

***Interactive comment on* “A Holocene record of mercury accumulation in a pristine lake in Southernmost South America (53 S) – climatic and environmental drivers” by Y.-M. Hermanns and H. Biester**

Anonymous Referee #1

Received and published: 8 August 2011

This work describes results of the analysis of Hg and a number of other parameters in a long core (5m) of sediment from a Patagonian lake (Lake Hambre). The record recovered from this archive spans some 17,500 years, stretching back to a period immediately following ice retreat. Thus, over the period of record, the lake has seen big changes in climate, ecology and geochemistry. Among the main findings of the work is that 1) Hg accumulation rates, on the whole, have not changed much over the period, 2) the “shorter term” (i.e., decades) variability in the record is well explained with variations of organic carbon production and export from the watershed into the

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lake as affected by changing precipitation rates, and 3) Hg loadings associated with known tephra layers were not exceptionally high.

This work is very well constrained and provides a coherent and insightful picture of the sources of Hg to a lake over time. Furthermore, and as this is a fairly “remote” and unimpacted site from a human point of view, provides an important backdrop against which pre- and post-industrial human related sources of Hg to the environment can be gauged.

My only semi-major comment relates to the last sentence in the paper: “we conclude that Hg accumulation in the catchment soils due to atmospheric deposition and bedrock weathering is in balance with the export of organically bound Hg from the catchment soils.” This sounds at first read that authors are suggesting that $Hg(in)=Hg(out)$ of the catchment. . .but surely this is not the case and that the soils are a net sink of Hg. A refinement of what they mean by this would also help in establishing a context from these results that could be used to help understand the more dramatic non-steady state situation that catchments are currently experiencing around the world.

I have just a few minor comments:

In general, I think it is not appropriate to start sentences with chemical symbols. . .spell out element name instead.

Page 6556, line 5. . .change “years” to “year”. . .also, add the lake name to the abstract.

Page 6556, line 18 (and elsewhere). . .”as carbon storage in the soils and transport into the lake have increased. . .” How does the biogeochemical trajectory of this lake compare to that of the work of Engstrom and colleagues (Engstrom, D.R., S.C. Fritz, J.E. Almendinger and S. Juggins (2000) Chemical and biological trends during lake evolution in recently deglaciated terrain, *Nature*, 408, 161-166.) . . .similar, different?

Page 6558, line 20. . .change “lake Hambre” to “Lake Hambre”.

Page 6559, line 12. . .”there were no other disturbances due to anthropogenic

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activities. . .” That you know of? Or is there a very good history of the area?

Page 6559, line 17. . .change “After opening the core. . .” to “After opening, the core. . .”
add the comma. By the way, how was the core opened?

In the results and discussion section, the ratios of Hg to Cu and Y and a comparison to their average crustal ratios could be made. This is done in essence during the PCA and other discussions, but a simple x-y plot might to the trick.

There is no indication of up-core increases in Hg associated with industrial activity. . .though the sampling resolution (1 cm) and nominal sediment accumulation rate (1.3 cm/y) should have made this possible. Any explanation?

Interactive comment on Biogeosciences Discuss., 8, 6555, 2011.

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