLEAM to estimating global evaporation" *by* D. G. Miralles et al.

D. G. Miralles et al.

diego.miralles@falw.vu.nl

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We would like to thank Dr. Gerrits for her interest in our work.

Dr. Gerrits is correct in the sense that the interception is very sensitive to the value of S_c and it is a major assumption to consider one single value. However we are wary of introducing a simple dependence on LAI. Van Dijk et al. (2001) dealt with the growth of a single species, which is fine; but when comparing different species with different canopy/leaf characteristics the situation is not so simple: for example tropical rain forest has a high LAI but a relatively low S_c due to the water shedding properties of the leaves (drip points and the hydrophobic leaf surfaces). For simplicity, we decided to use the mean value of S_c = 1.2 mm taken from a sample of 21 studies that presented a rather low standard deviation of 0.4 mm.

We also believe that the validation of a global product of understorey interception loss would be hampered by the difficulties of in-situ measuring litter interception in forests. A higher S_c value could however be used to account for the non-consideration of understorey interception by the model. As pointed out before, the S_c value was derived from studies where only canopy interception was considered. We accept that understorey evaporation can contribute to the interception loss, but it is important to remember the low windspeed, low aerodynamic roughness and low radiation conditions near the forest floor will result in low evaporation rates. This may lead to violation of the assumption that the canopy dries out between storms which is a fundamental basis of Gash's model. For this reason we currently do not attempt to use Gash's analytical model for understorey interception; we only differentiate tall canopy rainfall interception. We acknowledge that at some point in the text it may not be clear that what we mean by "forest interception" is "tall canopy interception"; if that is the case we will correct this in the final version.

As stated in Miralles et al. (2010), due to the aerodynamic characteristics of forested ecosystems – which allows interception loss in forests to overcome several times the rates of transpiration – the interception from tall canopies needs to be dealt with independently from transpiration. In a simplified global model like ours, this may not necessarily be the case for other types of interception processes (like litter or short vegetation interception), as in those processes the rates of wet and dry evaporation present more similar rates. Perhaps this issue – together with the interception of snowfall – should be a subject of future research.

Regarding the tuning of Gash's analytical model; as we mentioned before the model runs with values of the state variables derived from a meta analysis of existing literature. In the case of the S_c, the value of 1.2 mm is (as Dr. Gerrits already mentioned) the average of 21 studies. We believe this could only be considered tuning if we were modifying the values of these static variables to obtain (for instance) better statistics in the validation of our estimates.

Finally, it is not our intention to evaluate the rain products in Section 3. We intend to evaluate how well the methodology estimates the water available for runoff (P-E). The only reason we apply two different precipitation products is the obvious dependency of the P-E estimates on the input of precipitation that is used to drive the model. We identify thus whether the scatter found in the comparison with discharge measurements responds to systematic errors in the parameterization of E by the methodology.

References

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