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Interactive Comment

Interactive comment on "Long-range transport of giant particles in Asian dust identified by physical, mineralogical, and meteorological analysis" *by* G. Y. Jeong et al.

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Dear Dr. Pósfai:

Thank you for your kind review of our manuscript. We are pleased to reply to your constructive comments.

1. Quantitative mineralogical analysis of Asian dust is best done by X-ray diffraction (XRD) analysis. However, the XRD method requires a sufficient quantity of sample, at least one gram. Enough dust samples can be collected near dust sources, but usually not in remote sites. Single particle analysis using scanning electron microscopy

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Interactive Discussion

Discussion Paper

(SEM) and energy dispersive X-ray spectrometry (EDXS) is an alternative method for the mineralogical characterization of dust. However, the quantification of the mineral composition of single dust particle using SEM-EDXS is practically not possible because of the uncertainty of EDXS elemental data of irregular particles and variations in the chemical composition of some minerals. Nevertheless, the qualitative classification of the Asian dust particles depending upon the major mineral or mineral group is somewhat straightforward because Asian dust particles are commonly predominated by a mineral species or a mineral group. We have prepared thin slices (< 100 nm in thickness) of 40 representative particles using focused ion beam (FIB), and observed the internal microstructures using transmission electron microscopy (TEM). TEM data of two FIB slices are presented in Fig. 5 of this ACPD paper. We are preparing another manuscript reporting the systematic classification of the internal microstructures of the Asian dust particles. Our extensive TEM observations show that the Asian dust particles are commonly 1) core mineral (quartz, plagioclase, K-feldspar, calcite, amphibole, muscovite, biotite, or chlorite) with coatings of illite-smectite series clay minerals (ISCM) and 2) ISCM agglomerates with the submicron inclusions of quartz, plagioclase, K-feldspar, calcite, muscovite, biotite, and chlorite. Of course, granular mixtures of similar sizes are also found rarely. The dust particles were classified depending on their predominant mineral (quartz, plagioclase, K-feldspar, calcite, ……) or mineral group (ISCM) to obtain number and volume compositions of mineral and mineral group in Table 2. Some of the EDXS patterns typical of minerals and mineral mixtures were given in Jeong (2008). ISCM may be underestimated e.g., by counting the ISCM-coated quartz as quartz particle, but overestimated by counting the ISCM with quartz inclusions as ISCM particle. Thus, both the errors will be partly cancelled. Further explanation will be provided in revised manuscript. Obviously, our methods are semi-quantitative. Nevertheless, the results in the Table 2–4 are internally consistent, showing the distribution characteristics of minerals through different dust sizes and events. Fast and reliable methods quantifying mineral compositions of single particles from the EDXS pattern are expected to be developed adopting sophisticated correction

ACPD
13, C7557–C7560, 2013

procedures for irregular morphology and sizes (Fletcher et al. 2011).

2. Mineral dust particles are the condensation nuclei for cloud formation. However, it is uncertain whether the coarse size of the dust nuclei influences the degree of cloud formation and precipitation. There are few experiments and observations about the relation between dust particle size and droplet/ice formation. Currently, we have little idea on that subject. Thus, we hope to leave this subject for next researchers.

3. "Díaz-Hernández, J. L. and Páraga, J." will be corrected to "Díaz-Hernández, J. L. and Párraga, J." in revised version

4. All the researchers agree that the ages of sediments bearing stone tools in the Korean Paleolithic sites are younger than ca. 500000 yr. However, the exact ages are not available because of the absence of good dating materials such as charcoal, bone, and teeth. Detrital quartz grains in the sediments have been used for optically stimulated luminescence (OSL) dating. Unfortunately, the OSL ages determined by geochronologists showed a wide range of age. A short review on the debate of exact deposition age of the eolian sediments was provided in Jeong et al. (2013) (Quaternary Science Reviews, v.78, 283–300.). Thus, we prefer "the late Quaternary (< 500000 yr)".

5. "A direct observation of the particles collected on the filter does not guarantee the high resolution microscopy and focused ion-beam application due to the low electrical conductivity of the mineral dust even after metal coating and resulting poor images." will be reworded to "The dust particles collected on the filter were not suitable to the high resolution SEM and focused ion-beam (FIB) work due to charging even after metal coating."

6. In "Calcite is most susceptible to chemical weathering than other major primary minerals", "most" will be replaced with "more".

7. Fig. 1 will be enlarged in the final version for ACP. This is caused by the larger horizontal size of the ACPD page. Vertical size of the ACP version is larger than horizontal

ACPD

13, C7557–C7560, 2013

size.

8. Figs 4 and 5 will be better adapted to the page size of ACP.

Sincerely

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