Biogeosciences Discuss.,
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Biogeosciences Discussions
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Interactive comment on "From fibrous plant residues to mineral-associated organic carbon – the fate of organic matter in Arctic permafrost soils" *by* Isabel Prater et al.

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Dear Referee #1,

We thank you for your kind and helpful comments on our manuscript and we really appreciate that they helped to further improve it. Please find our answers below, we also added the respective line numbers of the updated manuscript to improve the traceability:

- line 45: please check the reference (should be Frank et al., 2012)

Thank you for this hint, the reference reads now Frank et al, 2012 (l. 51).

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- lines 58-59: the sentence should come before, the warming climate is already mentioned lines 38-39 for example

As recommended, we moved the sentence (l. 43/44).

- lines 75-78: please clarify your objectives, the “physical fractionation” is an approach and not an objective

We rephrased the sentence to clarify that the detailed insights into chemical composition and stabilization mechanisms of SOM are the objectives and not the fractionation itself (l.80-86).

- line 81: add “Siberia” somewhere

We added "Siberian" (l. 89).

- line 98: add “electric conductivity (EC)” to be consistent with line 117

Thank you for the remark, we added (EC) (l. 109).

- line 162: “to detect correlation”: check the sentence, statistically a correlation is quantified and not “detected” using a plot

We changed "detect correlations" to "identify interrelations" (l. 173).

- line 179: the data could be presented with cumulative area charts for each profile and each element (C and N) to illustrate the proportions of each fraction by depth (in supplement)

We thank you for this remark; it is always good to explore better ways to visualize data. We tested the cumulative approach, but decided to stick to the table as we think that a graphical depiction would be redundant.

- lines 221-222: move to the discussion

We moved this part of the sentence to l. 338/339.

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- line 271: “considerable amount of N” compared to what?

We changed "considerable" to "noteworthy" (l. 284) as this expression works without comparison. We do not aim at comparing the values; we want to show that the N content should not be neglected.

- line 283: change “C:N” to “C/N”

Thank you for this hint, we changed it accordingly (l. 296).

- line 340: change “dinitrogen” to “N2”

To meet both this recommendation and the recommendations of the co-authors, we changed this part to "nitrous oxide (N2O) and dinitrogen (N2)" (l. 365).

- figure 3: use “I” and “II” instead “a” and “b” to be consistent with the figure 2

We reworked all our figures according to your suggestions and we appreciate that you helped to clearly improve them. We changed the captions and labels accordingly, used a consistent color code for all figures (that should also work for people with color vision deficiency) and took care of a much better quality.

- figure 4: the quality is too bad, be consistent with fig. 2-3, use indication of x log-scale (and not just 10 and 100 that are not indicative, add minor gridlines for example), use the same color code as in figure 5

We changed it accordingly, see comment above (figure 3).

- figure 5: change the labels in the PCA to be in agreement with the text (C/N, a/o a ratio, etc.)

We changed the figure, see comment above (figure 3).

- figure 7: same comments as for the Excel plot in figure 4

We changed the figure accordingly, see comment above (figure 3).

- figure 8: I do not understand the point of adding both PCA and correlation matrices. I suggest to keep either the PCA, including individuals (as done in figure 5), or correlation matrices only.

We decided to follow your suggestion and left only the correlation matrices in the manuscript as we are convinced that those help best to illustrate the differences between large POM fractions and oPOMs fraction.

Interactive comment on Biogeosciences Discuss., https://doi.org/10.5194/bg-2020-52, 2020.

