

## ***Interactive comment on “Organic Carbon Characteristics in Ice-rich Permafrost in Alas and Yedoma Deposits, Central Yakutia, Siberia” by Torben Windirsch et al.***

### **Anonymous Referee #2**

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The manuscript by Windirsch et al. “Organic Carbon Characteristics in Ice-rich Permafrost in Alas and Yedoma Deposits, Central Yakutia, Siberia” examined and compared the organic carbon storage and characteristics from two rare and deep cores using different methods (C%, soil texture,  $^{14}\text{C}$  age, ice content, etc..). Since such deep cores are very rare, this study is very important and gives us valuable inside information about the history of these deep deposits. The scientific question and the used methods are well established, however, there is still room for some improvement. Overall, the discussion section is rather weak and speculative, and the based conclusions too shaky. One reason, most of the used methods were nor fully incorporated in the discussion section. Some results as for example  $^{14}\text{C}$  inversions or magnetic sus-

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ceptibility are not really discussed and explained. Nitrogen data not presented, even though obviously available. Conclusion too short, missing main points as for example that the global estimate of SOC in Yedoma might be by far overestimated and possibly not so vulnerable due to rather low ice contents. Also, recent publications suggest Yedoma being not extremely vulnerable. Missing older Russian Literature. Below I list more specific points, which should be addressed before final publication. P.1 L. 15: "has not yet", actually parts of Yedoma are already in the active carbon cycle; P1 L: 30 "very carbon poor", please add number; P2 L2 "provide"???, and why is it important; P2 L6, reference on CO<sub>2</sub> in the atmosphere not appropriate. Use actual data source; P2 L16 "vulnerable" recent paper by Kuhry et al. states that Yedoma is rather stable. ; P2 L20 Is this the case only for carbon stored within Yedoma deposits???. P2 L21 released how? I guess you mean as carbon dioxide.; P2 L25, please add ref.; P2 L27 Explain why below 3m less understood? P2 L29 missing space; P2 L32 "822 Gt" this is wrong, the number refers not only to Yedoma, but refers to combined permafrost SOC in soils (0–3 m), deltaic alluvium and Yedoma region sediments. P3 L5 Your 'only' 2 research questions are going under in the paragraph. Please make them stand out. P3 L24 "in Siberia", is there no data for MAAT at least for Central Yakutia? P2 L27, No more data or drilling campaigns since Soloviev, 1973? P4 L23 "approximately every 50cm? Why this distance? Why not using visual changes in the core for the increments? P6 L4 check paragraph spacing. P6 Since the main question is carbon, a chapter on how carbon estimates were calculated would be more than appropriate. P7 L18 "material composition???" soil texture. P9 L6 please remove rather, enough with the given SD. P9, when you compare the grain sizes, you change between median and mean, why? P10 L1 I don't fully understand the SOC calculations. How many samples were used for bootstrapping? Please add a table comparing these two cores with SOC data, TN data, DBD data, to 3 m meter, to the different used units and to the total. P11 L1-5. And what exactly are you arguing? Also, a lot of speculations. Please stick to the point. Also, the rather obvious reason for the low C comes first on page 13! P11 L13-15 But then the frozen sections should have the same C/N ratio, but they don't?

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P11 L18 “decomposed” if, then rather pre-decomposed. P11 L21-26 Ok, so what is the reason for inversions? Section by far too short. And no discussion on the other dates. 11 L32 “indicate colder climate conditions” How, and what does it mean for the core? Any refs for that? P12 L2 “explained by climatic variations” Is this an assumption or is there data? Need refs for this statement. P13 The final reason for the low C% should be mentioned earlier. Also, this page can be shortened. P15 L15 & 23, repetitive sentence. Also, main conclusion, Yedoma SOC estimates likely too high. P15 L28. “high ice content. . . . vulnerable” actually the opposite. You showed very little ice content except one one ice wedge. Yedoma “had an estimated” ice wedge and lenses content of up to 90%. These two cores have far less. So these Yedoma deposits are not very vulnerable.

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