Atmos. Chem. Phys. Discuss.,
doi:10.5194/acp-2016-286-RC1, 2016

Atmospheric Chemistry and Physics Discussions

Interactive comment on "Technical Note: Mineralogical, chemical, morphological, and optical interrelationships of mineral dust re-suspensions" *by* Johann P. Engelbrecht et al.

Anonymous Referee #1

Received and published: 21 May 2016

The technical note presents results from measurements of surface soils collected from locations all over the world, which are representative for many dust source regions. Various techniques were applied to analyze the mineral and chemical composition as well as the morphological and optical properties of the soil samples. The size distributions of the soils were determined after treatment (sieving and suspending in an aqueous solution). The data provided in this study allow insight into the variability of the properties of dust generating soils in different source regions, and they are potentially very useful for remote sensing and dust modeling purposes. I have only a few minor remarks, which should be taken into consideration for the publication of the manuscript.

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Discussion paper

In Section 1, on page 1–2, the authors state that only particles smaller than $10\,\mu$m generally survive long-range transport. Although this may be true for very large distances, some studies found a significant volume fraction of dust with particles sizes larger than $10\,\mu$m after transport (*Stuut et al.*, 2005; *Jeong et al.*, 2014). Thus, it may be better to not phrase this as absolutely and to also mention these other studies.

In Section 2.1, on page 2, it is mentioned that the soil samples were first sieved to remove larger pebbles, and then additionally sieved to obtain sub-sets of different size classes of the soils. Soil consists of aggregates to a large degree, and so does emitted airborne dust, despite partial fragmentation of the aggregates that occurs during dust emission (*Kok*, 2011). The literature states that some sieving techniques, especially wet sieving disperse the aggregates more than others, shifting the sieved soil particle size distribution to smaller sizes, compared to the non-dispersed parent soils in the dust source regions (*Shao*, 2001). How much dispersion occurs due to wet sieving also depends on the soil type (*Choate et al.*, 2006). Thus, the dispersion of aggregates by sieving techniques that are commonly applied for soil analyses may introduce a bias into the analysis with respect to the size distribution of specific dust/mineral properties, including the ones measured after re-suspension of the soil. For instance, the abundance of clay minerals in the smaller size ranges may be increased at the expense of the larger size ranges in the measurements, compared to the undisturbed distribution in soils or airborne dust.

The authors should add information on what sieving techniques were applied by them. Also, it should be discussed how the techniques may have affected the measurements due to possible dispersion of the aggregated particles. Such information will be helpful for interpretation, for instance when the data are used for modeling studies.

In Section 3.2.2, page 11, the study by *Lafon et al.* (2006), where estimates for the Fe/Al-ratio in dust are provided for Chinese, North African, and Sahelian dust, should

be referenced and included in the comparison.

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Interactive comment on Atmos. Chem. Phys. Discuss., doi:10.5194/acp-2016-286, 2016.