Clim. Past Discuss., 11, C1798–C1804, 2015
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Climate of the Past Discussions

Interactive comment on "Eastern Andean environmental and climate synthesis for the last 2000 years BP from terrestrial pollen and charcoal records of Patagonia" *by* G. D. Sottile et al.

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Dear Editor, Catalina González Arango Please find below the authors responses to the reviewer's comments. We have also submitted a revised version of the manuscript and the supplementary material including most of the reviewer's suggestions. Regards, Gonzalo Sottile

Please find the new version of the manuscript and supporting material as a supplementary zip file

Response to Reviewer 1

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Interactive Discussion

Discussion Paper

Major comments:

Reviewer comment (1) One of the objectives of this manuscript is apparently to improve the chronology of some of the existing pollen records. Although it is mentioned as such in the introduction, this objective is not really addressed anywhere in the manuscript. The only place where I found some (new?) chronological information is in supplementary information S1 and S2, but there is no reference to these sections in the main manuscript (except for S1 in table 1). The authors need to clarify what is really new regarding the chronologies in the main manuscript. Did they obtain new radiocarbon ages? New 210Pb/137Cs profiles? On how many cores? Which ones? If this is really one of the two main objectives of this manuscript, as stated in the introduction, it needs to be detailed in the main text, particularly in the method and results sections.

Authors response: Two of the chronologies previously published (Bajo de la Quinta and La Tercera), were improved with a new radiocarbon dating at each sequence ca. 550 cal yrs. BP. The detailed chronology of every record is shown in supplementary material section 4. We decided to skip this objective from the manuscript because we agreed that this is not a central point of this work

Reviewer comment (2). Section 2.1 contains a relatively long paragraph on ENSO variability (mostly copied from Moy et al., 2009 – see below). It is not clear why since the most important mode of variability in the region is SAM/AAO and not ENSO. The authors should focus on introducing (and interpreting their records in terms of) SAM variability. I recommend (re-)reading, for example, Garreaud et al palaeo3 2009, Garreaud j of climate 2013 and Abram Nature Climate Change 2014.

Authors response: We have included in section 2.1 an introduction about SAM variability and also ENSO. Also we discuss our results in terms of both SAM and ENSO specially in Section 5.3. We disagree with the reviewer about the higher importance of SAM variability despite ENSO variability. We agreed that both climatic modes drives important consequences in Patagonian ecosystems. This Manuscript include a review

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of Northern and Southern Patagonia environmental variability, and we cite a large list of references discussing ENSO effects over Patagonia.

Reviewer comment (3) The authors interpret variations in moisture/precipitation on the eastern flank of the Andes as representing variations in the strength/latitudinal position of the Westerly Wind Belt. As correctly stated in the introduction, however, the eastern side of the Andes is where the correlation between westerly wind speed and precipitation transitions from positive (western Andes) to negative (eastern part of SSA). The relation between precipitation and westerly wind speed at the coring sites is therefore not as straightforward as the authors seem to assume. This should be addressed by (a) showing the location of the pollen records on a U-wind vs precipitation correlation map (e.g., fig 4 of Garreaud et al 2013), and (b) interpreting the pollen records in terms of SWW variability more carefully, i.e., only after having demonstrated that they actually represent SWW variability, i.e., after comparison with records from western Patagonia. In other words, I think the authors should first interpret their records in terms of variations in precipitation/moisture, then compare them with records from western Patagonia, discuss the similarities and discrepancies, and finally interpret their results in terms of SWW variability. Even if the correlation between u-wind and precipitation at the study sites is currently positive (which still has to be demonstrated), it may not always have been the case in the past (the records are located in a transition zone).

Authors comment: We have included in figure 1c, the U-wind- precipitation correlation map and include the eastern Andean selected pollen records to show their correlation coefficient. We discussed the pollen records U-wind- precipitation correlation in section 4.1 and 4.2 of the new version of the manuscript. Special attention was dedicated to Forest records of southern Patagonia that were located under low or null correlation values. Therefore, we followed the reviewer suggestion and interpreted them as Southern Westerly Winds variation after comparing them with Western Andean proxy records.

Reviewer comments (4) I miss the scientific rationale behind using records from the

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eastern slope of the Andes to reconstruct SWW variability (it is much more straightforward to use records from the southwestern Andes). A much more appropriate scientific approach in my opinion would be to use these pollen records to (a) understand how precipitation varied on the eastern flank of the Andes during the last 2k, and (b) assess the origin of these variations (i.e., linked to SWW variability or not?) Authors comment: Our results evidence changes in paleohydric balance conditions at eastern Andean environments at different latitudes and longitude locations. Integrating eastern Andean environmental changes has been always challenging due to the complex climatological specially linking Andean and extra-andean changes. We hypothesize about past environmental changes (in terms of paleohydric balance conditions and fire regime) and their possible linkages with the Southern Westerly Winds (SWW) variability. Also, the comparison of our Composed Northern and Southern Patagonia pollen based indices with independent proxy records at the western side of the Andes, also prove that sedimentary records of eastern Andean may be also sensitive to SWW variability and thus, they could be potentially used for past millennial SWW modelling as other commonly proxy records (e.g. Dendrochronological and sedimentary records).

