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## ***Interactive comment on “Forest floor CO<sub>2</sub> flux measurements with a dark-light chamber” by H. J. M. Lankreijer et al.***

### **Anonymous Referee #1**

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Lankreijer and coworkers reports on the design of a canopy gas exchange chamber that allow successive measurements of net CO<sub>2</sub> assimilation and respiration during day time by changing a transparent chamber for an opaque one. They were then able to compare estimation of day time respiration extrapolated from night fluxes or measured during daytime with the opaque chamber. They showed that there is in one site a difference of gross photosynthesis computed from the two methods, but not in another site. They also reports the contribution of the photosynthesis of forest floor vegetation to net ecosystem exchange, which is far from being negligible in boreal forests.

According to the title, this is mainly a methodological paper that reports the design of a chamber. As recognized by the authors, the approaches used in very classic (closed

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circuit and periodic darkening of a transparent chamber to estimate successively FNEE and daytime respiration. The major improvement is that the light dark transition has been improved (automatic transition). I am not convinced at that point that it fits the editorial policy of BG. In addition, there is only few description of the chamber. Is the vertical part of the chamber (30cm height) transparent? If yes, how was it darkened? How was the dark cover design and move? If the vertical parts are opaque, what about shading of the included vegetation when the sun is not high in the sky (which is important in boreal latitudes). A scheme will be appreciated.

Hopefully, there are not only the methodological aspects in the paper but also some data that are analysed. The title doesn't reflect that and the objective in the introduction might be reformulated to put emphasis on the scientific question rather than on the tool. The way of analysing the data is very classical.

The spatial coverage of the data (3 plots) and the temporal coverage (6 to 9 days) in Hyttiala is not sufficient to obtain a clear picture of seasonal and spatial trends in FNEE, gross photosynthesis and forest floor vegetation that would be required for comparison with forest NEE, which would be a nice objective. There is no indication of the sampling scheme for Norunda forest but it seems to be worse.

The comparison of the two methods for estimating gross photosynthesis of forest floor vegetation requires a statistical analysis (P15L27).

The conclusion over interpreted the data: 1. Improvement of analysis of the role of ground vegetation will require much more measurements 2. How can we know that we got good estimates of gross assimilation by ground vegetation? 3. The underestimation of gross assimilation computed from night time respiration is not statistically demonstrated, and there is no convincing argument to conclude that daytime dark respiration gives better estimation than night time respiration.

In conclusion, the authors have developed a promising tool for measuring both photosynthesis and respiration of forest floor vegetation, but much more data are needed to

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compute a spatially and temporally relevant carbon budget of this ecosystem compartment. I would like to encourage the authors to do that.

#### Additional comments

P2L8-10: not very clear. Should be reformulated P2L14: Mention that the work is conducted in boreal forests P5L24 : not needed. The system design by the author and the analysis of the data they presented doesn't separate respiration into these 3 components.

Give confidence intervals of estimated parameters in Table 1 and 2.

Due to the depth of the organic layer, soil water content at 5 cm was measured in this O horizon. How does the thetaprobe work in this kind of soil? I would recommend the author to perform their own calibration (but its is not so important for this paper).

Soil temperature was measured at -5cm but one may think that air temperature will have a stronger influence on forest floor respiration. It might explain the low R2 for Arrhenius plots in Hyytiala (summer data) and Norunda during summer. Indeed, respiration of vegetation may dominate forest floor respiration in summer (or even control belowground respiration through carbohydrate transfer belowground). Air temperature should be measured in the future.

Not clear in Fig 2 and 4 if it includes night respiration or only daytime dark respiration

My English is not so good but I feel the manuscript can be improved.

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**BGD**

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