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Interactive comment on "Holocene climatic evolution at the Chinese Loess Plateau: testing sensitivity to the global warming-cooling events" *by* Taslima Anwar et al.

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Authors' Response to Comments from Reviewer 2

Dear Reviewer,

We are grateful to get such a constructive feedback from the reviewer. Particularly, some critical observations are deeply appreciated. As per your suggestions, we have addressed all the issues arisen and we do believe it responds to all the queries.

Best regards,

On behalf of the co-authors,

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Discussion paper

Vadim A. Kravchinsky (corresponding author, vadim@ualberta.ca)

General Comments:

In this paper the authors intend to reveal the Holocene millennia climatic change in the Chinese Loess Plateau by linking the pedogenic alterations and the variations in temperature and precipitation in the involved regions. Although this is an interesting subject in paleoclimate research, the manuscript is not well constructed to demonstrate the relationship between the geophysical proxies and the sequence of climate change. What the authors ignored are the complex in interpretation of the pedogenic related proxies, and the difficulty in correlation among different sections in the region and different regions in the world. Thus the conclusions of the manuscript should be treated with caution.

Response:

Thanks for this observation. Here, we address these comments through the responses to the specific comments (below).

Specific Comment 1:

The ages of the reported sections are assigned based on previous OSL dating data by correlating pedogenic units among different sections, and, based on these assigned ages the different sections as well as their proxies are correlated. I think this is inappropriate, and is hard to avoid circular reasoning. It is noted that the boundaries of pedogenic units are not necessary equaled to chronological labels, especially in millennial to centennial timescales. Thus the correlation between different sections is not adequate.

Response:

Two sites (areas), the Yaozhou and the Jinjie, were sampled in this study. From the Yaozhou site, three sections (YZ1, YZ2, and YZ3) were investigated. These sections are only few meters apart of the same site, therefore, the stratigraphic subdivision was

assigned based on the field observations of colour, texture, and structure of the sediment. Zhao et al. (2007) dated the Yaozhou (YZ1 section) loess paleosol sequences using optically stimulated luminescence (OSL) dating technique. We assigned ages of each soil section based on the OSL dating of Zhao et al. (2007) for the YZ1 section. Since YZ2 and YZ3 are parallel cross-sections from the same site, the ages of pedogenic units for all the three sections (YZ1, YZ2, and YZ3) can considered the same.

Two parallel cross-sections (JJ1 and JJ3) from the Jinjie site were studied. Although these sections are 1 km apart, three soils can be visually traced in the field along the road and the correlation is straightforward. Ages are assigned based on the OSL dating of Ma et al. (2011) for this site.

Specific Comment 2:

Although the soil formation is certainly related climate change, a simple correlation between petromagnetic parameters and climate indexes (e.g., temperature, precipitation) is seen to be oversimplified.

Response:

Thanks for this observation. Yes, soil formation is definitely related to climate change (temperature, precipitation etc.). We used multi-parameter analyses of two sites (5 sections) to evaluate the influence of temperature, precipitation, and wind strength on regional climate changes along the south-to-north eastern Chinese Loess Plateau.

The pedogenic feature of the studied sections is clearly identifiable in the magnetic concentration parameter records (Figures 4-8); and it is widely accepted by the research community that higher magnetic parameter and finer magnetic grains (Figures 4-8) correspond to higher precipitation and temperature for the Quaternary (textbook Environmental Magnetism of Evans and Heller, 2003). Moreover, we have observed Xarm/Xlf and Xarm/SIRM data (Figures 9-13) to confirm whether the three periods were both warm and wet. For all the sections, Xarm/Xlf and Xarm/SIRM records show simi-

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lar trends (Figures 9-13). The co-varying trend pattern for Xarm/Xlf and Xarm/SIRM records indicate that the climate was both warm and wet like the present day climate conditions (higher precipitation corresponds to higher temperature) for the time scale observed.

Therefore, based on our multi-parameter study, we found temperature and precipitation were coupled during the Holocene and 3 warm-humid intervals occurred during the Holocene in northern China.

Specific Comment 3:

In the last two figures we did not find a good correlation between the reposted sections with other sequences in the regions as well as in the world. Thus it is hard to come to the conclusions that the manuscript has achieved.

Response:

Thanks for this comment. Here, we would like to mention that the correlations (Figures 14 and 15) were not filtered, rather they were presented in the original forms. If we applied band pass filter, as many studies did, the correlations might look much better; however, we preferred to show our original records to create a clear understanding for readers. When different proxy records from different areas are correlated, there are always slight differences; and that is common in all the published correlations for original geophysical records. Considering these points, we do demonstrate both the regional and global data (Figures 14 and 15) correlate well with the studied records.

Technical corrections:

1. The labels of y-axis in the last two figures are not clear and sometimes lacking.

2. In the abstract, the sentence “the Mu Us Desert of the Chinese Loess Plateau” is uncorrect, as we know that the Loess Plateau has never included the Mu Us Desert.

Response:

1. The details of the Y-axis are given in the figure captions for the Figures 14 and 15.

2. Necessary changes have been made accordingly in the revised paper (line 24).

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