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Atmospheric Chemistry and Physics Discussions

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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The paper by Jeong et al. discusses a special event, an incursion of dust over Korea that contained a high concentration of large dust particles. Giant aerosol particles are a rather neglected topic in atmospheric science, even though there is plenty of evidence that they contribute significantly to the mass and volume of atmospheric mineral dust. The introduction gives a concise story why smaller particles have been more exciting to study for atmospheric chemists, but also gives enough reasons to study the larger ones. In this study, particles from the 2012 dust event are analyzed in detail and the results compared to those from two earlier dust events.

Satellite observations of the path of dust are presented, based on a dust index that uses temperature measured at two different wavelengths. Aerosol size distributions were measured using both an optical particle counter and scanning electron microscopy (SEM) data from individual particles, whereas the mineralogical composition of dust was analyzed using SEM and transmission electron microscopy (TEM). The experimental work is extensive, since almost 3000 individual particles were analyzed. Concerning the mineralogical identification of dust particles, it is highly commendable that TEM of thin slices of individual dust aggregates prepared by focused ion beam milling was used to complement the SEM data. This experimental procedure is particularly useful for the detailed characterization of complex aggregates, and for the identification of sheet silicates for which EDX data have limited value due to the complex crystal chemistry of clays. The section entitled "microtextures and submicron mineralogy of giant particles", which discusses intraparticle heterogeneity, is a highly useful addition to the study of atmospheric dust. Evidence for the remote origin of the particles is provided by the presence of calcite nanofibers. Other interesting observations include the remarkable uniformity of mineralogical composition over a wide size range, and the relatively high Fe contents of the clay minerals. The results are clearly presented and interesting enough to deserve publication in ACP. The paper is well written.

I have only two critical comments:

1) It is not clear how the data for the "mineralogical" number and volume abundance of particles were derived for complex aggregates. As discussed in the paper and shown in Figs. 4 and 5, many particles are highly complex mixtures of clays, quartz or feldspar, and calcite. What was the basis for assigning them into the mineral groups shown in Table 2? Was it based on their major component? Please explain, since the data in Tables 2, 3 and 4 are all based on this classification.

2) According to the Discussion, the main implications of the experimental observations are that under certain synoptic conditions giant dust particles can occur in significant numbers in Asian dust plumes transported over long range, and that these particles

contribute to sediment formation and deliver nutrients (in particular, iron) to the ocean. These points are discussed in detail. However, I wonder if anything could be said about the atmospheric roles of such giant dust particles, in particular about their possible effects on clouds and precipitation?

Minor comments:

- please correct the spelling of Párraga in Diáz-Hernandez and Párraga (2008)

- Late Quaternary sediments - since the Quaternary lasts until present time, and Paleolithic from about 2.6 million to 10000 years ago, neither “late Quaternary” nor “Paleolithic” is very specific. If a more exact age of the sediment is available, please report.

- “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.” Meaning not clear, please reword.

- "Calcite is most susceptible to chemical weathering than other major primary minerals” Replace "most” with "more”

- Fig. 1: This figure should be larger in the final version.

- Figs 4 and 5: Details in the images could be better seen if each of these figures would be split into two separate parts (and then numbered accordingly).

Interactive comment on Atmos. Chem. Phys. Discuss., 13, 21041, 2013.