Dear Dr. Kandler:

Thank you for your kind review of my manuscript.
I am pleased to reply to your constructive comments.

When abbreviating mineral names, I suggest using common symbols (Kretz 1983).
→ Re: Current abbreviations of mineral names will be replaced with symbols recommended by Kretz (1983) in revised manuscript

Fig. 2 / size distributions: The size distributions in particular towards the larger particles can be considerably biased by the type of inlet used for measurement. Please give some more details here. Also, Serno et al. refer to deposited aerosol from a sediment core. In principle, airborne size distributions should differ from deposited ones based on the same aerosol due to increasing deposition velocity for larger particles, so I'm not sure whether an agreement should be expected here.
→ Re: Particle-size data have been routinely measured using optical particle counters (GRIMM Aerosol Technik Model 180) at dust monitoring stations operated by the Korea Meteorological Administration. The instruments report particle numbers over 31 size bins from 0.25 to 32< μm. The specification sheet of the Model 180 states that "Sample air at a volume flow of 1.2 liter/minute is directly fed into the measuring cell by passing through a TSP (total suspended particles) head and the probe inlet", indicating that total suspended particles were directly fed into cell and measured. Details of the OPC will be added to the Section 2.1.2 in revised manuscript as follows: "OPC (GRIMM Aerosol Technik Model 180) reported particle numbers over 31 size bins from 0.25 to 32< μm. Sample air was directly fed into the measuring cell at a volume flow of 1.2 liter/minute by passing through a TSP head."
→ Re: The author agrees with reviewer. Size distribution of airborne dust may differ from deposited ones, not only by settling velocity dependent upon particle size but also by aggregation. It is required to compare the particle size of airborne dust particles with that of corresponding sediments at particular site remote from dust source. There are no systematic data yet. Nevertheless, the author experienced that the volume (or mass) size distribution is not so much different between airborne dust and corresponding sediments. For example, the median particle size of eolian sediments on Korean Peninsula deposited during the last glacial age (more intensive dust storm) was within the range of 5–6 μm (Jeong et al., 2013, Quaternary Science Reviews, 78, 283–300). The author likes to keep Serno et al. (2014) for comparison, but delete the over-interpreting sentence: "It is remarkable that particle size of dust is uniform from the western margin of the North Pacific Ocean to the subarctic mountains of the North America" from the section 2.1.2 in revised manuscript.

Fig. 4: Where is the La/Yb proxy information in the plot, which is referred to in the caption?
→ Re: It will be deleted in the revised manuscript.

Fig. 6: Is the Fe and K enrichment of dust versus soil significant?
→ Re: Data show that Fe and K are slightly enriched in dust relative to soil. It may be caused by the enrichment of fine mineral grains in dust such as K-bearing illitic clay minerals and iron oxides. However, it is more complicated by the presence of non-mineral K-bearing inorganic/organic aerosols and some Fe-rich pollutants emitted by fossil fuel combustion in East Asia. Thus, further experiments such as selective extraction are required in order to clarify the origin of Fe and K enrichment in dust samples on quantitative basis.

Page 6 / line 7: What means 'side packing'?
→ Re: Sample powders are normally loaded into the cavity of XRD holder and pressed with glass slide to obtain flat surface. This causes the preferred orientation of platy minerals hindering quantitative analyses. Careful packing of powders into the side of cavity covered with frost glass much reduces the preferred orientation. Moore and Reynolds (1997, X-ray Diffraction and the Identification and Analyses of Clay Minerals) will be added as a reference in revised manuscript.

Page 8 / line 16-17 and P9 / 22-23 and P13 / 18-21: The apparent anticorrelation between relative compositions might be misleading. If a major component – clay minerals here – variates, the other components must anticorrelate, a property of the normalized system. Feldspar and quartz show a similar temporal behaviour here, so a variation in clay minerals might drive the apparent anticorrelation; however, there is not proof just by composition data.
→ Re: The author agrees with reviewer. In revised manuscript, the author will delete "…, and showed a roughly inverse relationship with the total clay mineral content (R2=0.37)" in Page 8 / line 16-17, and "…, in the opposite direction to the clay mineral content" because of some statistical expression. However, the author like to keep P13 / 18-21.

Page 14 / line 7-8: As dust emission might take its material mainly from the topmost crust (millimetres), couldn't the depletion of zircon have already happened before the emission, i.e. a zircon depletion from these top millimetres? From which depth were the soil samples collected?
→ Re: Soil samples were collected from the exposed surface of Gobi Desert (several cm depth). The surface is generally covered with loose sediments. Sampling of several mm depth from the loose sediments is certainly challenging. Mineral fractionation is possible at the soil surface in addition to the possible fractionation during the long-range transport. In future field work, careful sampling could be carried out to confirm any mineralogical fractionation at the thin layer of surface.

Page 15 / line 24 onwards: What would happen actually to the dolomite in the acidic environment?
→ Re: This study could not confirm the fate of dolomite in the acidic atmospheric environment. Accuracy of quantitative XRD of clay-rich soils is generally much low in comparison to routine chemical analyses. It is difficult to state any trend from mineral compositions of around 1% quantity. Separate study focused on dolomite using electron microscopy may clarify the behavior of dust dolomite.

Page 16 / line 11-13: What could be the source of Sn?
→ Re: The source of Sn is fossil fuel combustion as written in Page 16 / line 8.

Page 2 / Line 5: Rephrase, maybe "Asia is one of the major mineral dust sources: : :"
→ Re: The phrase will be rearranged to "Asia is one of the major sources of mineral dust" in revised manuscript.

P5 / 20: "shredded" -> "cut"
→ Re: O.K.

P11 / 21: "Taklamacan" -> "Taklamakan"
→ Re: O.K.

Is Section 5.4 a subsection of 5.3? Both are termed fractionation.
→ Re: Section 5.3 deals with mineral fractionation, while Section 5.4 deals with chemical fractionation.

P15 / 5: Should that mean that the fractionation supposedly occurs on shorter distances? Please clarify the wording.
→ Re: 2000 km is generally long distance for mineral dust, while it is short distance compared with mineral dust crossed Pacific Ocean. Thus, the author did not use words such as 'short' or 'long'.

Sincerely

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Korea