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Climate of the Past Discussions

Interactive comment on "Evidence for increased expression of the Amundsen Sea Low over the South Atlantic during the late Holocene" *by* Zoë Thomas et al.

Anonymous Referee #1

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Thomas et al. present new high-resolution pollen data on a radiocarbon dated peat record from the Falkland Islands for the last about 5000 years. They relate major changes in the vegetation dynamics on the island and in the far-distant Patagonia pollen transport to major reorganizations of the high latitude Antarctic atmospheric circulation pattern in the Southeastern Pacific sector, namely the intensity and position of the Amundsen Sea Low (ASL). Main observation of this study is a significant change in the vegetation and enhanced charcoal input around 2.5 kyrs indicating a shift to warmer/drier conditions over the island likely associated with a strengthening and northward expansion of the ASL. Simple Dome ice core data and a marine carbonate record from the Chilean fjord region are used for comparison and in support of

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their interpretation.

This peat record is one of the few very valuable paleoenvironmental data available from this part of the world. However, this cannot be the only reason to assume, that it is representative for the whole South Atlantic ("across the South Atlantic"), as it is stated several time in the manuscript. Rather it responds to SE Pacific/Southern Ocean climate variability, which is restricted more or less to the southeastern South Atlantic (as it is shown also in the correlation maps, Fig. 2).

Altogether, the manuscript is well organized and concise, referencing is adequate, and the layout and total number of figures are very reasonable.

General remarks: 1. Please provide evidence for the representativeness of this location for the South Atlantic, if not please correct the respective statements in the whole manuscript

2. The indicated wind pattern in figure 1 is too simplistic and this map would benefit from adding major surface current patterns and the frontal zones in this region.

3. The interpretation of the own data is very much restricted to the atmospheric part. Changes in ACC strength, Drake Passage through flow, and the surface current dynamics in the southwestern South Atlantic (Malvinas confluence dynamics e.g. Voigt et al. 2015) are important as well and not discussed

4. Regarding the age model I have two comments/remarks. One is regarding the 137Cs record. It is mentioned in the text as age marker for the earlie sixties nuclear weapon testing fallout. Normally, the manuscript should contain the graphic display of the whole measured activity profile, just the mentioning in the text is not enough. Second, if fruits and leaves werde 14C dated (as indicated in the table), there is not much reason to exclude two dated at the base but include only the one date above (this could have been a outlier as well). Sedimentation rates would make sense with the two basal ages as well. So I suggest to include them into the bayesian age modelling.

5. In the “contemporary climate” chapter the author use deseasonalised/detrended seasonal data? As a paleoclimatologist, I’s difficult for me to understand this preprocessing step and perhaps some additional explanation could make things clearer here.

6. In the data comparison chapter the Siple Dome and PALM2 data are assumed to be consistent with the Falkland data. There are, however, rather large offsets in the timing of the proposed “regime shift”. Majewski et al. e.g. suggest the Siple Dome ssNa+ shift to start aroud 1000-1500 years BP - that is more than 1000 years later that the quite abrupt shift described in the in the Canopus Hill record. There is also a 500 year offset to the carbonate accumulation record from the Chilean Fjords, which, by the way, is not an accumulation of carbonate in the surficial fjord waters, neither a carbonate preservation issue. If I understood these authors well, it represents marine carbonate production in the surficial fjord waters and its subsequent accumulation on the sea bed in response to salinity changes in the upper water column of the fjord. Of course all these records have theirs own stratigraphic issues, but one perhaps should discuss the potential meaning of these offsets more thoroughly.

7. The Late Holocene changes described in Lamy et al. address the latitudinal northward displacement of the westerly wind strength from its southern core (Early Holocene) towards its northern margin (Late Holocene). Conceptually, they suggest a weakening of the core westerlies in the Magellan Strait region, which is somehow in contradiction to what the authors assume in this manuscript.

8. Beside the millenial-scale trend there is much more centennial-scale fluctuation in the pollen/charcoal data from Falkland Island that unfortunately are not discussed.

Minor comments: Line 30: please explain why ASL is of global significance.

Line 98: More precisely it is a vegetation record. “record of airflow” is for my feeling to imprecise here

Line 133: If mentioned, please provide the exact information for the two periods

Line 125: “contiguously” should be “continuously”

Line 283-283: This cannot be, except the authors assume an full inversion of the westerly winds? Across the South Atlantic would mean easterly winds?

Line 291: “compliment” should be “complement”

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