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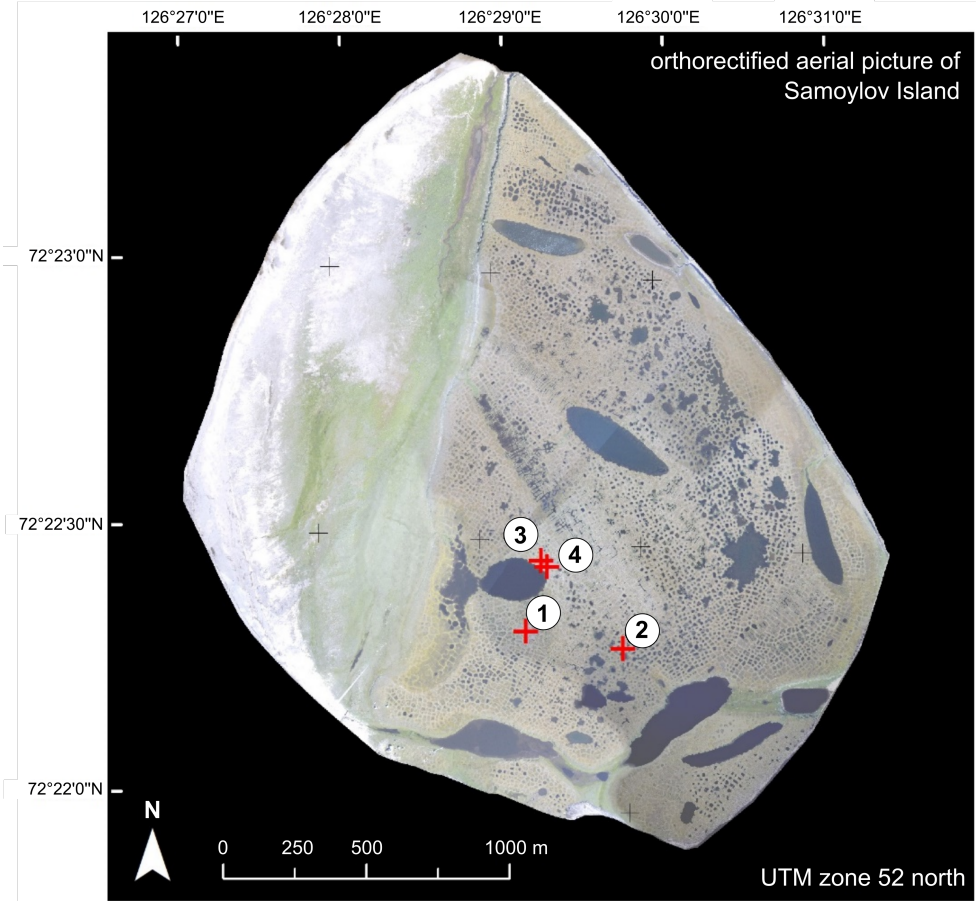

Fig. 1. On this aerial image of Samoylov Island, the separation between the floodplain in the west (with the white unvegetated sandy sediment) and the Holocene terrace on the eastern part (with blue-grey spot

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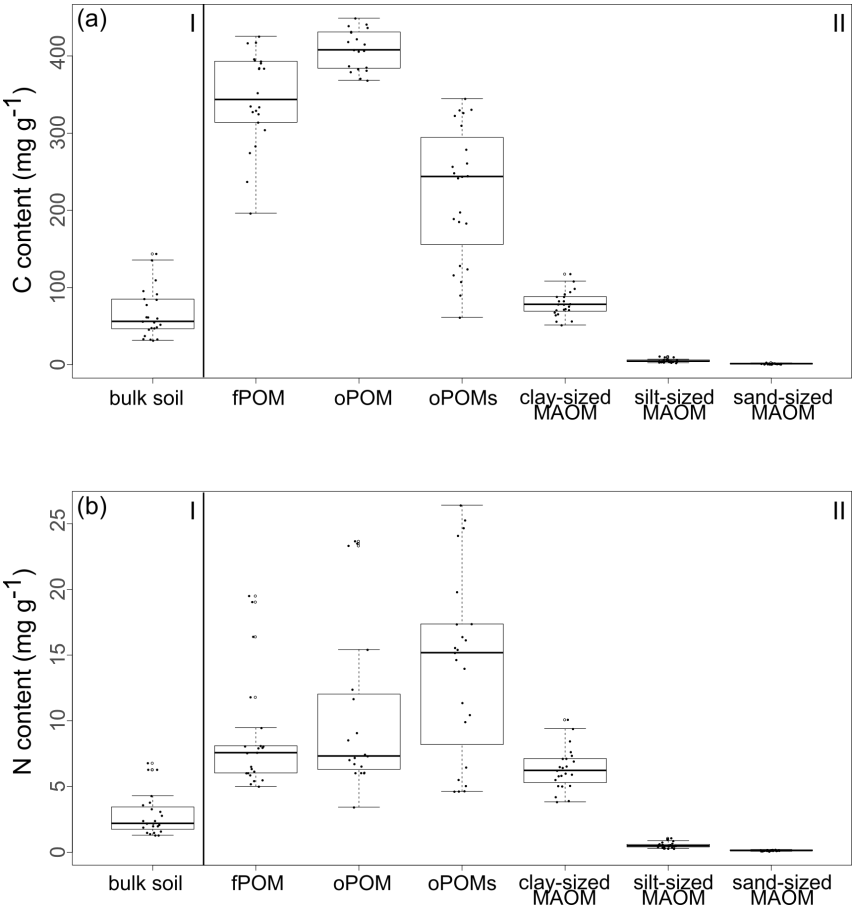

