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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Mineralogy and mixing state of North African mineral dust by on-line single-particle mass spectrometry" *by* Nicholas A. Marsden et al.

Anonymous Referee #2

Received and published: 23 October 2018

This is a very well-written paper analyzing single particle measurements of silicate dust for pure laboratory reference material, soils collected from dust-productive regions of Africa and in-situ measurements at Cabo Verde. This is both a timely topic and the analysis of single particle spectra is rigorous, making use of laboratory reference material for comparison with field measurements.

Overall, I recommend the paper for publication in ACP after addressing the major and minor concerns below.

Major comments: I would like to see more discussion of uncertainties in these measurements. In particular, the manuscript mentions that the LAAPTOF instrument tends

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Discussion paper

to undercount silicate particles (page 12, line 13). Is there any evidence that it could undercount selectively and thus introduce a bias into the results as presented? In other words, are there any chemical biases in the way LAAPTOF detects silicate-rich particles?

In the analysis of dust mixing state, chlorine, CN- and CNO- (termed "org-bio") and sulfate (later nitrate) were chosen as mixing state markers. Comparing between soils collected from the ground and particles analyzed in-situ for these particular components is complicated because of atmospheric processing, but the text seems to draw an equivalence here. For example, CN- and CNO- might indicate a biological or biogenic fraction for soils, but in situ they are much more likely to arise during atmospheric processing and using them as biological markers leads to large overestimates. Similarly, the large chlorine fractions at Cabo Verde are largely expected because of marine influence at that sampling location, but their origin is likely very different in the laboratory soils collected in-land.

Minor comments: In section 2.1.1, large parts of the text (especially first two paragraphs read like introductory material instead of methods.

Page 8, line 17: Figure 6 is called out in the text before Figures 4 or 5.

General comment for the methods section: please indicate the number of single particles analyzed in laboratory and field studies.

Results, first sentence: "...we choose to analysis..." should be we chose to analyze? Please clarify.

Section 3.1, line 12: the authors say that vast majority of particles contained silicate markers, but then they also say that all particles contained some silicate minerals. This is a bit vague.

Page 11, lines 2-5: I am not sure I follow the reasoning here and in Figure 8. For the Moroccan sample, the two techniques seem to be showing the exact opposite

composition.

Section 3.2, line 9: Why were peaks shifted in positive and not negative spectra?

Page 15, line 10: “Sub-compositional analysis is a techniques” – should be technique.

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