Clim. Past Discuss., 9, C400–C403, 2013
www.clim-past-discuss.net/9/C400/2013/

Climate of the Past Discussions

Interactive comment on "A 1500 yr warm-season temperature record from varved Lago Plomo, Northern Patagonia (47° S) and implications for the Pacific Decadal Oscillation (PDO)" *by* J. Elbert et al.

Anonymous Referee #2

Received and published: 10 April 2013

General Comments

The paper in question, "A 1500 yr warm-season temperature record from varved Lago Plomo, Northern Patagonia (47°S) and implications for the Pacific Decadal Oscillation (PDO)," offers a new warm-season (September–Feburary; SONDJF) temperature reconstruction that is combined with a previously published cold-season precipitation reconstruction to explore subdecadal-to-centennial climate variability in this region. This suggests a coupling between the two reconstructions, where positive (negative) correlations between warm-season temperatures and cold-season precipitation appear to

coincide with negative (positive) PDO phases.

Unfortunately, on the basis of three major points, I am unable to recommend this paper for publication. The first point concerns the chronology before and during the slump in the sediment core and changes in the sediment composition before and after the slump that have not been adequately addressed. The second point considers the combination of the piston core and gravity core record, which is critical for establishing a calibration-in-time. The third point raises concerns about the choice of warm-season temperature proxy.

These three points, I firmly believe, cannot be properly addressed within the scope of a "major revision."

Specific Comments

First point:

In the upper (post-slump) section of the sediment core(s), the average sedimentation rate appears to be 2.9 mm yrˆ-1 [1800 mm / (2011 - 1391) yrs]. However, according to the age-depth model, the slump (ca. 1800–1840 mm depth) encompasses a whopping 148 varve yrs. This implies that either (a) the sedimentation rate was dramatically reduced during those years [ca. 0.27 mm yrˆ-1; which is questionable because, as the authors describe, "the overall sedimentation rate is very homogeneous with (. . .) c. 20 cm per century between c. 700 and 1242 AD"], (b) a substantial amount of sediment was scoured and displaced during this event, or (c) there is something wrong with the chronology below the slump. As the chronology below the slump is floating and anchored by only one radiocarbon date, an additional date is needed to better constrain the chronology. There also appears to be a change in the composition of the sediment before and after the slump [i.e., a shift in the mean and variability of MAR and a shift in the mean of total brightness (TB)]. Can additional data (e.g., TOC, Dx, XRD, etc.) be used to better understand this difference? This impacts the assumption that the relationship between the proxy and climate is stable in time.

Second point:

The description of combining the piston core with the gravity core is unclear. Considering that the two sediment cores were taken from “adjacent” sites, the low correlation between brightness is surprising. Can this solely be a result of varve thickness? It is also unclear why both time series needed to be homogenized (i.e., why did the piston core data from AD 1701 to AD 1940 need to be adjusted?). Finally, the use of the term “composite” core is unclear. Do you refer to a composite of sections making up the piston core or a composite of the piston and gravity core?

Third point:

Sediment TB in the sediments of Lago Plomo can indicate an increase in (bright) summer or decrease in (dark) winter sedimentation. It can also indicate a change in the source of sediments or a change in the water content of the sediments. What other reflectance-based (and non-reflectance-based) proxies were explored and what types of results did they provide?

According to the authors the sediments of Lago Plomo seem to be highly sensitive to changes in the catchment that are related to climate. However, the sedimentary variables used for the reconstruction of warm-season temperature and cold-season precipitation [TB and mass accumulation rates (MAR), respectively] are inherently related due to sedimentary processes. According to the authors, TB depends on winter precipitation, snow-/glacier melt (used interchangeably in the manuscript despite possibly indicating very different processes), and warm-season temperatures. MAR in Lago Plomo is said to be dependent on both winter precipitation and snowmelt (also implying an influence of warm-season temperatures). Considering that these sediment-based variables have the same drivers, and that the correlation between TB and the reanalysis data is quite weak (i.e., only 34% of variance in TB is explained by warm-season temperatures for the 5-yr-filtered calibration period data, which introduces the question: how much of the variance is related to cold-season precipitation?), I find the conclusion

of the running correlations between the reconstructed temperature and precipitation, and the relationship of these running correlations to the PDO to be tenuous at best. I also question the significance of the relationship between the Lago Plomo interseasonal coupling and three PDO phases.

In conclusion, the concept behind this paper is very intriguing. However, the conclusions are built on a very weak foundation. Therefore, I regret that I cannot recommend this paper for publication.

Interactive comment on Clim. Past Discuss., 9, 1771, 2013.