Fig. 2. The content of C (a) and N (b) of bulk soils (I) and SOM fractions (free particulate OM (fPOM), occluded particulate OM (oPOM), small occluded particulate OM (oPOMs) and clay-sized mineral-associated

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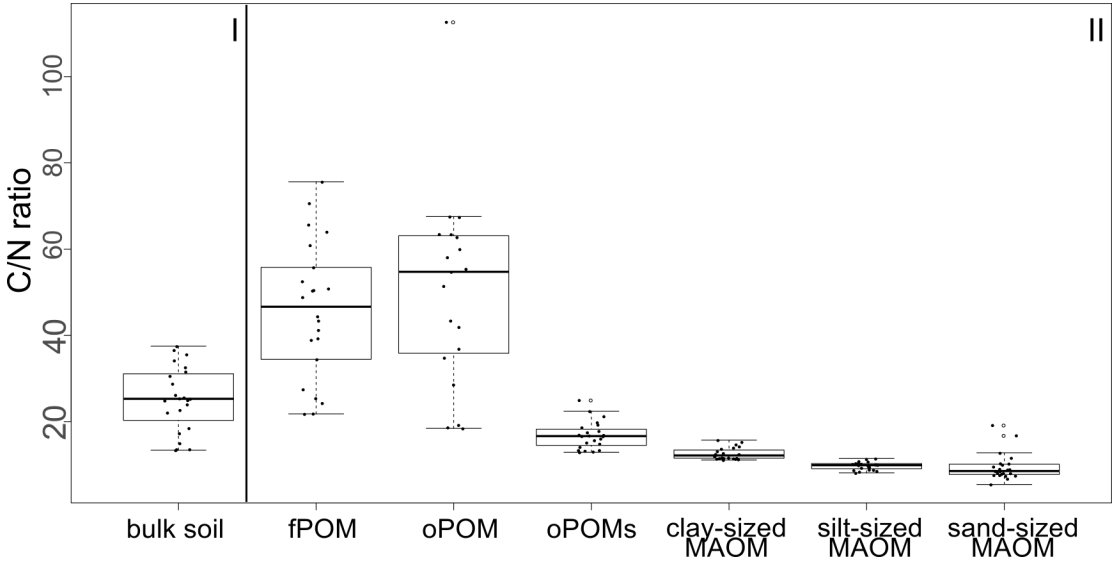

Fig. 3. C/N ratios of bulk soils (I) and SOM fractions (free particulate OM (fPOM), occluded particulate OM (oPOM), small occluded particulate OM (oPOMs) and clay-sized mineral-associated OM (MAOM)) (II).

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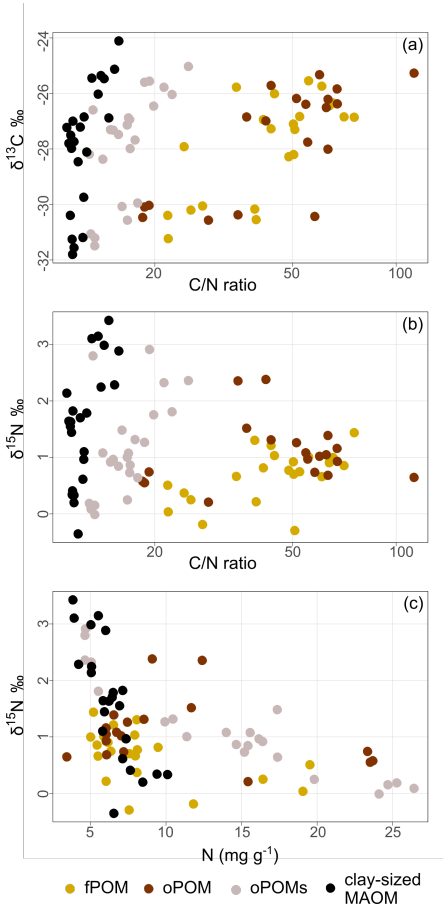

Fig. 4. Natural abundance of δ13C and δ15N plotted against the C/N ratios, and the δ15N values plotted against the N content of SOM fractions (free particulate OM (fPOM), occluded particulate OM (oPOM), sma