Reviewer comment (5) A final but important issue with this manuscript is that it contains some serious examples of plagiarism. Entire sentences are literally copy-pasted from the literature. The two most obvious examples (copied from Moy et al DPER 2009 and from Bertrand et al QSR 2014) are listed below but there are more examples throughout the manuscript (I have probably missed several). This will need to be carefully evaluated by the editor.

Authors comment: We completely disagree with the reviewer, all the sentences that replicates information of another paper are followed by the relevant reference. Indeed, the author accuses us to plagiarize some Bertrand et al QRS 2014 fragments, and the most important evidence that was never our intention to plagiarize Bertrand et al., is that we proposed Bertrand as a possible referee when we submit the manuscript. Nevertheless, we have paraphrase some fragments that the referee pointed and re-

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structured them in order to avoid any possible doubt of plagiarism. As state at the acknowledgment section most of the discussion of this results and the comparisons of Eastern Andean pollen records with other western Andean proxy records were presented in Sottile, 2014 (Doctoral dissertation) and at the PAGES meeting which took place in Medellín, Colombia during middle 2014. Respect to Moy et al 2009 citation, we agreed with the referee, we have corrected the citation at the references list.

All technical minor comments or suggestions have been included in the new version of the manuscript

Response to Vera Markgraf comments

Vera Markgraf comments: In the present paper the authors propose to interpret the last 2k of precipitation changes from 12 pollen records in Patagonia by calculating a "paleohydric balance index" (why not just call it a moisture index?) based on the proportions between forest versus steppe pollen types.

Authors response: We do not call our indices as "moisture" index because we assume that plants respond primarily to hydric balance conditions. In table 1 we define hydric balance as the ratio between annual precipitation and potential evapotranspiration. We have added some paragraphs and references supporting these assumptions in section 3.2 of the new version of the manuscript. Not all the indices are based on the proportions of forest versus steppe pollen types. Indeed 4 records are steppe records and Nothofagus was not included in these sites indices. A detailed explanation about the criteria used to calculate each site pollen index is provided in the supplementary material section 5.

Vera Markgraf comments: The specific pollen types selected to either group are based on data from modern pollen distribution and their relation to large-scale climate patterns, not from an ecological understanding of the plant taxa's habitat preferences. This explains perhaps why the same taxon (e.g. Misodendrum, Cupressaceae and several herbaceous taxa) in some records are taken to represent indicators for mois-

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ture (Mosquito, Rubens, PAB,Frias), whereas in other records they are listed in the category of dry conditions (Pollux, Trebol, etc). The authors need to present their reasoning for the seemingly haphazard choice of taxa. Furthermore, every pollen record, not just those from southern Patagonia, represents local as well as regional signals, with local taxa masking regional taxa. Escallonia (listed under the moist group) is a good example for representing a local signal, reflected by highly fluctuating values in the records and thus affecting the proportions of other taxa. This taxon's proportions are related to bog conditions (or to the coring site's vicinity to shore in case of lake records), and generally imply drier, not moisture conditions. This might explain perhaps single point "excursions" (such as in Trebol or Mosquito) and the generally large scatter of the data in all records

Authors response: We added in section 3.2. of the new manuscript version an explanation about the reasoning of our pollen indices selection, and added extra references about recent Patagonia pollen dispersal research providing new insights to understand different plants pollen dispersion behaviour. Also the detailed explanation of the criteria used to calculate every site past hydric pollen index provided at supplementary material section 5 would help the readers to understand the ecological basement of our taxa selection.

Vera Markgraf comments: To be able to compare data in the figures with those discussed I suggest 1. To plot the records according to latitude, North to South, and 2. To plot the actual precipitation (moisture) values (mm/year difference from present-day hydric value) that are discussed in the text instead of an index (which is not discussed and fluctuates around 0).

Authors response: We disagree with the reviewer in reorganizing figures 2 and 3 according to latitude. The records included on each figure follows the west-east Vegetation and hydric balance gradient (we added this tittle on "y" axis at the new version of the manuscript) in order to highlight possible synchronicity between forest and steppe environments in Northern Patagonia (fig. 2) and Southern Patagonia (fig.

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3). Latitudinal comparison can be observed by contrasting fig. 2 and fig. 3.

Please also note the supplement to this comment:
http://www.clim-past-discuss.net/11/C1798/2015/cpd-11-C1798-2015-supplement.zip

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Interactive comment on Clim. Past Discuss., 11, 2121, 2015.