

Interactive comment on “Organic matter mineralization and trace element post-depositional redistribution in Western Siberia thermokarst lake sediments” by S. Audry et al.

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This is a unique study reporting trace metal data from three thermokarst lakes on the Western Siberia plain. Although we do not learn much about basic trace metal geochemistry in this paper, it should be published because it indicates how trace metals in the terrestrial environment are related to the global carbon cycle. The coupling between trace metals in the oceans and carbon cycling is well established, but couplings between the carbon cycle and trace metals in terrestrial environments have been little investigated. This study is an interesting attempt to couple terrestrial trace metal processes with the global carbon cycle, I therefore recommend publishing after some

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revision.

General comments

There is a large difference in pH between Shirokoe (around 3.5) and the two other lakes (5.1 and 5.6). What is regulating pH? This must be explained in the text. I do not believe DOC regulates the pH, because the DOC concentration is almost the same in all three lakes. The low pH in Shirokoe suggest a strong acid not a weak. Furthermore, why is the sulphate concentration so high in lake Shirokoe? This is only briefly discussed in the text. It appears to me that the low pH and high sulphate originates from pyrite weathering. Is this likely? This is a fundamental question. Is pyrite, or mono sulphides, present in the original peat or soil (bedrock?), or is it weathering of secondary sulphides formed in lakes? This could also explain temporary changes in the sulphate concentration. When the groundwater table is low, sulphides are oxidised by oxygen and high sulfate concentrations are obtained when the ground water is rising. Furthermore, it is well known that a suite of trace elements can be found in pyrite. The trace metal pattern in primary sulphides can thus be used as a fingerprint for trace metal distribution. The oxidation of ammonium is strongly pH dependent (slow oxidation at low pH). This means that ammonium can migrate up into the water column from the sediment especially in lake Shirokoe. The authors should briefly discuss the significance of slow nitrification in relation to slow oxidation of ammonium at low pH, although ammonium not was measured. The nitrogen species in the free water column should be displayed in table 1.

Detailed comments

Page 8848 line 22 tremendous necessity...better with important Page 8850 line 16 Table 1 does not show a change of DOC from 120 to 7 mg/l Page 8857 line 17 Is the dissolved nitrate shown in any figure? Page 8858 line 20 Any explanation for the removal of Mn(II)? Page 8864 line 8 In the water column? No Figure is showing this. First it is stated Co and Ni are correlated with Fe...Cobalt is also likely to...?? Rephrase.

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