Atmospheric Measurement Techniques Discussions

Atmos. Meas. Tech. Discuss., referee comment RC1
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Comment on amt-2021-431

Anonymous Referee #1

Referee comment on "Contrasting mineral dust abundances from X-ray diffraction and reflectance spectroscopy" by Mohammad R. Sadrian et al., Atmos. Meas. Tech. Discuss., https://doi.org/10.5194/amt-2021-431-RC1, 2022

This study is aimed to compare the methods of X-Ray Diffraction and Reflectance Spectroscopy in determination of abundance of different mineral species in the atmospheric dust. The results indicated that both XRD and reflectance spectroscopy are useful to characterize mineralogy of airfall dust, because the former technique is good at identifying and quantifying the SWIR-transparent minerals (e.g., quartz, albite, and microcline), while the latter technique is superior for determining abundances for clays and non-mineral components. Although the interesting result were obtained, there are some major issues for these methods.

- This is a methodology study and should have a standard proportionally mixed samples for comparison. So, the results for the mineral percentages based on combined XRD and IR methods may still not convincible. At least, the calculation results have to be tested by the standard mixture.
- The calculation of the mineral contents based on the XRD patterns of the natural samples should be careful, as the peaks may be the overlapped results of several different minerals, such as the peak for the kaolinite might contain d(002) peak of chlorite, etc.
- Should the relative proportion of different compositional groups be reported as volume percentage or area percentage or weight percentage? If it the weight percentage, some more conversion factors must be used according to the world standard such as American Standard for the XRD-based mineral identification?
- Line 104-106: It is stated "Although there were no standard reference patterns in the AMCSD dataset to show the match peak for illite, we detected this mineral in S11 based on the visual assessment and past published data on the location of illite peaks". Does it mean that the "illite" mineral in the analyzed samples are the illite/smectite mixed layer with the d(001) from 10 to 15 Å, i.e., the transition between the illite and smectite?
- The percentages of detected minerals measured by XRD are different from measured by SWIR. Compared with SWIR, the XRD overestimate the quartz and calcite contents, and underestimate the clay mineral contents. However, which results can we trust, XRD or SWIR?
- Line 166: "The modes for each size ranges are clay ~ 6 %, silt ~ 85 %, and sand ~ 3

%.” From Figure 5, it looks that the “Sand ~ 3 %” is not correct.

- The section title sequence number needs to be revised.