

# ***Interactive comment on “Net ecosystem exchange of carbon dioxide and water of far eastern Siberian Larch (*Larix dahurica*) on permafrost” by A. J. Dolman et al.***

## **Anonymous Referee #4**

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### GENERAL REMARKS

The paper is interesting and original. The data are highly valuable and were certainly difficult to collect. The relevance of the study is obvious and well motivated in the introduction. The paper is well written and clear, the figures are relevant and of good quality.

The colour surface figures are clearly illustrative, but for a quantitative visualisation, additional time series for half-hourly or diurnal values of fluxes and driving variables would be desirable. This is especially important with respect to black-and-white copies of published material that will remove essential information from the colour figures.

The introduction section should be shortened somewhat, comparisons with other references should be moved to the discussion section. With a more careful treatment of the night time correction and some minor changes according to the specific comments

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below, I recommend publication of the paper.

## SPECIFIC REMARKS

p. 276, l. 6: What is maximum uptake and respiration? Are these daytime and night time fluxes, respectively, or was the net flux decomposed into gross uptake and efflux?

p. 276, l. 19: By which means was net ecosystem uptake normalized?

p. 278, l. 7: I assume that annual evaporation (mm y<sup>-1</sup>) is meant

p. 278, l. 12 ff: The comparisons should be moved to the discussion section

p. 280, l. 12: What is meant by “absolute minimum”? During what time period, and what is the average time of the value?

p. 281: Was any gap-filling applied? In that case, on what fraction of the time series?

p. 281, l. 7: “net ecosystem CO<sub>2</sub> flux” would be more informative

p. 281, l. 15: Fig. 1 does not show daily, but half-hourly values. If the energy balance is considered on a 30-min basis, energy storage in the air and the canopy has to be taken into account. To avoid that, I would recommend daily means or cumulative fluxes instead.

p. 284, l. 10 ff: If a correction during stable night time conditions is applied, the relation between normalized night time CO<sub>2</sub> fluxes and the friction velocity should be shown and the  $u^*$ -threshold should be mentioned and motivated.

I do not quite understand the “second method”. Why should there be a linear relationship between fluxes during stable and non-stable conditions? I would prefer a single-level estimate of CO<sub>2</sub> storage as a lower limit, which would be a rather good approximation considering the fact that the canopy is relatively open.

However: monthly or seasonal estimates of NEE must not be “ustar-corrected” in this way! Especially if there are no catabatic flows or other “leaks” in the system, the “prob-

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lem” of reduced night time fluxes consists of storage, which averages out on the long term, and possibly minor additional “real” mechanisms. Introducing a ustar-correction will overestimate the ecosystem efflux by selectively including the reduced uptake in the morning that is due to a consumption of the accumulated CO<sub>2</sub>. Furthermore, occasional flushes of stored CO<sub>2</sub> out of the canopy in the morning will be measured and thus double-counted if the night time fluxes were replaced by a model. Suggestion: (1) estimate storage from the LI-6262 data, (2) plot normalised night time CO<sub>2</sub> flux + storage against ustar, (3) use uncorrected fluxes for NEE estimates.

p. 285, l. 5 ff: How was the evaporation measured, by the krypton hygrometer or the LI-6262? If both, were there significant differences?

p. 286, l. 25: A figure on the Bowen ratio would be nice

p. 288, l. 10 ff: In fig. 6 a and c, the extreme values at high canopy conductances should be commented.

p. 288, l. 12: The approximation should be referenced or explained.

p. 290, l. 2: Which year is referred to?

p. 290, l. 4: I assume that the difference between the two methods is meant. Applying the correction or not affects the NEE by more than 40 %.

p. 290, l. 8 ff: Units should be used more consistently - grams or moles or both.

p. 290, l. 19: Comparison might be moved to the discussion section.

#### TECHNICAL REMARKS

p. 278, l. 28: “then” should be “than”

p. 281, l. 12: “van der Molen et al.”

p. 288, l. 7: “20001” should be “2001” (Time is flying, but not that fast!)

p. 294, l. 1: “arguable” should be “arguably”

p. 295, l. 12: Ref. Adger et al. is not referred to.

p. 296, l. 14: Ref. Georgiadi et al. is not referred to.

p. 296, l. 28: Ref. mistyped

p. 307, fig. 6: (b) and (d): unit for vapour pressure deficit: format “-1” as exponent, (c) and (d): unit for NEE missing, (d): latent heat flux with Greek letter, unit missing.

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