

Potential of carbon uptake and local aerosol production in boreal and hemi-boreal ecosystems across Finland and in Estonia

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This manuscript explained and researched the CO₂ uptake and local aerosol production at different types of stations in Finland. Authors analysed each NEE and N_{neg} characteristics at each station and compare between them. Introduction is very persuasive and interesting why this study is necessary. However, the way to describe the result of experiments is not kind to the readers. Result was simple and it seems like lack of discussion. I also wonder whether the conclusion gives the answer to the question in the Introduction section. Hopefully authors read the manuscript carefully with reader's view and revise/describe them explicitly.

General comments

1. Title mentioned 'boreal and hemi-boreal ecosystem' but all manuscripts are not linked to boreal and hemi-boreal region. Authors did not explain which site is belonging to boreal or hemi-boreal. According to the category in Table 1, there are forest, agricultural, peatland, urban garden and coastal area. It was hard to match to the title. Authors should consider how to make this manuscript well match to the title and more interesting.
2. Authors did not make station ID and mentioned the station name directly (Table 1). But readers are not familiar with Finish and hard to follow up what type of station with only station's names. Hope authors reconsider the way to explain station' name.
3. In many paragraphs, authors did not suggest table/figure # but also values. For example, L367-369: *The momentary net CO₂ uptake rate at midday in summer was highest in agricultural fields, followed by the forests. The urban garden in this study displayed distinct net CO₂ uptake, lower than the forests and higher than the open peatland.* Next to the highest, it needs value. Lower than or higher than, authors can suggest certain values. Without certain values, all explanations such as "lower than, higher than, highest, similar" are very boring and insufficient to deliver what authors would like to say.
4. Hope authors can describe the sufficient reason after the result, for example, in section 3.3. This is scientific paper not a report.

Minor comments

1. L58: Rätty et al., 2023 was not on the reference list.
2. L86: long-term datasets. What's the definition of 'long-term' here? Only long-term datasets are from Hyytiälä station and others are less than a decade.
3. Table 1: Between the category (such as Forest and Agricultural) it would be good to have a line.
4. Table 1: Hope station name can be reconsider. Especially Hyytiälä station is 'reference station', used everywhere but in the forest category. Author can name stations with their characteristic.
5. Table 1: Location. Hope author can add height of each station.
6. L133: *at same heights*. Please add values.
7. L137: *Diameter range*. Does it mean particle size?
8. L140: *The data were cleaned*. What does it mean? Does it mean 'filtered' or 'selected'?
9. L142: *total particle concentration*. Is it mass concentrations or number concentrations or others?
10. L151: *their footprints are constrained within the ecosystem scale*. Don't authors think that it can be differed according to the height of station?
11. L153: *outside the active hours of the ecosystem, were taken as the background concentration at each site*. This sentence is conflict against L352-357.
12. L194: *tower*. Hope to add the tower height.
13. L203: *interference*. What kind of interference?
14. L205: *fields*. What is the possible source to affect on data?
15. L226: *In the other seasons, the urban garden area was a net source of CO₂ most of the time, similar to the results previously reported for the years 2006-2010 from the same site (Järvi et al., 2012)*. Most of section did not explain the reason. Why is that?
16. Figure 2-4: Why did authors add 50th and 25th graph? It would better to add median with standard deviation to see the variation of the values since experimental periods are different at each station.
17. L237: *In the case of agricultural fields in summer (Figure 3), the Haltiala site had higher momentary net CO₂ uptake than the other two agricultural sites*. Why don't authors add specific value for 'higher than' precisely?
18. L239: *Qvidja was a CO₂ sink during daytime with a similar uptake rate to the Hyytiälä forest*. Add specific value and figure #.
19. L240: *The different plant species (Table 1) and management activities between the agricultural fields likely caused the differences in their seasonal CO₂ fluxes*.
This is very confusing to readers. In table 1, authors mentioned of plants type but not management activities. I confirmed that it was described in the section 2.1, it would be good to add table 1.

20. L294: *The median values of N_{neg} in the daytime in spring were higher than those in the Haltiala and Viikki croplands, Siikaneva peatland, and Kumpula urban garden area.* I cannot understand what this sentence means.
21. L296: *summer median values were higher.*
Please finalize the sentence. Higher than what?
22. L338: *The application of fertilizers in agricultural fields is known to remarkably increase the atmospheric concentration of ammonia (NH_3).* This sentence seems to be generalized to all stations. Please add specific type of regions.
23. Figure 9: I cannot understand the meaning of bar in Figure 9.
24. Table 2: There is no explanation of 'c' (superscript) and there is no 'b' in the table.
25. L409: Summary and conclusions or only summary?
26. L416: What are 10 stations belonging to hemi-boreal station? Why did not author define 'hemi-boreal' and 'boreal' in the manuscript?
27. L421-423: Why didn't authors add the reasons?
28. L431: What's the difference between reference station and background station?
Please add the definition.