Solar Output Controls Periodicity in Lake Productivity and Wetness at Southernmost America

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Cyclic changes in total solar insolation (TSI) during the Holocene are known to have strong effects on climate such as Bond events [1, 2] and related changes in the South America monsoon system [3], although the physical mechanisms linking both are yet unclear [3-4]. However, it is largely unknown if and how changes in TSI affect the climate sytem of the southern-most Southern Hemisphere. Here we show that aquatic productivity proxies derived from sediments of a lake at the south Atlantic coast (53 °S) reveal strong dependency on cyclic changes in TSI throughout the Holocene.

We used principal component analysis (PCA) to extract climate-dependent chemical signals from Fourier Transform Infrared Spectroscopy (FTIR) data, which allows us to evaluate the influence of TSI variations on aquatic productivity and catchment erosion.

Productivity changes in the past ~9 kyrs years show periodicity of ~220 years coherent with the time series of the cosmogenic nuclide ^{10}Be, but correspondance with periodicity of Bond events (~1500 years) was only observed until ~ 3000 yrs BP. However, periodical changes in precipitation, as indicated by fluxes of mineral matter from the catchment, resemble those of Bond events during most of the past ~ 10 kyrs suggesting ~1500 years periodicity in shifts of the Southern Westerly Wind belt (SWW) controlled by solar output.

[1] Bond et al., *Science*. **278**, 1257 (1997).
[2] Bond et al., *Science*. **294**, 2130 (2001).
[3] Stríkis et al., *Geology*. **39**, 1075 (2011).
[4] Baker et al., *Nature*. **409**, 698 (2001).