

Interactive comment on “Terrestrial mollusc records from Xifeng and Luochuan L9 loess strata and their implications for paleoclimatic evolution in the Chinese Loess Plateau during marine oxygen isotope stages 24–22” by B. Wu and N. Q. Wu

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The authors present a detailed examination of variations in the mollusc fauna within L9 loess at Xifeng and Luochuan. Their 10cm sample spacing offers an opportunity to reconstruct ecological shifts and interpret climate variability in the Chinese loess plateau on a multi-millennial scale for the terrestrial loess interval correlated with marine oxygen-isotope stages 24–22.

The authors' paleoclimatic interpretations and conclusions are generally supported by their data. Because they infer less severe glacial conditions during L9 loess formation than had been previously proposed, they offer a testable alternative hypothesis as to the origins of the thick, coarse L9 loess. The faunal analysis provides valuable data and interpretations, but the authors should consider several points when preparing their final manuscript.

1. Although it is possible to sample loess strata in the field at closely spaced intervals, deposition is a non-linear, episodic accumulation of silt, alternating with periods of reworking, insitu weathering, and pedogenesis, reflecting local, regional, and global climatic conditions. The age model for the Luochuan and Xifeng loess sections is based on the correlation of local magnetic susceptibility profiles – a measure of primary (depositional) + secondary (pedogenic) magnetic mineral content – with the globally averaged marine oxygen-isotope stratigraphy. While the general applicability of this model has been demonstrated in the literature, it is commonly over-interpreted in terms of the temporal resolution and the precision and accuracy of ages applied to the loess stratigraphy.

The authors briefly reference the chronology and acknowledge dating limitations (p. 2771, lines 10-18), but then apply a high-precision, high-resolution timescale to their interpretations. Beginning on p. 2775, the authors state ages (e.g., 940-923 ka) and sedimentation rates (e.g., 17.12 cm/kyr; 9.62 cm/kyr) that exceed the resolution supported by their magnetic susceptibility – $\delta^{18}\text{O}$ -correlated age model. Attention to significant figures will help resolve this problem.

2. Carbonate dissolution is noted in the upper part of L9 (corresponding to late MIS 22) as impacting the preservation and therefore number of mollusk shells present. It would be helpful to include a plot of CaCO_3 vs. depth, if available, to demonstrate whether dissolution affects the preservation or abundance of shells elsewhere within L9.

3. Plots of percentage variations (figures 4, 5) have different scales for each taxon,

sometimes with breaks in the axes, making it very difficult to interpret the plots at the figure size presented. The axis breaks should be made more clear, and ideally the individual taxon percentages should all be plotted at similar scales.

4. The authors define three ecological assemblages based on a subset of the mollusk fauna. *P. aeoli* is listed as a cold-arid indicator (blue, in figs. 4 & 5), but it appears to vary inversely with the other cold-arid taxa (*V. tenera* and *P. cupa*) and parallels more closely the warm-moist indicator *G. armigerella* in fig. 4. Why are those seemingly incongruent taxa so commonly present together in L9, and how does that affect the paleoclimatic interpretations?

5. Authors argue based on high values of *G. armigerella* and *P. orphana* that warm-humid conditions prevailed during formation of L9SS1 (MIS 23). However, this interval is dominated by *P. aeoli* (cold-arid), especially at Luochuan. *P. orphana* appears to be a relatively minor percentage of the total. The argument for warm-humid conditions during MIS 23 is unconvincing, based on the presented taxa.

6. The comparison of L9 and L1 faunal data is seemingly less similar than authors suggest on p. 2777, lines 9-10. While thickness and sedimentation rates may be somewhat comparable, different taxa are included in two ecological groups (figs. 4 & 5), and the warm-moist group is essentially absent in loess corresponding with MIS-3. Within the paper the authors appear to argue that L1 and L9 are similar early on, while later (fig. 6) they suggest that L1 is representative of much colder, stronger glacial conditions than L9. The comparison between L9 and L1, and the purpose of that comparison, should be clarified.

7. The authors present a possible alternative explanation for the thick, coarse L9 loess on pages 2779-2780. This is a useful model that may explain the seemingly conflicting interpretations between the current faunal analysis and sedimentological data. Further exploration in a separate study can test this hypothesis, but it is appropriate to present this model as a potential explanation here.

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Overall the paper is well written with few technical problems. A thorough English language editing is recommended to correct a few stylistic problems. Throughout the paper the authors should correct significant figures on reported values for ages, sedimentation rates, percentages of taxa, and sample depths, and they should adjust interpretations accordingly.

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