

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.

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We are grateful to the three reviewers for their comments on which we have acted in full and agree that this has improved the manuscript considerably. We were particularly delighted to receive “strong recommendation for publication” from Reviewer 1.

Summarising the major revisions suggested by the reviewers, these included:

1) The synthesis and integration of longer-term meteorological data with those available from the GNIP stations, first to verify if there was consistency between the two

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records and secondly to provide a longer term perspective to the trends described in our original manuscript (specific recommendation by Reviewer 2) 2) A more detailed and thorough discussion of the statistical significance and low slope angles of the bi-plots of the δP values and clarification of the discussion involving deuterium excess (specific recommendation by Reviewer 2) 3) Removal of the comparison of peatland palaeodata with data from a northern hemisphere peatland site. (Reviewers 2 and 3) 4) Consideration of the seasonal variation in moisture sources and the role of that variation in determining the δP values (Reviewer 1).

The manuscript now contains an extended discussion of the modern meteorological data and deuterium excess values and uses those to discuss variations in moisture sourcing based on conditions in the S.E. Pacific, which we infer from NCEP-NCAR reanalysis data. We also give much consideration to the seasonal variations, as suggested by Reviewer 1. Through this analysis, we discover that the summer (DJF) changes in δP values and the deuterium excess at Punta Arenas have been statistically significant and complex. We provide an explanation that is consistent with isotope theory and reanalysis data based on a southerly retraction and intensification of the austral westerlies. We also highlight the role of variations in upstream topography with changing atmospheric circulation patterns with reference to Stern and Blisniuk (2002) (recommended by Reviewer 3) and highlight differences between Punta Arenas and Ushuaia as a challenge for future research.

At the recommendation of Reviewer 2, we have incorporated our original section 2 into a more logical position in section 1 and have added an explanation of the deuterium excess and its value in climatology (section 1.4).

We were particularly grateful for Reviewer 3's comments in relation to the comparison with Northern Hemisphere sites. They noted how our “arguments questioned the hypothesis postulated in the paper”. This was entirely true and much more measured consideration is given to our conclusions. We have extended the detail of the discussion relating to the two existing peatland records in section 4 but have chosen not to go

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much further for risk of over-interpreting these data (consistent with recommendations by Reviewer 3). The analysis of the modern meteorological and stable isotope data reveal a complexity to the isotope signal in precipitation for which the only conclusion can be that the current set of peatland records is not sufficiently resolved to answer our modern questions.

The manuscript now contains 8 figures and 1 table that we have designed to demonstrate more clearly 1) The modern climatological setting, 2) the importance of seasonal change, 3) the nature of regional topography and 4) our explanation for the measured changes in δP values with NCEP-NCAR reanalysis data.

At the recommendation of Reviewer 2, we have removed three abnormally positive values from the Punta Arenas regression of $\delta^{18}O$ and δD values, which it was suggested may well have been typographical errors in the GNIP database (now Figure 3). These still remain in the figure, but are highlighted by open squares. Also at the recommendation of Reviewer 2, we have plotted all meteorological anomalies against a common climate norm, for which we chose 1961-1990 (new Figure 4). References for the mass-spectrometric analysis of cellulose have also been updated.

We hope very much that you consider this revised manuscript suitable for publication in *Climate of the Past*.

Interactive comment on *Clim. Past Discuss.*, 8, 595, 2012.