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Interactive comment on "Organic matter quality of deep permafrost carbon – a study from Arctic Siberia" *by* J. Strauss et al.

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This work presents the results of comprehensive, state-of-the-art research on organic matter chemical composition in two contrasting but dominant sites of permafrost development in eastern Siberia: thermokarst and yedoma. The topic is of high interest and will certainly be useful for a large community of permafrost scientists.

Few technical comments should be addressed to make the text clearer.

The last sentence of the Abstract is somewhat contradictory to the statement of 10 lines above that OM vulnerability and quality are independent on their age. If so, why recent input should yield a better quality of OM?

p.15948: The notations 83 +61/ -57 and similar are unclear. Section 2.3.2, L25. The

C/N ratio interpretation implies a similar source signal. How efficient is such an approach for paleo-reconstruction if the sources of OM (say, terrestrial versus aquatic or different plant species) changed over past periods?

Section 2.3.6, Acetate: Justify the choice of 1 mg/L as threshold value. This is especially important given that the median value of the Yedoma sample falls exactly on this threshold.

p.15963, L 9: It is hard to accept "quite stable" the value "between 0.1 and 4.9" – this is a factor of 50 variation. . .

There is a lack of clear quality difference between yedoma and thermokarst in the Abstract. The higher the acetate, the better the quality of OM. Mean 6.7 mg/L (Yedoma) and 23.5 mg/L (thermokarst) are distinctly different. The difference between median values is also perfectly visible. Some inconsistency is seen here. Note that the medians and means C/N also indicate at a lower degradation state better organic matter quality in thermokarst deposits (p. 15966, L19).

p. 15966, L8-10: The authors state that thermokarst basins can act as a local sink for the carbon released from thawing permafrost. This is highly questionable statement given strong aerobic heterotrophic respiration of thermokarst lakes (Shirokova et al., 2013 Biogeochemistry). Methane production here is only a fraction of total CO2 evasion to the atmosphere from the sediments (frozen peat), mediated by the thermokarst waters.

p. 15967, L15-17: This is contradictory to L20-24 of the Abstract and allows one to think that "blind" PCA analysis is misleading. Instead, one by one parameter analysis is capable to assess the true difference between two types of deposits.

p.15968, L 23-25: The reader is left with a conclusion that the differences are not significant, yet the thermokarst organic matter is of better quality. It makes sense to compare the measured parameters of two sites with those of other permafrost deposits in Siberia or Northern America to illustrate how variable the organic matter quality of the permafrost regions. The reader may be puzzled: what if all permafrost carbon fall in the range of parameters reported in this study?

p.15970, L 8: Why the units are mg/L? per L of interstitial solution? May be the units are mg/cm3 or mg/g soil?

p.15971, L 7-12: Organo-mineral bonds as protecting mechanism of organic matter. It makes sense here to distinguish suspended (> 0.45 μm), dissolved (< 0.45 μm), colloidal (0.45 μm – 1 KDa) and "truly dissolved" or low molecular weight (< 1 kDa) OM. See for instance size fractionation scheme in thermokarst lake waters (Pokrovsky et al., 2011, Biogeosciences). Large-size, organo-mineral colloids may be poorly bioavailable, yet being dissolved in the water column.

p. 15971, L 17-19: Thermokarst processes are not so local. A million of km^2 of non-Yedoma region in western Siberia is subjected to thermokarst lake formation.

I also noted some references without capitals in geographical names; please correct

Figure 3 and Figure 4 are totally unreadable in pdf format. Separate each of them in several sub-figures, otherwise the main results of this work will be lost.

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Interactive comment on Biogeosciences Discuss., 11, 15945, 2014.