Clim. Past Discuss., 4, S139–S141, 2008
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Climate of the Past Discussions

Interactive comment on "Provenance changes of eolian dust at Lingtai section in the Chinese" *by* Y. Isozaki et al.

Anonymous Referee #1

Received and published: 1 May 2008

Comment on “Provenance changes of eolian dust at Lingtai section in the Chinese Loess Plateau since 7Ma and its implication for desert development in East Asia” by Isozaki et al.

General comment:

This article aims to use Electron Spin Resonance (ESR) signal intensity and Crystallinity Index (CI) of quartz from the fine fraction of Chinese loess to infer the temporal provenance changes of eolian dust since 7 Ma ago. These data are new, and this paper is suitable for publication in “Climate of the Past”. Nevertheless, the MS raises many questions that should be substantially revised before acceptance.

Specific comments:

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1.The authors aimed to use the ESR signal of quartz in the fine fraction of dust to infer provenance information. However, the ESR signal intensity of the sample was normalized by quartz content to calculate the ESR signal intensity of pure quartz. According to their description, the quartz contents were measured by XRD method. As we all know, the XRD can be only used for quasi-quantity analysis, such method has large uncertainties, this will definitely influence the precision of their ESR signal data, how about the precision of this technique? Why they did not extract pure quartz for such measurements?

2.In their conclusion and abstract, the authors suggest that the provenance of fine fraction of the eolian sediment at Lingtai changed at 4.3, 2.1, 1.4, 1.1, 0.8 and 0.4 Ma. However, when we observe both the ESR signal and the CI curves (see Fig. 3), we can easily see that the both curves with large error bars, and many neighboring points have very large varying range nearly comparable with the largest variable value (i.e., the maximum minus the minimum). I do not think such large changes of the used index indicate striking provenance changes of eolian dust of the neighboring points, but are due to analyzing uncertainties. Considering this fact, I think the authors can only discuss the general patterns of the two curves, rather than notice the details of the curves. Generally, the remarkable changes of the patterns of the two curves only occur at about 2.1 and 1.1 Ma ago, and another change may be around 4.3 Ma. Therefore, the other so called changes at 1.4, 0.8 and 0.4 Ma should be omitted. Moreover, in their following discussions, their divisions of different Stages should also be changed accordingly.

3.Due to the large variable range of the neighboring points, I wonder the significance of the series of End Member (e.g., from EM1 to EM4) values used by the authors, especially when they correlate such End Member values with some definite mountains (e.g., Kunlun, Tian Shan, Qilian etc.). In my opinion, rock types and ages are quite complicated even within same mountain range, before detailed measuring the ESR signal and CI values of materials derived from the different parts of the mountains, it is

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difficult to give convincible results.

4.In Figures 4 and 5, the authors compared the ESR signal versus CI diagrams of different stage samples with that of modern desert samples. However, I have two questions for the values of the modern deserts. Firstly, In China, there are at least nine sand deserts and other large gobi (gravel) desert, why the authors only used the values of five deserts? Secondly, all the deserts have large areas, sand compositions in different sites of the same desert are usually different because the nearby fan deposits of the adjoining mountains will definitely affect the composition of the local sand dunes. This can be easily evidenced by their variable values from the five samples of the Taklimakan Desert (see Fig. 5), my question is: How many modern sand samples from each desert were taken? How they are distributed within each desert?

5.In the discussion section, the authors related the provenance changes to major tectonic activity. Actually, both tectonics and Cenozoic climatic cooling induced rock denudation can lead to provenance change. The uplifts of the Kunlun, Tian Shan, Altyn, Qilian mountains are all the intracontinental deformation in response to the northward moving of the India Plate since about 55 Ma ago. And many previous tectonic studies suggested much earlier uplifts (older than 4.3 Ma) in the above ranges (e.g., Hendix et al. 1994 suggested uplift of the Tian Shan at about 24 Ma by using apatite fission track technique). Therefore, one can not simply correlate each provenance change to tectonic event.

6.This manuscript is too long, and it should be more concisely.

7.The authors should cited the Ref. of Sun (2002) published in EPSL (v. 203, pp. 845-859), which used multiple methods to trace the provenance of the Chinese Loess Plateau, even some of your conclusions are different from this previous study.

Interactive comment on Clim. Past Discuss., 4, 335, 2008.