Atmos. Chem. Phys. Discuss.,
https://doi.org/10.5194/acp-2019-948-RC2, 2020

Atmospheric Chemistry and Physics
Discussions
Open Access

Interactive comment on "Mineralogy and geochemistry of Asian dust: Dependence on migration path, fractionation, and reactions with polluted air" *by* Gi Young Jeong

Anonymous Referee #2

Received and published: 8 March 2020

Jeong (2019) studied Asian dust transported to Korea for long term based on mineralogical and elemental compositions. Since there have been very many studies on the mineralogical and geochemical studies for Asian dust, I do not think that the novelty of this study is very high. However, there are several things as suggested below that can be improved based on the data given here, which can make the novelty higher than that in the present form. If it will be successful to increase the novelty, it might be possible to suggest that this manuscript is worth publishing in ACP.

(i) Source of the dust If you could clearly show that the Taklimakan Desert is not the source of the dust studied here based on the geochemical data, that would be impor-

tant. However, this study uses remote sensing data to distinguish the source, but the remote sensing data are not the main results of this study. There have been lots of REE data of sand in Taklimakan Desert (e.g., Honda et al., 2004), which may be useful to distinguish the source. If other data included in this study are also useful for this purpose, that would be also good.

(ii) Development of other tools Major element data can be more useful. For example, CIA (chemical index of alteration; Nesbitt and Young, 1982) may be good to show the clay mineral content based on the elemental data.

I have tried to plot Y/Ho vs. Zr/Hf (see the attached file), which shows systematic variation. These plots suggest the degree of influence of aqueous phase reactions. Generally speaking, phases formed in water (e.g., carbonate) is deviated from their chondritic values (Y/Ho = 28; Zr/Hf = 38; Bau, 1996). For example, these values decrease from non-chondritic value to more chondritic value in the order of D21 > D22 > D23 (see the data in the attached file). This may reflect decrease of carbonate content, which can be an important topic to discuss. Moreover, I think that this kind of information is related to the provenance of the dust, and the data of D21 to D23 may suggest the shift of the source during the event. Anyway, this kind of new data is strongly needed to make this work worth publishing.

Similarly, other trace element signatures should be tried in this study. I think that the plot of Cs/K vs. Rb/K may show the illite fraction among the whole minerals (Derkowski and McCarty, 2017), which is also effective to distinguish provenance of the materials.

(iii) Other minor comments (1) Sets 1, 5, and 6 and (ii) sets 2, 3, and 4 are different groups in terms of the grouping method. I think that it is not good idea to plot them into the same group. (2) Reaction of calcite with sulfuric acid to produce gypsum has been studied also by spectroscopic methods, which may be better to cite, since the method clearly reveal the process of the reaction in natural samples (Takahashi et al., 200). (3) L15 in P10: "ouliers" should be "outliers". (4) Table 1: Meaning of "Travel" is not clear.

(5) Table 4: Concentrations of Cu, Zn, and Pb are actually high in aerosols. Thus, low concentrations of these elements cannot be reason why the authors reported these elements only in a part of the samples.

References: Bau, M. Controls on the Fractionation of Isovalent Trace Elements in Magmatic and Aqueous Systems: Evidence from Y/Ho, Zr/Hf, and Lanthanide Tetrad Effect. Contrib. to Mineral. Petrol. 1996, 123, 323–333. Derkowski, A., & McCarty, D. K. Cesium, a water-incompatible, siloxane-complexed cation in Earth's upper crust. Geology 2017, 45, 899-902. Honda, M.; Yabuki, S.; Shimizu, H. Geochemical and Isotopic Studies of Aeolian Sediments in China. Sedimentology 2004, 51, 211-230. Nesbitt, H. W.; Young, G. M. Early Proterozoic Climates and Plate Motions Inferred from Major Elements Chemistry of Lutites. Nature 1982, 299, 715–717. Takahashi, Y.; Miyoshi, T.; Higashi, M.; Kamioka, H.; Kanai, Y. Neutralization of Calcite in Mineral Aerosols by Acidic Sulfur Species Collected in China and Japan Studied by Ca K-Edge X-Ray Absorption near-Edge Structure. Environ. Sci. Technol. 2009, 43, 6535-6540.

Interactive comment on Atmos. Chem. Phys. Discuss., https://doi.org/10.5194/acp-2019-948, 2020.

	Y	Ho	Y/Ho		Zr	Hf	Zr/Hf
D1	27.6	0.93	29.67742		128	4	32
D2	26.9	0.87	30.91954		139	3.7	37.56757
D3	23.6	0.84	28.09524		128	3.9	32.82051
D4	24.9	0.76	32.76316		119	3.4	35
D5	21.3	0.72	29.58333		106	3.1	34.19355
D6	23.2	0.76	30.52632		108	3	36
D7	28.4	0.91	31.20879		137	3.6	38.05556
D8	25.7	0.91	28.24176		111	3.8	29.21053
D9	26.4	0.85	31.05882		129	4.2	30.71429
D10	24.4	0.81	30.12346		136	3.9	34.87179
D11	26.7	0.85	31.41176		148	4.4	33.63636
D12	19.8	0.58	34.13793		144	4	36
D13	22.4	0.71	31.5493		106	2.9	36.55172
D14	26.5	0.87	30.45977		141	4.2	33.57143
D15	29.7	0.97	30.61856		125	3.7	33.78378
D16	28	0.92	30.43478		121	3.6	33.61111
D17	26.6	0.88	30.22727		108	3.3	32.72727
D18	27.7	0.93	29.78495		121	3.5	34.57143
D19	24.9	0.77	32.33766		141	3.9	36.15385
D20	21.8	0.71	30.70423		144	4.1	35.12195
D21	25.2	0.77	32.72727		121	3.1	39.03226
D22	26.6	0.88	30.22727		116	3.5	33.14286
D23	23.8	0.83	28.6747		109	3.3	33.0303
D24	25.7	0.81	31.7284		109	3.2	34.0625
D25	28.8	1.01	28.51485		134	4	33.5

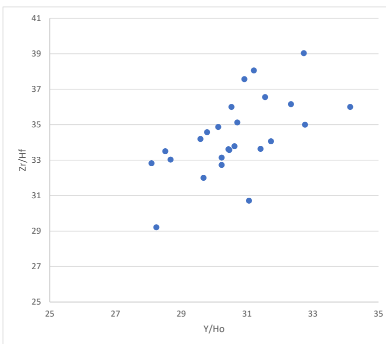

Fig. 1.