

Interactive comment on “Atmospheric N deposition causes carbon balance gains in a seven year field experiment in subalpine grassland” by Matthias Volk et al.

Anonymous Referee #2

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General comments This was an interesting paper which is well written and falls clearly within the scope of Biogeosciences. While interpretation of the data and the logic leading to the authors' conclusions were clear, some parts of the paper did suffer because the statistical results were not strong. In particular, the parts concerning the response of NEP and SOC to N addition treatments were weak because no significant responses were observed at $P < 0.05$. The shape of the data do support the interpretations made, but the authors somewhat gloss over the lack of strong statistical support. I would like to see more information about why the authors thought those responses were not clearer. That said, the discussion was interesting and the results of the study add usefully to work in this area where studies with realistic N deposition treatments are

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relatively few.

Specific comments 1. Title: I'm not sure that the title is well supported by the results of your study, sure N deposition caused an increase in plant C yield, but you don't actually have significant results for NEP or SOC. 2. Abstract line 10-12. Your hypothesis is not clearly communicated here. What do you mean by a mature ecosystem? Does 'air pollutants' refer to both N and O₃? And its not clear what 'develop in parallel' means. The hypotheses need more explicitly and clearly stating. 3. Abstract line 13. Cumulative plant yield needs quantifying in the abstract. 4. Abstract line 15. SOC response was also non-significant. 5. Abstract line line 18-20. This conclusion is not really based on the evidence presented in the paper – need to make that clear. 6. Page 2 line 4. N deposition is lower at high altitude in the alps, but this is not general across other mountain ranges. 7. Page 2 line 14. What is the relevance of CO₂ enrichment here? N deposition can increase decomposition without it. 8. Page 3 line 9-17. Hypotheses could be stated more clearly. They would read better as 3 hypotheses: 1. Annual NEP would be positively correlated with temperature. 2. SOC in control plots would be unchanged over 7 years (steady state), 3. Productivity, NEP, SOC would show consistent positive response to N input and negative or zero response to O₃. 9. Page 4 line 20. How did you get from dry matter to g C m⁻² using individual plant species C measurements? This needs more detail. 10. Page 6 line 15. You mention that the years vary in both temperature and moisture, do you have data to support this? If so it would be useful to see this in figure 1. Were relationships between C fluxes and soil moisture also considered as well as temperature? 11. Page 8 line 8. There were no significant differences between N treatments so you need to be cautious here about how you interpret this and clear about how much evidence you have.

Technical corrections 1. Page 2 line 22 Check parenthesis around references 2. Page 3 line 17. Delete 'typical in the context of a global change scenario'. 3. Page 3 line 28. Check parenthesis around references 4. Page 4 line 6. Would read better as 'applied

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bi-weekly as ammonium nitrate (NH₄NO₃) solution... 5. Page 6 line 20-21. These values are already given in the figure so don't need to be replicated. 6. Page 6 line 26-28. Values replicate the figure 4. 7. Page 7 line 6. I know this is a point of discussion but I'd regard a P=0.09 as indicating a trend rather than 'marginally significant'. 8. Page 10 line 25. The final conclusion needs a sub-heading.

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