

## ***Interactive comment on “Modeling dust emission response to MIS 3 millennial climate variations from the perspective of East European loess deposits” by A. Sima et al.***

**Anonymous Referee #1**

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Sima et al. (2009) explored dust emission changes in Western Europe following the North-Atlantic millennial climate variations during Marine Isotope Stage 3, using an AGCM. In this manuscript, they examine the same issues, but for the Eastern Europe with reference loess sites in Ukraine, using more advanced tools (the LMDZ atmospheric general circulation model and the ORCHIDEE land-surface model). The experiments yielded highly interesting results with regards to the dust source locations, transporting-wind changes, the roles of vegetation and snow cover etc, within the background of the D-O and Heinrich millennial climate changes.

Such kind of numerical experiments is not only helpful for understanding the global

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climate tele-connections and mechanisms, but also very useful for refining and improving the climatic interpretations of the loess-soil sequences, which are widely used for documenting continental paleoclimate histories.

In the case of the present study, the acquired information about the seasonal dust deflation changes, the source variations and the dominant role of vegetation, is of particular significance. The results offer a strong support on the concept that loess deposits attest to the presence of poorly vegetated, and hence, some kind of desertic source zones. This is not insignificant because dust accumulation rate was sometimes interpreted as an indication of the availability of fine-grain materials due to tectonic-induced erosions.

A few minor suggestions are as follows.

1. Dust accumulation rate is mostly used by the loess community as a proxy of source region aridity while grain-size is usually interpreted as an indication of wind strength. Different views also exist although the voice is not so strong. It would be finer if the paper can provide some discussions on the links between the source extents (the sizes) and dust accumulation rate, based on the experimental results. At least, the current discussions are not clear enough relative to this issue.
2. The discussions on the dust grain-size invoked both wind strength and the relative contribution of the nearby vs. remote sources. Could their roles be addressed in a more explicit way?
3. If it is possible to generate two curves from the model outputs, showing the dust content and grain-size changes with the elevation? This would be interesting for loess geologists to compare the sites at different elevations, although it is clearly not the focus of the present manuscript.
4. There is a room to improve the text. Especially, some paragraphs are so long that the readers would feel hard to follow.

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