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Climate of the Past Discussions

Interactive comment on "The quantitative reconstruction of the paleoclimate between 5200 and 4300 cal yr BP in the Tianshui Basin, NW China" *by* N. Sun and X. Q. Li

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General comments A quantification of two sets of charcoal assemblages from middle Holocene terraces in China was done in order to reconstruct past climate. Although the chosen tool for this study the CA method is not novel, it applied to 2 sets of charcoal in an important part of the world. This is overall an interesting manuscript with useful conclusions.

Specific comments: 1. I do not understand how you come to an age of 4800-4300 cal yr

BP for the samples in the Xishanping section. There is a date at 350 cm of 4970+-100, therefore your first sample (at 450 cm) is older than this and more likely to be close to 5620 yr, the date at 490 cm depth. This has serious implications because your 2 sites have then a clear chronological overlap. If the date at 5620 yr BP is to be rejected you have to explain this clearly. I suggest that you add a section on chronology, as other radiocarbon dates are reversed too.

Many thanks. The cultural sediment was disturbed at times. The age data appeared a little inverted. Li et al., (2007) built a chronology sequence on the Xishanping section using 5 AMS dating (selected from the 8 age data) according to the linearity of the ages. This paper used this age model and the depth of 40-450 cm is covered by 4300-4800 cal yr BP. We have added the information in the paper.

2. Page 2746, lines 8-9: you suggest that 100 charcoals is sufficient for a temperate region. You work however in a subtropical region, which has normally more biodiversity. Should this mean that you should count more charcoals?

Thanks. Keepax (1988) has carried the counting in England. We have also try to make a saturation curve from the Dadiwan site, when the examining fragments over 110, there was almost no more new taxa showed up, so about 100 pieces from each sample examined is enough. The results have been added in the paper.(See fig.1 in the last page of the reply letter)

3. Page 2746, Lines 18-23: discuss what is the difference with the mutual range method? It is used widely in the Holocene for various proxies such as pollen and beetles.

Good suggestion. Both the CA and the mutual range method use the presence/absence data, and all the taxa from an assemblage are considered, they all firstly, confirm the plant biogeography; secondly, transform the geographical distribution of each plant into a climatic range; finally, the coexistence area of climatic interval of all the taxa is the paleoclimatic range. So, the principles of the two methods are the same.

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Only the CA is often used in the palaeoclimate reconstructions in the Tertiary, and it is based on the assumption that Tertiary plant taxa have similar climatic requirements to the nearest living relatives. The fossil charcoals in our paper come from mid-Holocene, so the plants almost have the same climatic requirements to modern taxa, which means the CA is suitable for our study.

4. Page 2747, line 3: we need many more details here on where you got the plant distribution, species by species, and also explain better how you have linked the plant distribution and the meteorological data in the stations. Add at least a paragraph.

Good suggestion. The modern plant distribution has been examined extremely accurately, the distribution of all the taxa comes from the online version of 'flora republicae pobularis sinicae' (http://frps.plantphoto.cn/) and 'Chinese Virtual Herbarium' (http://www.cvh.org.cn/cms/). The meteorological data is from the plant distribution range, generally one of the meteorological stations is selected from the north, south, east, west border of the distribution range, respectively, and also the one from the highest and lowest elevation, respectively. So, the meteorological data used for each taxa are almost from about six meteorological stations; and then defining the maximum and minimum value of the meteorological data as the plant tolerance range of the climate. We have added new information according to your suggestion.

5. Page 2747, line 23: add an 's' to forest because you are dealing here with at least two different forests types. Some charcoals may have been transported as trees by the river.

Thank you, the 's' has been added. Charcoals could be transported by the river, but in our paper, the cultural sediment located on a highland of terrace and haven't been disturbed by rivers. So the fossil charcoals from the section were discarded randomly by early farmers.

6. Pages 2749-50: What is the role of the difference in altitude between the 2 sites? is it enough to have different vegetations and different climates at the same time? What

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is the altitude of the Lueyang site you use for comparison?

