

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.

Anonymous Referee #2

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This paper presents a nice and unique data set. Moreover, the topic of water balance of forests is still poorly documented, especially its interannual variation over long periods. Predicting water balance under changing climate is an important challenge which is addressed in this paper.

First, there is a point that I do not understand well: why using the model WATBAL in this study? If the aim was to quantify its performance, this point is not really discussed here. Does the low performance of this model comes from the use of Thornthwaite potential evapotranspiration which is less realistic than Penman or Penman-Monteith formulas, moreover when calculated daily instead of monthly?

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Very few is said about rainfall interception, which is often high in coniferous stands, except that the model SECRETS calculates it. What about ORCHIDEE: is there a rainfall interception routine in this model? Also, is the interception flux included in ET (equation 1)? I am not very confident in the accuracy of the eddy covariance technique for measuring rainfall interception: this could be a source of deviation between eddy covariance measurements and models.

Even there is a nice agreement between two models (SECRETS and ORCHIDEE) and the stand-scaled sap flow (Fig. 4), the authors found a discrepancy under low transpiration condition. Before explaining this behaviour by a capacitance effect, the first step would be to compare sapflow and ET as measured by eddy covariance. According to what will be found, a capacitance effect can be suspected.

Another point is the proportion of transpiration to ET, which is supposed to come from soil plus understorey vegetation; quite abundant literature on this question is cited in the discussion (p 10534). The effect of tree LAI on understorey evapotranspiration has to be more clearly stated: the large range of T/ET is probably due to that of LAI. In the investigated stand, LAI is particularly low (ca. 1.8) and induces a low T/ET ratio.

I agree that nice relationships cannot be found on annual values between ET and its climatic drivers. Besides the fact that the “dormant” season could weaken the relationships, the range of variation of radiation, temperature and vpd shows a low interannual variability. But why not try to study those relationships on daily or monthly values?

Minor comments:

- The first sentence of the abstract is not very informative and quite nebulous: I suggest the authors to remove it.
- Is the word “empirical” (§2.2.4) most appropriate for field measurements?

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