

Interactive comment on “Holocene environmental changes in the highlands of the southern Peruvian Andes (14° S) and their impact on pre-Columbian cultures” by K. Schittek et al.

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Received and published: 15 May 2014

1. Does the paper address relevant scientific questions within the scope of CP? Yes
2. Does the paper present novel concepts, ideas, tools, or data? Yes, peat archives of the Central Andes have been poorly investigated and provide an important archive for paleoenvironment and paleoclimate of this region.
3. Are substantial conclusions reached? Yes
4. Are the scientific methods and assumptions valid and clearly outlined? Yes, but some aspects has to be considered in addition as described below.
5. Are the results sufficient to support the interpretations and conclusions? Yes, in general, but some aspect described below should be further considered.
6. Is the

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description of experiments and calculations sufficiently complete and precise to allow their reproduction by fellow scientists (traceability of results)? Yes- 7. Do the authors give proper credit to related work and clearly indicate their own new/original contribution? Yes
- 8. Does the title clearly reflect the contents of the paper? Yes
- 9. Does the abstract provide a concise and complete summary? The abstract should be shortened and partly re-written.
- 10. Is the overall presentation well structured and clear? Yes
- 11. Is the language fluent and precise? It should be partly improved: see comments below and attached manuscript
- 12. Are mathematical formulae, symbols, abbreviations, and units correctly defined and used? Some minor changes are required. Comments below.
- 13. Should any parts of the paper (text, formulae, figures, tables) be clarified, reduced, combined, or eliminated? The length of the text is appropriate. The figures are also necessary, but their quality should be improved as described below.
- 14. Are the number and quality of references appropriate? Yes
- 15. Is the amount and quality of supplementary material appropriate? I have not seen supplementary material

The manuscript of Schittek et al. includes interesting new results concerning the Holocene climate history in the central Andes and its relationship the human settling and culture dvelopment in this area. Therefore the manuscript is appropriate for the Journal “Climate in the Past”. However, there are some points which should be revised previous to publication and this requires major revision of the following aspects: Some comments and suggestions are also made directly in an attached pdf version.

1. The abstract should be shortened and partly re-written. I have given some suggestions in a pdf version. The introduction chapter can be also improved and I gave also several suggestions for modification of in the PDF version.
2. The authors use very often the term “high resolution” throughout the manuscript. But what does this really mean with respect to time resolution of single proxies. This should be clarified. Along the nearly 10 ka record only the periods between 5.2 to 3.6 ka and from 1.8 to 0.5 Ka (mainly the peat bearing sections) are precisely dated. The other poorly dated core sections are dominated by clastic sediments. From these core sections fifteen

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¹⁴C ages have been removed with the argumentation that these ages represent reworked probably older organic material. It is possible to identify an reworked origin of his organic material or it is just a suggestion, because they appear within clastic sediment sections? However, the modelled ages are just interpolating the clastic sediment sections which are probably controlled by pronounced precipitation events. Some of these layers seems to be various centimeter thick and could have been deposited in hours to few days during flodd events. This could have produced abrupt changes in the sedimentation rates. In the lowermost core section there have been removed the ¹⁴C ages at around 5.9 and 7.6 ka from the age model, probably because they do fit not well into the interpolated curve. Or are there other reasons? I suggest a careful discussion of the type and role of the clastic sediment layers with respect to the interpolated sedimentation rates which gives the model ages for the core. 3. Peat decomposition can produce a strong relative enrichment of the metal concentrations in a peat. This aspect is not well discussed with respect to e.g. As, Fe enrichment in the profile. It is mentioned that the As peaks appeared during relatively dry periods when the fixation of As to organic matter can be enhanced. On the other hand it is well known (e.g. Biester et al. 2003 in EnST) that peat decomposition rates can increase strongly during drier periods which will cause also lower C/N ratios. How far are the peat sections with high As concentration related with low C/N ratios? Furthermore, As, Fe or other redox-sensitive metals can be transported by percolating water into the peat where it can be precipitated or fixed to organic matter (depending on the redox-conditions) at different levels within the peat, but not necessarily at the surface of the peat. Therefore, the ages discussed for peaks of such elements within the profile has to be considered with care. 4. The general and over-regional climatic influences concerning the investigated site are well discussed. However, this region has a pronounced seasonal rain period. The clastic sedimentation seems to be controlled by strong precipitation events (besides general changes in the plant cover of surrounding hills). This more seasonal aspects of climate perturbations, their causes and relationship to atmospheric circulations should be better addressed in a revised version. 5.

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The figures should be improved as suggested below, taken in mind that they have to be reduced in size. Often links to the figures are missing in the text. please check this.

Fig. 1: It would be better to move 1B and 1C to the left of 1A and then to change the labeling of 1B to 1A and 1A to 1 B. The reason is that the overview map is usually first referenced in the text. In 1 A the city names of LIMA, Ica, Arequipa Nazca and Arica are given within the dark colored areas. They can be moved into the lighter colored areas. "Arica" is plotted on the border line. All text in this figure is in relatively small font size (with exception of the distance scale). Lake Titicaca should be labeled beside the lake. It is sufficient to give the latitudes and longitudes only on one side of the figure 1 C. The labeling within this figure is too small!! 1D: There could be given some elevations in this figure so that the morphology can be better estimated. In the Figure legend it should be mentioned that this photo is a "South to north view", I guess that it is.

Fig 2: The age scale has marks each 400 years which means that 1000, 3000, 5000 years are not marked on this scale by marks. It is not labeled that this are calibrated years. In the lower left corner of the figure the "C" of "¹⁴C" has a rare font type.

Fig. 3: The font size of the Ages and Depth at the vertical bar are too small. All font sizes are at the lower limit. It could be easier to read the graphics if either peat or the siliciclastic sections are marked with horizontal grey bares.

Fig. 4: Again most font sizes of text and numbers are too small!! There is given a "%" in the lowermost part of the figure. Is this wt.% or vol.%?

Fig. 5: Again most font sizes are too small and the text and numbers cannot be identified! It should be mentioned in the legend what does the vertical yellow underlying bars mean.

Please also note the supplement to this comment:

<http://www.clim-past-discuss.net/10/C481/2014/cpd-10-C481-2014-supplement.pdf>

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