

# ***Interactive comment on “Terrestrial Water Loss at Night: Global Relevance from Observations and Climate Models” by Ryan S. Padrón et al.***

**Anonymous Referee #3**

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The paper is handling an important topic in ecohydrology – the nocturnal water loss of ecosystems. The tools used in comparison are appropriate but not convincingly comprehensive. The processes that might cause differences in derived NWL between EC measurements and modelled data should be investigated more thoroughly by diving e.g. into variable footprints, processes handled in the models, gap-filling problems for ET from EC during night, and general night-time problems present in EC data. I clearly would desire uncertainty estimates for NWL especially as we are dealing with very low fluxes. Fortunately, NWL can only take place under well mixed conditions which gives trust in the nocturnal EC data used for the analysis. But we have to consider that ET (measurements and post-processing) has unfortunately hardly been the main focus of the FLUXNET data set. So we should be aware that so far we do not have well estab-

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lished gap filling procedures for ET at night, especially under stable conditions. Thus, the paper lacks uncertainty estimates for the nocturnal fluxes determined by EC.

Specific comments: Introduction: What are the processes causing nocturnal water loss? Which kind of energy is converted into ET at night? And why is it so important to deal with? It should be mentioned that a water loss is accepted (during day-time) by gaining carbon. Is there any advantage for the plants or the ecosystem to loose water at night? Or just no possibility to avoid? The authors mainly summarize previous work here. Page 2, Line 18/19: 'Both ET and dew correspond to a latent heat flux and can prove difficult to disentangle depending on the temporal resolution of the data.' These fluxes are in opposite direction, even if the net ET might comprise a combination of both, for energetic reasons these processes hardly occur simultaneously. Could you describe more clearly what exactly is meant?

Page 3, Line 21: if weight increase without rain measured is considered as rain or snow, we have to ask how reliable are the rain measurements? Or otherwise you should provide any further explanation for the procedure. And maybe the frequency of occurrence or the amount of water switched from dew to rain.

Page 3, Line 27ff: we have to consider that ET has never been the main focus of the FLUXNET data set. This statement should not imply that all ET data from FLUXNET are less reliable. But we should be aware that so far we do not have well established gap filling for ET at night, especially under stable conditions. Fortunately, NWL can only take place under well mixed conditions which gives trust in the nocturnal EC data used for the analysis. Most probably the majority of the data used for the analysis were measured anyway. But it would be quite interesting to see the relation of measured and gap-filled data used for the data-analysis, not only for the Rietholzbach site but also for the FLUXNET analysis. This information gives also a hint related to the uncertainty of the derived nocturnal fluxes.

Page 4, Line 8: for night-time data? Page 4, Line 14-15: move this sentence to the

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acknowledgements, even though appreciated by myself

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Page 5, Lines 4ff: this section should be improved by quantitative uncertainty values.

Page 6, Line 14: '...across sites cannot easily be explained by annual average....'

Page 7, Line 1: can you be sure that EC data are reliable under 'snowy and windy conditions'? EC assumption might not be fulfilled, sonic data are often disturbed under such conditions.

Page 10, lines 1ff: for EC estimates no uncertainty is considered. How large are the uncertainties related to the fluxes under consideration? Page 11, lines 5ff: here it is correctly said that nocturnal measurements can be affected by low-turb conditions. But nocturnal fluxes are not treated by the energy-balance correction, as also correctly said before. In the discussion part, also the uncertainty of EC data should be discussed.

Figure 1, caption: should include the site name Figure 2: caption to be extended. What exactly is show? Always consider that reader often concentrate on the figures of a paper only and thus need more information. In addition, in c), the colours of the tiny dots are difficult to distinguish with normal page size. But I also fear, this is not a 'spatial distribution' but rather a 'distribution of sites with ....'

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