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Hydrology and Earth System Sciences
Discussions

Interactive comment on "A site-level comparison of lysimeter and eddy-covariance flux measurements of evapotranspiration" *by* M. Hirschi et al.

Anonymous Referee #3

Received and published: 30 September 2016

General comments:

Hirschi et al. reports an intercomparison of eddy covariance (EC), lysimeter, and catchment observations of evapotranspiration (ET) from a small catchment in Switzerland. The description of the methodology and intercomparison is very thorough, and the results add a new ecosystem to this type of intercomparison (many previous lysimeter-EC studies have been on irrigated agroecosystems in semi-arid or arid regions). The study is generally well-written and presented. There is, perhaps, a bit too much emphasis on the EC error terms and too little discussion of the underlying site meteorology and vegetation of the lysimeter, EC footprint, and catchment as a whole. How does vegetation density and greenness in the EC footprint compare to the lysimeter and

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the overall catchment? How significant is advection in this site/region? Do you have larger differences between the EC and lysimeter under specific meteorological conditions (certain wind direction/speeds, time of day, vapor pressure deficit)? Including some of these comparisons will help contextualize your results against other comparisons such as BEAREX reported by Alfieri et al. and the earlier study by Ding et al. – see doi:10.1016/j.agwat.2010.08.001).

Some other comments: 1. I agree with Reviewer 2 that more results about G need to be reported. I realize that much of the meteorological data may have been reported in earlier studies, but I think you need to at least refer back to these data. 2. With respect to energy budget closure for the EC tower, you assume that canopy energy storage and energy storage due to photosynthesis are negligible. I do not share this assumption. Photosynthesis storage can be significant in productive grasslands and is not corrected by diurnal averaging. Canopy energy storage can be averaged out with daily energy balances. Correcting fluxes by energy balance on a daily basis can also significantly improve energy budget closure as reported by Leuning et al. (2012) and Anderson and Wang (2014 – see doi:10.1016/j.agrformet.2013.09.012). How do your EC ET calculations change if you use daily closure of energy fluxes instead of hourly closure?

Specific comments: Lines 42-45: Although you cannot review all of the previous studies, you should at least discuss how your study builds on them (new study region, longer time record, etc.). Some discussion of Alfieri et al.'s differences (and relationship to heterogeneity in vegetation), would also be good.

Line 105: "Relatively-large" is subjective here. Your lysimeter still only has a surface area of ∼0.8 m. I have worked with large weighing lysimeters with 8 m2 surface area.

Line 185: This is organized a bit awkwardly as you present your EC instrumentation and theory, then energy budget theory, then the G and Rn measurements in section 2.5. Might be good to add (see section 2.5) somewhere with G in this sentence so

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readers don't go back looking for details about the Rn and G instruments.

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