Lake Mercury Accumulation in the Southern Hemisphere follows Bond Cycles

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Lake sediments are often used to investigate historical accumulation of Hg in lakes related to anthropogenic emissions and atmospheric Hg pollution. To evaluate the anthropogenic factor the understanding of natural drivers of Hg accumulation in lake sediments, especially climate and productivity, is essential. Bond events are cyclic changes (~1500 yrs) of Northern Hemisphere cooling during the Holocene related to cyclic changes in total solar insolation, typically indicated by percentage of hematite stained grains (%HSG) in North Atlantic sediments [1].

To investigate the link between cyclic changes in solar insolation and Hg accumulation in lakes we investigated sediments dating back 4500 yrs BP from a small lake (LH) located at the Strait of Magellan (53°S) for Hg and proxies of mineral matter deposition as well as lake productivity (μXRF, hydrogen-index (HI) and FTIR data).

Hg concentrations show strong variation throughout the record which correspond to changes in productivity and %HSG, as well as periods of lower deposition of mineral matter. This indicates that Hg accumulation was highest during Bond events (high %HSG) when productivity was high (high Cp9 and HI) and climatic conditions were relatively dry.

The correspondance of Hg concentrations and productivity proxies suggests that Hg accumulation in LH is too a large extent controlled by insolation and related algae production. The mechanism of the periodical Hg enrichment is not yet fully understood. We assume that Hg scavening and sedimentation by algae is the major process during dry periods when fluxes of Hg and organic- and mineral matter from the catchment have been low. Moreover, our findings reveal that Bond events affect climate in southern Patagonia at 53 °S most likely through influence on the Southern Hemisphere wind belt which controls precipitation at the LH site. Our study demonstrates the importance of insolation and climate for Hg accumulation in pristine lakes.

[1] Bond, G. *et al. Science (80-.).* **278,** 1257–1266 (1997).