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Hydrology and Earth System Sciences
Discussions

Interactive comment on "Generalized combination equations for canopy evaporation under dry and wet conditions" *by* J. P. Lhomme and C. Montes

Anonymous Referee #2

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General

Technically, the paper is very well written, and the authors show a real mastership about their equations. The equations which do involve the "="-sign are flawless, and their assumptions are well explained.

Equations involving the "is about equal to"-sign are often obscure. The authors want to show in the end that the approximations may cause problems (see results section), but even so it remains to be explained why approximations are made in this and not in another way. For example Equation 16: this is said to be based on taking the harmonic means but that cannot be true, the same holds at other places where the "harmonic

mean" is invoked. It seems as if the choice between taking an arithmetic or harmonic mean is made ad hoc, trusting that the components are so similar, or at least correlating, that the exact method does not matter much.

Although the set up of each modeling method can be completely inferred from the text, there are so many methods that a reader can easily become confused. It is unsatisfactory that a reader has to go through all equations to know which assumptions are made for each method. It would be better if clear names could be given to the methods, expressing their properties; or if a table could be added to list the differences. Also, when figures are described, the methods behind them should not be indicated only by referring to equation numbers (like with figure 3), or only in the figure captions.

Most important, I am concerned about the significance of the paper in its present state, mainly because of its very one-sided emphasis on theory. It is tried to replace the modern method of calculating canopy fluxes layer-by-layer by the older (though not obsolete) method of using bulk resistances, but trying to accurately express the latter in resistances of vegetation/soil elements leads to difficulties which remain unsolved; on the other hand, approximate expressions yield systematic deviations in the resulting fluxes. All this is honestly highlighted in the conclusions, and it is admitted that much of this has been considered already long before. Some qualitative conclusions are drawn in the conclusions, which are however already commonplace in the cited (often old) literature. The translation to the world of the practitioner is hardly made. In my opinion, it should be tried to substantially enhance the significance by trying to translate the findings, so that relevant questions of hydrologists are answered, such as: how have bulk resistances that have been measured under certain circumstances (e.g. dry soil, dry canopy) have to be modified when applied under other conditions (moister soil, wetted canopy) ? And how should the errors be estimated ? Are the estimated improvements robust with respect to the uncertainties e.g. about the distribution of the available energy over the layers ? I understand that certain assumptions are hypothet-

ical, making quantification difficult, but even qualitative statements about the direction and significance of the corrections are a step ahead. The numerical exercises show that the authors already possess the tools to answer such questions to a considerable extent. The paper could be made more useful by further working out this matter.

Specific comments

C4 is a strange assumption (but this is not an essential point).

Figure 2: the fact that some experiments do and some don't take the soil contribution into account makes comparison difficult. It would seem more logical to compare canopy contributions without soil, and to evaluate on the other hand the importance of the soil contribution.

Figure 2: a and b should be reversed to get better consistence with the order in which they are discussed.

Technical corrections

At the end of the results section, figures 4a and 4b are sometimes referred to as 1a and 1b.

Interactive comment on Hydrol. Earth Syst. Sci. Discuss., 10, 10943, 2013.