

Interactive comment on “Recording of climate and diagenesis through fossil pigments and sedimentary DNA at Laguna Potrok Aike, Argentina” by A. Vuillemin et al.

Anonymous Referee #3

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Recording of climate and diagenesis through fossil pigments and sedimentary DNA at Laguna Potrok Aike, Argentina

General comments

The authors describe a paleolimnological study of a polymictic lake in Patagonia using two sediment cores which were analyzed in detail covering the last 50 thousand years, using pore water chemical and microbiological activity as well as pigments and 16S rDNA community analysis. Two different periods were compared, the more productive period of the Holocene and Younger Drias (YD) with a general lower water level and the less productive period during the last glacial maximum (LGM). Organic car-

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bon and organic nitrogen as well as various pigment concentrations showed significant increase during the YD and Holocene period. From the 16S rDNA community composition analysis a principal difference in community function between OM-degrading bacteria and methane-producing archaea in greater depth during Holocene and YD vs. the sulphate-reducing bacteria and lithotrophic archaea was suggested.

Much of the conclusions is hypothetical, nevertheless I consider the study interesting, and of high descriptive value.

Specific comments

P18352, I 2: analyzing 2500 samples for pigments is impressive, nevertheless, have measurements been replicated?

P18358, bacterial clone libraries:

given the abundance of cyanobacterial pigments I wondered why any cyanobacterial genotypes can be detected in the clone library during the more recent YD? the indicated primers 27F and 1492R are very general and would have amplified cyanobacteria as well, the second question relates to chloroplast sequences (e.g. diatoms), (which would sink and sediment much more efficiently)? P18263, 1-: It is unclear whether direct measurements of methane have been performed in this or in related studies? currently conclusions are drawn from the abundance of genotypes in clone library and ATP measurements. Given the low number of analyzed clones in general (see Suppl.) the relative estimates of abundance might be biased.

P18363, I8: should read 29 ka old LGM?

P18366, I. 3: The mismatch between isorenieratene pigment composition and DNA genotype analysis is discussed for green sulfur bacteria. Perhaps it would be helpful to speculate what could be the potential habitat of green sulfur bacteria in this ecosystem? In contrast to cyanobacteria (and diatoms) living in the epilimnetic water, sulfur bacteria might be able to live on the sediment surface.

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What is the situation at present? Is there evidence of (intermittent) lake stratification? In general the preservation of the DNA depends on the degree of deoxygenation of the water column, for example, in deep lakes with a meromictic hypolimnion, cyanobacterial DNA can be recovered from relatively recent sediments. eg. Savichtcheva, O., et al. 2011. *Appl. Environ. Microbiol.* 77(24), 8744-8753.

In general, a more recent 16S rDNA community composition analysis from sediments would be useful to compare and to better characterize the community from the water column.

Interactive comment on Biogeosciences Discuss., 12, 18345, 2015.