

Interactive comment on “Soil carbon, available nutrients, and iron and aluminium crystallinity vary between boreal closed-canopy forests and open lichen woodlands” by Carole Bastianelli et al.

Anonymous Referee #1

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General comments

This paper examines the differences in soil properties between two forest ecosystems in north eastern Canada and draws conclusions as to the likely drivers of these differences. The authors conclude that the observed differences in soil properties can be largely attributed to the impact of different vegetation cover, which in turn is related to changes in the frequency of forest fires over the past millennia. The paper is very clearly written, the results are clearly presented and the discussion is well argued and supported by literature.

Specific comments

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1. Does the paper address relevant scientific questions within the scope of BG?

The paper clearly addresses scientific questions that are within the scope of the Biogeosciences journal and will be of interest to the journal readers.

2. Does the paper present novel concepts, ideas, tools, or data?

The paper is well founded on the existing understanding of soil paedogenesis and the factors driving the variability of soil physical and chemical properties. The paper concludes with a clear and enlightening synthesis of the detailed findings, which are presented in a clear conceptual diagram. This new conceptual framework is an important contribution as it opens the way for further hypothesis testing in subsequent research.

However, on initial reading, the novelty of the paper is not clear from the outset. On page 5, lines 21-23 it is stated that ‘This experimental design was conceived for further investigations linking soil and lake sediment composition at the watershed scale. Indeed, it corresponds to the first step of a paleoecological investigation aiming to retrace the opening of the landscape over time using geochemistry analysis from lacustrine deposits.’ If this paper is a first in a series and provides a methodological underpinning to subsequent work, I suggest that this should be brought to the readers’ attention at the outset so that the purpose of the work is clear from the beginning.

3. Are substantial conclusions reached?

Substantial conclusions are reached in respect of the influence of vegetation on the development of soil properties and the consequences of these changes for forest management and soil carbon sequestration.

4. Are the scientific methods and assumptions valid and clearly outlined?

The scientific methods are clearly outlined. However, I would propose to include additional Figures in the paper that would i) clearly show the location of the study site within Canada/North America ii) show a schematic of the experimental sampling design and

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particularly the different methods of sampling individual soil horizons (mentioned in the Methods section page 6, lines 0-11)

5. Are the results sufficient to support the interpretations and conclusions?

Yes

6. Is the description of experiments and calculations sufficiently complete and precise to allow their reproduction by fellow scientists (traceability of results)?

Methods could be further clarified on page 6, lines 0-11. How were soil samples collected from the mineral B and C horizons? What was the diameter of the soil auger used? How was bulk density calculated – presumably this was only done for the volumetric samples?

7. Do the authors give proper credit to related work and clearly indicate their own new/original contribution?

Yes

8. Does the title clearly reflect the contents of the paper?

The title could be made more interesting/dynamic, reflecting the purpose and the research in respect of the most interesting conclusions that only become clear at the end of the manuscript. These include significant conclusions pertaining to the vegetation/soil interactions, forest management and the implications for soil carbon stocks and global change.

9. Does the abstract provide a concise and complete summary?

The abstract does not fully make clear the novelty of this work. In fact, the novelty only becomes apparent after a thorough reading of the full manuscript. I suggest that the authors bring forward their most important conclusions and include these in the abstract and ideally also more clearly prime the reader to the purpose of the work at the end of the Introduction.

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10. Is the overall presentation well structured and clear?

Yes

11. Is the language fluent and precise?

Yes

12. Are mathematical formulae, symbols, abbreviations, and units correctly defined and used?

Yes

13. Should any parts of the paper (text, formulae, figures, tables) be clarified, reduced, combined, or eliminated?

No

14. Are the number and quality of references appropriate? Yes

15. Is the amount and quality of supplementary material appropriate?

Yes

Technical corrections

Page 4, line 25 – can you please specify the size of the study sites?

Page 6, lines 3-5 sentence 'They were composed..' should perhaps be part of the results, rather than methodology?

Page 12, line 2 – should read 'did not find'

Page 12, line 3 – can you please give some examples of references after the statement 'in line with those of other studies'

Page 13, line 11 – should read 'environmental conditions'

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