

Interactive
Comment

***Interactive comment on* “Decadal water balance of
a temperate Scots pine forest (*Pinus sylvestris* L.)
based on measurements and modelling” by
B. Gielen et al.**

B. Gielen et al.

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Received and published: 3 February 2010

We would like to thank the referee for the thorough review of our manuscript and for her/his constructive and helpful critique. Below are given our answers (A) to the referee's comments (C). We copied the comments and answered each comment separately.

C: I suggest to change the title from Scots pine forest to a mixed coniferous/deciduous forest because in my point of view the footprint of the EC measurements at the given height should be much larger than 2ha only.

A: We agree with the referee that the footprint of the EC fluxes comprises not only
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pine forest but also has smaller contributions of surrounding deciduous forest, especially during low turbulent conditions. However, we prefer not to change the title because all other approaches are based only on the Pine forest. Furthermore it is clearly mentioned in the discussion that there is contribution of other forest types in the EC based estimate and that this could cause a deviation between the EC and the other approaches.

C: Furthermore, I can't follow the decision not to do the latent heat flux correction using the energy balance closure gap according to C3361 Amiro (2009). In the conclusions of Amiro (2009) one of the statements is: "However, experience at other sites with poorer energy closure indicate that the residual may over-estimate ET by about 5%, which adds some uncertain bias." In my point of view an overestimation of 5% is better than an underestimation of up to 37% (acc. to the energy balance closure of 63%). On an annual or monthly basis a possible approach of the latent heat flux (LE) correction could be the partitioning of the energy balance closure gap according to the bowen ratio (br) and the correction of LE as follows: $LE_{corr} = LE + (1/(1+Br)) * \text{closure gap} * \text{available energy}$ with LE_{corr} - corrected LE; LE - uncorrected LE; Br - Bowen ratio. This could be a better EC based ET estimate than LE itself or AE-H (difference of available energy and sensible heat flux). At least I think the energy balance closure gap should be regarded as the main reason for the differences of EC based ET and modelled ET.

A: We would like to thank the referee for this comment. We implemented his/her suggestion in the manuscript and corrected the ET fluxes measured by eddy covariance by for the energy balance closure problem according to the Bowen ratio as suggested. The new estimates were inserted in the figures and the MS was changed according to the new results.

C: The labelling and legends of Fig.6-10 are too small.

A: Done

C: P10523L19: "16m a.s.l.":

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A: Done

C: P10524L11: “gaseous concentrations”

A: Done

C: P10528L16-17: declare the biomass and soil values used for the model

A: We added the biomass and soil C values resulting from the spinup runs in the MS. We mention only the total living biomass and the total soil carbon. Details of the different simulated pools (wood, leafs, above and belowground, roots, litter pools, mineral soil pools) are also available, but we think it is beyond the scope of this paper to mention all these details.

C: Which consequence has a change of the 2mm value to e.g. 1mm or 3mm?

A: We simulated ET again with ORCHIDEE and changed the minimum rainfall event in summer to 1 mm and 3 mm. Results show that there was not much change in ET on yearly scale. Total yearly ET changed about 3% on average. It decreased with increasing rain intensity, probably due to decreased canopy evaporation. Since this change was not significant we did not change anything to the MS.

C: P10540L1: “Grünwald” instead of “Grunwald”

A: Done

C: Tab.1: indicate the time step (based on annual values) Tab.2: indicate the time step (based on annual values)

A: Done

C: Fig.4: based on daily values or mean monthly values like in Fig.5?

A: These are based on daily values from 120 day measurement period in 2001 as stated in the Field measurements paragraph. We clarified this again in the figure caption.

C: Fig.6: “without” instead of “sans”

A: Done

Interactive comment on Biogeosciences Discuss., 6, 10519, 2009.

BGD

6, C4270–C4273, 2010

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