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Climate of the Past Discussions

Interactive comment on "Three exceptionally strong East-Asian summer monsoon events during glacial conditions in the past 470 kyr" *by* D.-D. Rousseau et al.

Anonymous Referee #1

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In this paper, the authors report a record of mollusks of the last 470 kyr from the Luochuan section in the Chinese loess plateau. Based on the abundance of thermal-humidiphilous mollusks, they conclude that there are three exceptional East Asian summer monsoon events occurring respectively during glacial intervals MIS-12 (L5), -10 (L4) and -6 (L2). Possible causes for these events are also discussed. This paper provides a valuable proxy record for the study of regional climate and its response to different climate forcings, and also for the study of monsoon variations and mechanisms at the orbital timescale. It deserves to be published, but the authors have to make clarification and corrections related to the following remarks.

1. The 'exceptional strong' East Asian summer monsoon during MIS-12, -10 and -6 is a relative concept, relative to the other glacial times. It might be pretty weak if compared to the summer monsoon during interglacial times. Therefore, to avoid misunderstanding, I suggest (1) 'strengthened monsoon' instead of 'strong monsoon' to be used in the text and in the title of this paper, and (2) also to stress that it is in comparison with summer monsoon of the other glacials.

2. The abundance of warm-moist demanding mollusks does not necessarily depend upon the summer monsoon only. It might rely also on the winter climate because of survival condition. Warm-moist demanding mollusks would not exist when winter is too cold even if the summer monsoon is very strong. This might be the case for the other glacials where moist-warm mollusks are not found. The authors also mention, in the first paragraph of Page 1301, that the exceptional summer monsoon events recorded by the mollusks corresponds to decreased grain-size recorded in other loess section. This needs more comments because the grain-size is traditionally taken as a proxy for winter monsoon. Moreover, there seems to be no indication of exceptional East Asian summer monsoon in the magnetic susceptibility recorded during these glacials. Is there any proxy which can be used to confirm the conclusions drawn here from the mollusks data?

3.1. In the second paragraph of Page 1300, the authors try to interpret the exceptional summer monsoon in L5 and L4 from a summer insolation gradient between high and low latitudes. They associate peaks of the insolation gradient curve to these East Asian summer monsoon events. But what the other peaks during the other glacials? For example, we can see from Fig.5 that, there are two high insolation-gradient peaks in L1 among which one is higher than that in L4, and both are higher than in L5. 3.2. For L2, the authors comment only the lowest of the two peaks in the insolation-gradient. It is almost the lowest of all the peaks during the glacials. So why are the other ones not as valuable as this one (for example in L1)? Moreover, another peak is higher than in L4 and L5, but corresponds to a winter monsoon event (shown by WMI). Why does

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it not reflect a strong summer monsoon but rather a winter one? 3.3. For L3, the same remarks hold as for L2. Therefore, this interpretation seems to be questionable and requests more explanations. The same holds also for the interpretation drawn from the low values of obliquity, because for example the obliquity at L5 event is not low at all.

4. 'average summer insolation' used in the text and in Fig. 5 needs to be clarified. Is it calculated from daily insolation using an astronomical calendar? And over which period of time?

5. In Fig .5, clarify what is the red and what is the black curve in the first panel. Same for the last panel in Fig. 4.

6. Page 1291, Lines 22-23 are difficult to be understood.

7. Page1300 Lines1-3: There is no winter insolation curve in Fig 5. The strong statement of 'winter reduced monsoon strength characterized by low gradient between high latitudes and the tropics' has to be illustrated. Moverover, the relationship between winter monsoon and insolation gradient must be explained from physical arguments or modeling experiments.

8. The authors have to check typing errors except the following ones:

P1294 L10: 'several 2-3 m wide and 2-3 m high panel sections' P1294 L19: 'allows' rather than 'allowed' P1295 L28: '.' instead of ',' P1295 L9: 'of the Pleistocene' P1298 L8: ',' instead of '.' P1299 4.3 'summer' P1299 L9: 'implied by' P1303 L5: 'sensu lato' P1304 L17: delete 'were' P1305 L2: delete ','

Interactive comment on Clim. Past Discuss., 4, 1289, 2008.