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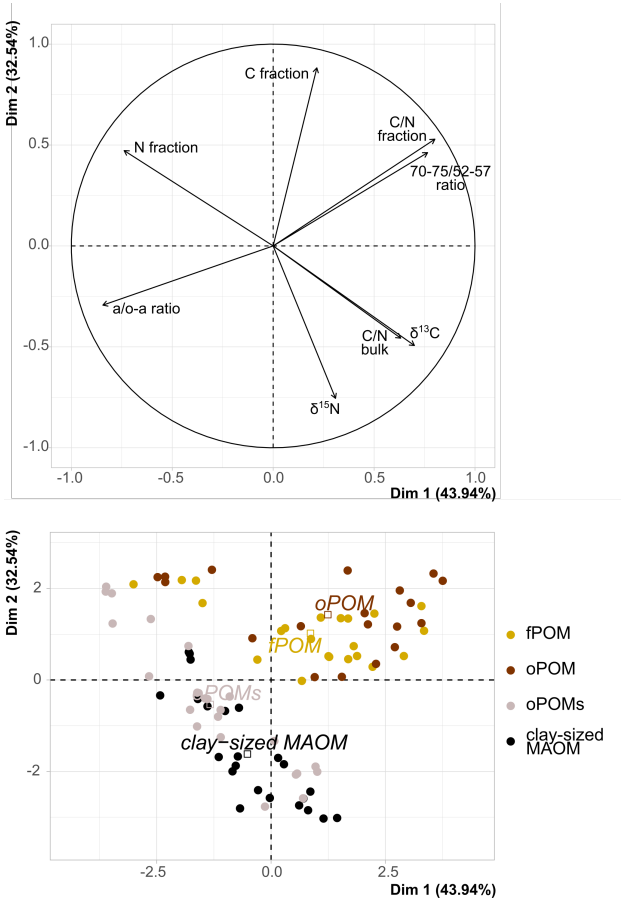

Fig. 5. Principal Component Analysis (PCA) of δ13C (‰ relative to V-PDB), δ15N (‰ relative to air N2), C and N content of the SOM fractions (free particulate OM (fPOM), occluded particulate OM (oPOM), small o

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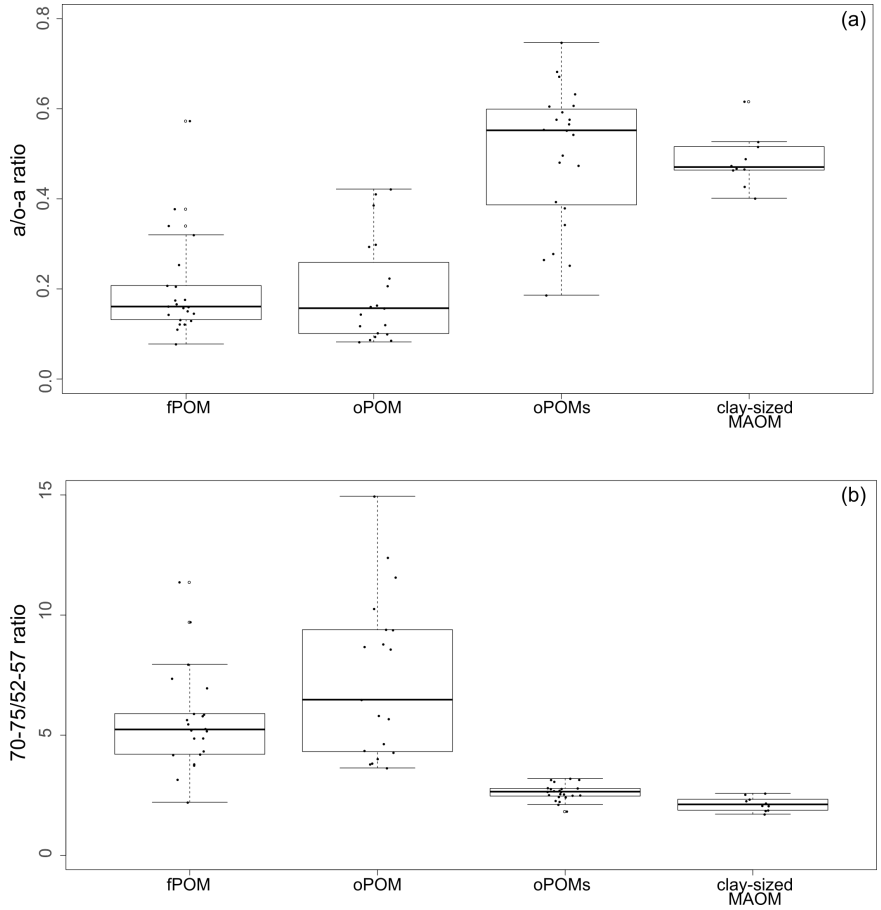

