

Interactive comment on “Investigating late Holocene variations in hydroclimate and the stable isotope composition of precipitation using southern South American peatlands: a hypothesis” by T. J. Daley et al.

M. Grosjean (Editor)

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Dear authors,

we have received the reports from our three advisors on your manuscript “Investigating late Holocene variations in hydroclimate and the stable isotope composition of precipitation using southern South American peatlands: a hypothesis”. Comments by Reviewer 3 see below.

Based on the advice received we feel that your manuscript is suitable for publication

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should you be prepared to incorporate major revisions (Explicit recommendation by Reviewers 2 and 3, no explicit recommendation by Reviewer 1).

The analysis of the modern situation with the GNIP and the instrumental meteorological data has been received very well and all of the three reviewers found it very useful and interesting (although the comment about the GNIP data and the d-excess by Rev #2 should be carefully considered). More ambiguous were the comments on the late Holocene reconstruction, in particular the question how consistent both records are, how consistent the interpretation is regarding the modern situation and to which degree they really provide ‘...the foundation for improved interpretation ...’ or are rather speculative (e.g. Rev 1 and 3). The discussion of the two South American peat bogs should be substantially expanded and deepened, including the revised discussion according to the comments about the d-excess (Reviewer 2) and inclusion of other regional records (maybe also Schimpf et al QSR 2011).

The comparison with the bog in N England should be removed from the manuscript. The selection of this site is arbitrary and the synchronicity does not appear conclusive from Fig. 3.

However, all the three reviewers found that the manuscript is an interesting contribution and acceptance is recommended if revisions are made accordingly.

We look forward to receiving your revised manuscript.

Kind regards,

Martin

————— Comments by Reviewer # 3:

The main objective of this paper is to propose that paleoclimate information (zonal intensity of the southern westerly wind belt) can be inferred from the isotopic composition of peat formed in ombrotrophic raised peatlands in Tierra del Fuego. The arguments used in the study included an analysis of isotope data in precipitation collected in two

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stations in Tierra del Fuego (Punta Arenas, Chile and Ushuaia, Argentina) covering the period 1982 to 2008. They used these data to derive hypotheses for how past changes in the wind belt would be reflected in the peatland archive if the same mechanisms were operational. Then they test these hypotheses against a synthesis of the current set of peatland-based palaeohydrological and palaeo-isotope records from Tierra del Fuego that cover the last ~ 3000 years. They also compared these paleodata with palaeohydrological and palaeo-isotope data from a peatland in northern England.

One key problem with the arguments used in the paper is the interpretation of paleohydrological and paleoisotope records which was used to support their interpretation of the modern isotope record in precipitation in the study area.

The authors used data of past water table depth derived from macrofossil analyses of two peat profiles from the Andorra Valley (AND-1) ca. 10 km to the northeast of Ushuaia, Tierra del Fuego, Argentina and paleoisotope data from peat samples from Harberton Bog, east of Ushuaia. Then, the plant macrofossil-derived hydroclimatic index from Andorra bog (AND-1) is compared with similar records from a site in northern England.

Based on the data presented on Figure 3, it is postulated that the data tentatively indicate that periods of drier (wetter) bog surface conditions at Andorra bog were associated with relatively higher (lower) δD values in Sphagnum moss from Harberton bog. This correlation is very weak and the interpretation is very speculative. For example, Figure 3 showed that during the period 0 to ~ 600 cal yr BP no changes are observed in the isotope composition of the sphagnum peat however significant changes are observed in the water table reflected in the BSW values. Then, there is no clear correlation between these two parameters and the key uncertainty is the difference in temporal resolution between both records. It is mentioned in the paper that the temporal resolution of the data from AND-1 and Harberton bog is sufficiently different to preclude a direct assessment of hydroclimatic and palaeo-isotope variation here.

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The interpretation of the comparison of the data collected in the bog AND-1 with the bog in northern England (WLM22) is also very speculative. It is stated that the longer-term (millennial-scale) variations in AND-1 were associated with similar changes in WLM22 that were opposite in direction (Fig. 3). Drier conditions on the palaeo-surface of Andorra Bog were coincident with wetter conditions on the surface of Walton Moss. However the early part of the record seems to show the opposite correlation. Wetter condition in the bog AND-1 are associated to a trend to drier condition on Walton Moss site.

Therefore, these arguments questioned the hypothesis postulated in the paper that changes in the past 3000 years, if associated with patterns of shifting latitudinal position and intensity of the westerlies, should be reflected in variations in the isotopic composition of the Sphagnum in sites near Punta Arenas and Ushuaia that are in phase, but in which hydroclimate records would vary in anti-phase. Peatlands offer an excellent archive for testing both the hydroclimatic and palaeoisotope variations.

The authors also should also tone down their conclusions stated in the abstract Existing peatland palaeoclimate data from two sites near Ushuaia, however, provide evidence for changes in the late Holocene that are consistent with the pattern observed in modern observations. Furthermore, the records suggest synchronicity in millennial-scale oscillations between the northern and southern hemispheres.

Major revisions

Other comments: There are a few references that should be considered in the paper. These are listed below and one key reference is Stern, L.A., and Blisniuk, P.M. (2002) since it has direct implications in the interpretation of the isotope data of the Punta Arenas station.

Moreno et al., 2009. Millennial-scale variability in Southern Hemisphere westerly wind activity over the last 5000 years in SW Patagonia. *Quaternary Science Reviews* 28: 25-38.

Stern, L.A., and Blisniuk, P.M. 2002. Stable isotope composition of precipitation across the Southern Patagonia Andes. *J. Geophys. Res.* 107, 4667, doi:10.1029/2002JD002509.

Moy et al., 2008. Isotopic evidence for hydrologic change related to the westerlies in SW Patagonia, Chile, during the last millennium. *Quaternary Science Reviews*, 27: 1335-1349.

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