The altitudes of the two sites are close and altitude is similar (Fig 1). Dadiwan is located on the north of Xishanping, and they belong to the same climatic zone but covered different ages, here we use these two sites intend to show the climate change during the mid-Holocene. The fossil charcoal assemblages show that the same vegetation type (evergreen broadleaved and the mixed conifer-broadleaved forests) developed in the two sites, except for the plant taxa in the Dadiwan is more than Xishanping (Li et al., 2011, Vegetation History and Archaeobotany). The analysis of CA method show that the climate in Dadiwan (5200-4900 cal yr BP) is similar with Xishanping (4800-4300 cal yr BP) but wetter, which agrees with the drought tendency after around 5000 cal yr BP in China (Wang et al., 2005). Lueyang County located in the south Qinling Mountains and the altitude is around 1200 m (adding in the paper). The paper comparing Lueyang with the two sites intend to give a space comparison, and then trace the climate belt migration.

7. Section 5 Discussion; it would be useful to illustrate the changes over time in each site using the CA method. Could you add two diagrams?

Good suggestion and Thank you. It is little insufficient that the CA method doesn't consider about the abundance of each plant taxon, which only use the presence/absence data. As long as one taxon appeared it means the climate during that time is suitable for it; besides, the plant taxa in each site is almost even along the section, the changes over time is just the abundance of each taxon, so it is hard to show the changes over time in each of the two sites.

8. Technical comments Page 2742 Lines 11-14, page 2749 lines 28-29, and page 2750 lines 1-2 and 13-15: replace the word 'increase' by 'were higher than present'. Everywhere replace 'from 5200-4900' by 'from 5200 to 4900'. Page 2742, line 15: between 5200 and 4300 Page 2743 line 20: are relatively direct proxies Page 2744, line 2: the fossil charcoal reflects local vegetation Line 4: reconstructing the local vegetation

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history and the local climatic Line 15: delete ", which is sensitive to climate change" as much too general Line 16: where does the information come from, from which met station and from which sources? This is an average on how many years? Line 21: replace by the modern botanical nomenclature Page 2746, line 16: in which institution is located the wood collection? Page 2748, lines 6 to 26: move this to the introduction. Table 1: In the caption indicate that the AMS was for 14C. The same for fig. 3 and 4. Add a column with the ages used in fig. 2 Table 2: Ulmus is misspelled Fig. 1: add North. In the caption, add the meaning of the triangles. Fig. 2: add a vertical line along each lithological column for the depth range where the samples come from. Disturbed is misspelled. Fig. 3 and 4: add a column with the numbers of charcoal counted. Fig. 4: it seems that the charcoal samples and the radiocarbon samples have the same sample numbers. Is this correct? Should it be different? Fig. 6 and 7: add horizontal lines for the modern values in each graph.

Thank you. The mentioned problems have been revised in the paper.

Please also note the supplement to this comment:
http://www.clim-past-discuss.net/7/C1916/2011/cpd-7-C1916-2011-supplement.pdf

Interactive comment on Clim. Past Discuss., 7, 2741, 2011.

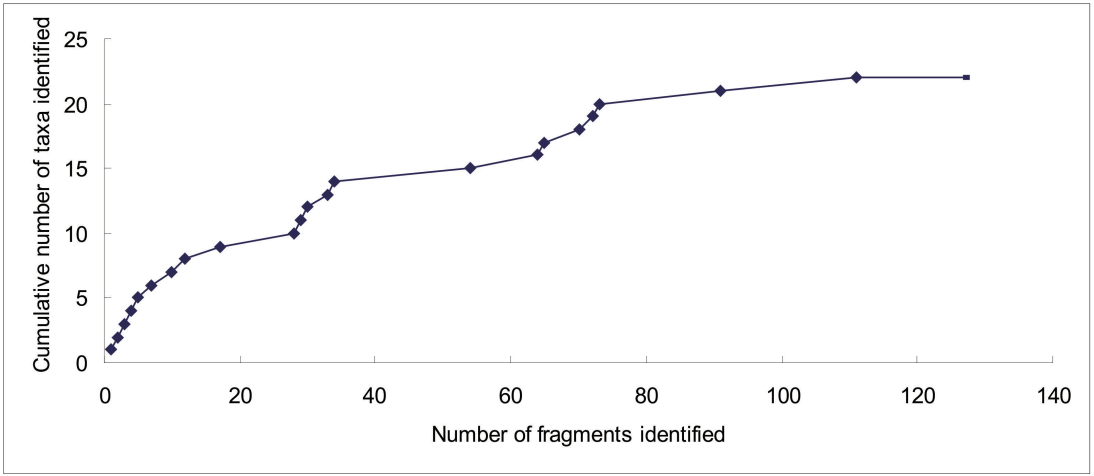

Fig. 1. Identification saturation curve from the Dadiwan site, China

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