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Atmospheric Chemistry and Physics Discussions

Interactive comment on "On mineral dust aerosol hygroscopicity" *by* Lanxiadi Chen et al.

Anonymous Referee #1

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The manuscript reports the hygroscopic properties of 7 authentic mineral dust samples and 14 major minerals contained in mineral dust. The manuscript aims to compare the results from this study to previous measurements on the same materials using a number of direct and indirect techniques.

Abstract line 28: replace 'very sensitive balance' with actual name of instrument

Abstract line 32: surface coverage of water has units. The numbers in this line do not have units. They refer to another quantity that should be labeled properly.

Table 1: reports average particle diameter, yet no uncertainty values are listed and the number of significant figures is just not realistic. Revise for accuracy.

Figure 2 is shown in the experimental section when it better moved to the results section

Equation 1, line 189: represents the "fractional" surface coverage, hence, it is unitless. This definition should be emphasized throughout the manuscript. The unit for 'surface area each adsorbed water molecule' is wrong, and the value assumed is too small. There have been measurements of this number for metal oxides that should be used and get cited.

Table 2-5: the formatting of the numbers is better in scientific than normal.

The discussion section 3.2.7 that compares the results to previous work is qualitative in nature. Given the limited novelty of this manuscript, the comparison has to be quantitative based on careful statistical analysis.

It is stated in the manuscript that the experiments were repeated three times (page 9, line 169), yet none of the graphs have error bars on the data points?! This has to be fixed.

Section 3.3 also talks about 'goodness of fit' in qualitative manner. This has to be fixed and the 'goodness of fit' argument has to be based on quantitative analysis.

One important and crucial reason for the differences observed among different studies is the sample pre-treatment prior to water uptake studies. Gas phase water uptake on mineral dust and metal oxides is a surface process and hence the chemical composition of the surface plays an important role in the extent of water surface coverage. Therefore, a detailed discussion on this factor has be added to the manuscript.

The manuscript requires careful reading for grammar, punctuation, and sentence structure.

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