For clarification the referee's text is written in **bold** and our replies in plain text:

Interactive comment on:

"Millennial-scale precipitation variability over Easter Island (South Pacific) during MIS 3: inter-hemispheric teleconnections with North Atlantic abrupt cold events"**by O. Margalef et al.**

Anonymous Referee #2

Received and published: 23 June 2015

GENERAL COMMENTS: I read this report on the most recent work from Rano Aroi on Easter Island (Rapa Nui) with great interest. The topic of linkages between paleoe- cological events the subtropical Southern Ocean and the rest of the planet is of great importance for our understanding how the ocean-climate system functions both today and in the past, and Rapa Nui occupies a unique geographical position. This article builds on the previous, detailed work of Margalef et al. (2013) on the Rano Aroi wet- land and the paleoclimate processes affecting it. This manuscript addresses topics of main-line interest to Climates of the Past. It is well-written, thoroughly referenced, and appropriately illustrated with figures. The title is appropriate, the abstract conveys the main points, and the overall conclusions are of wide interest. I especially like the global scale of the research question.

SPECIFIC COMMENTS: But I have problems with the chronostratigraphy on whichthe authors base their global correlations. The age-depth model (from Margalef et al.,2013), is based on a large number of AMS- 14C analyses of pollen extracted from their sediment cores. There are numerous dates that are too young in comparison to the favored interpretation of the age- depth relationship. The authors suggest this is a result of sediment mixing by deeply rooting plants and/or by the capsizing of floating islets of peat when the wetland had open water in its center. Regardless of the exact cause, the fact is that there are other ways to construct an age-depth curve through the 14C dates reported in Margalef et al. (2013). Wouldn't it make more sense that the older dates (to the right in Margalef et al., 2013 Figure 2) represent pollen that was reworked from older sediment layers? It seems to me that it is more likely that "old" pollen is reworked into younger deposits than vice versa. Have the authors tried to apply an alternate age-depth models to their Rano Aroi data? If so, do the resulting variations in hydrology fit or not fit their proposed teleconnections to the chronologies of other (global) climate events?

Anomalous radiocarbon ages have been reported by several groups studying Easter island records, especially when performed over *Scirpus californicus* peat (Butler et al., 2004; Gossan et al., 2007; Sáez et al., 2009). This sedge type can form a thick floating litoral belt as the peatland-lake system (Kratz and Dewitt, 1986) occurring in Rano Raraku today. But also floating islands made of peat and containing living sedges that drift, like happens at present in Rano Kao. Both stages likely occurred on Rano Aroi on the past during wetter events. These floating living structures can accumulate new organic matter upwards and downwards and also flip over, generating an anomalous age distribution. Moreover, the rhizomes of

Scirpus californicus can reach deep peat layers (until 1 m), altering with young carbon former peat strata. **Both processes**, rhizome contamination and floating mats dynamics contribute to generate **young anomalous ages**, as we found in our record. Moreover, the variations in accumulation rates provided by the considered ages are in accordance with facies changes. For example, the age discontinuity circa 40 cal kyr BP coincides with the presence of highly degraded peat indicating a coherent relation between facies D and ages. This relationship between accumulation rates and facies would not occur when considering only the “young” ages as the reviewer suggested.

A last argument for considering the young ages as “anomalous” is in Margalef et al. (2013). The ages provided by a second core of the same site (the edge of the mire) give ages that result coherent with the age model proposed in Margalef et al (2014) and this work. This can be appreciated in Figure 1.

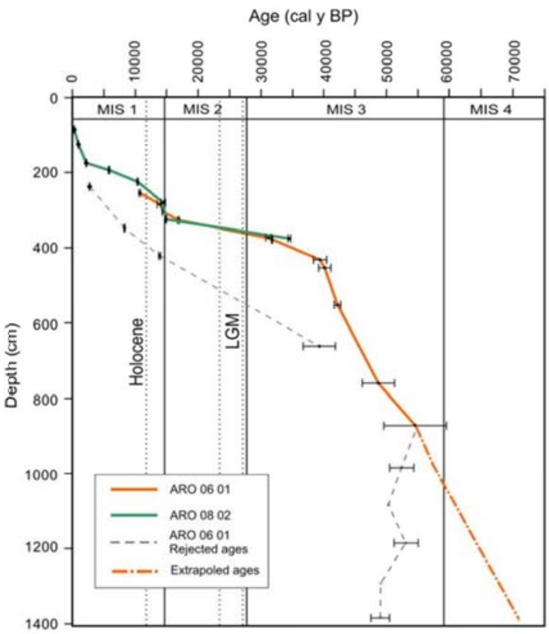

Figure1. Age model of Rano Aroi from Margalef et al. (2013). ARO 06 01 is the record used for this study and was retrieved from the center of the mire. ARO 08 02 is a 4 m record obtained from the edge of the mire. Age models of both cores are coherent.

The ages rejected that were younger than the radiocarbon detection limit were 4 from a total of 14. We claim that using these 10 ages for dating the upper part of the record (first 6.5 m) confers a much **robust** age model to work on than using the 4 rejected ones. The age model figure (Figure 2 of the manuscript) has been improved in the manuscript reviewed, including the stratigraphic discontinuity existing, the length of the studied period and extracting the rejected ages to avoid confusion.

Along this same line, millennial-scale conclusions require millennial-scale age control.The ecological shifts between different wetland types that the authors are using to infer precipitation changes very likely caused changes in sedimentation rates over millennial time scales. Such changes may only be fully revealed by closely spaced dating, closer that the authors have at this stage. I would be much more willing to accept (and even applaud) the results of this study if the authors could demonstrate that their chronostratigraphy is accurate and precise.

The referee is right, and these wet events could slightly modify accumulation patterns and rates. But facies C (wet events) are considered short events on the 14 m (70 kyr BP) record, imbedded on a facies B dominance. These changes to facies C are interpreted as a water level rise, but not a drastic change of the system, like the one recorded on Raraku Lake (transition from a lake to mire at Cañellas-Boltà et al., 2012; Sáez et al., 2009). Instead, Rano Aroi has always been a mire. For this reason, average accumulation rates are assumed to well summarize this type of changes in lakes and peatlands as shown by several paleoenvironmental works (McGlone et al., 2002; Muller et al., 2008; Vandergoes et al., 2005) when there are not evident discontinuities or signs of peat exposure and loss (like in facies D, that occurs in younger levels and is reported in the present manuscript).

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