Fig. 6. Decomposition proxies obtained by 13C CP-MAS NMR spectroscopy for specific SOM fractions: Both a/o-a ratio (a) and 70-75/52-57 ratio (b) of SOM fractions demonstrate the similarity of large particulat

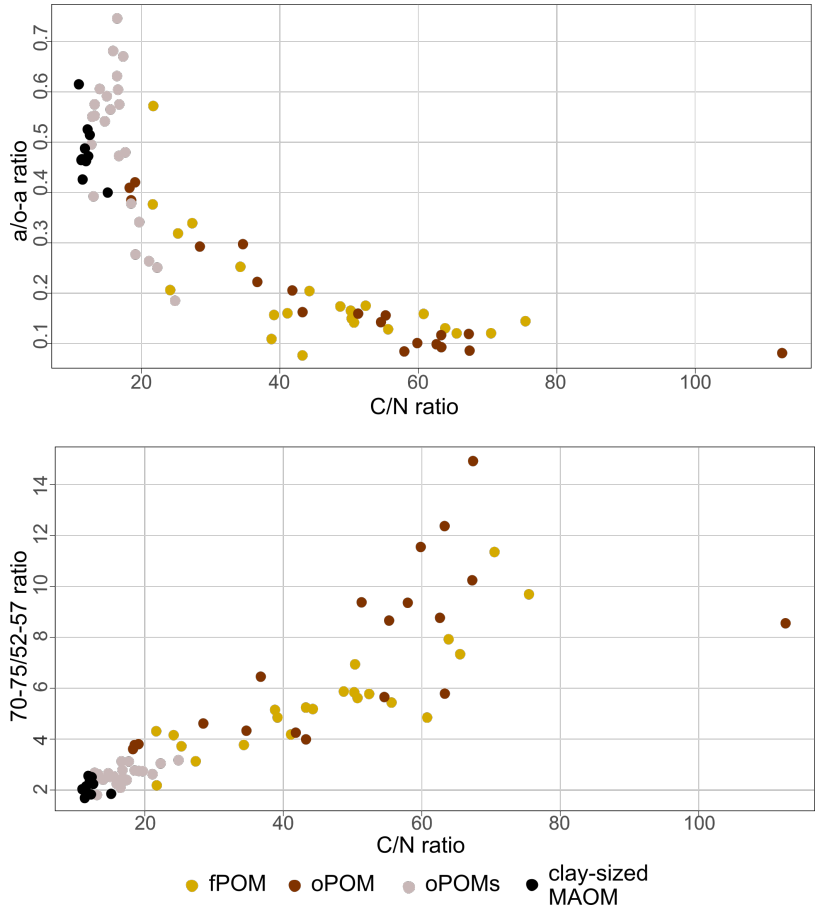

Fig. 7. Relation between decomposition proxies and C/N ratio of distinct SOM fractions: 13C CP-MAS NMR spectroscopy-derived decomposition proxies a/o-a ratio (a) and 70-75/52-57 ratio (b) vs. C/N ratio for fr

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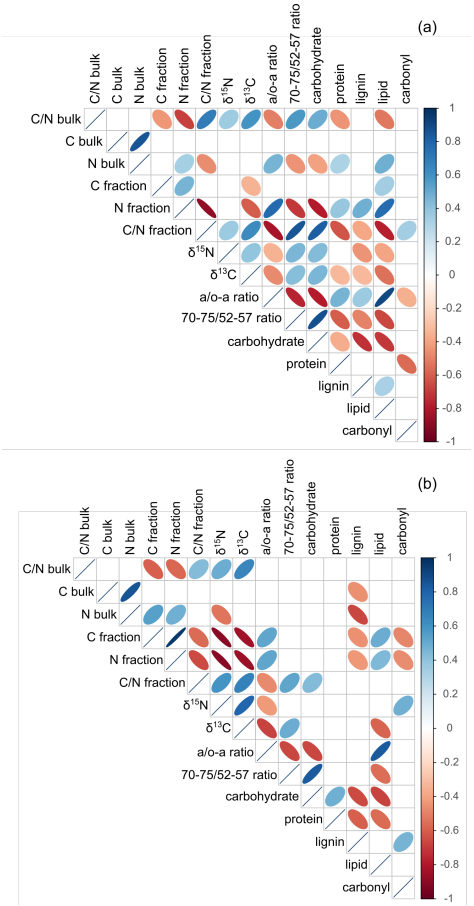

Fig. 8. Correlation matrices of POM fractions: The large POM (oPOM and fPOM) fractions (a) show different correlations compared to oPOMs fractions (b). The more intense the color and the smaller the ellipse,