Desert dust aerosol has great impacts on atmospheric chemistry. Although there are numerous field measurements in this field, the work by Lu et al. is very interesting as the dust event examined was very unique, characterized by low wind speed, high RH, higher concentration of reactive trace gases, and dust backflow. This work can be published after the following comments are addressed.

Major comments:

I have to admit that I am not familiar with field observation work, and therefore the editor may invite colleagues with field observation expertise to assess this manuscript. In my opinion, the phenomena Lu et al. observed and tried to interpret is very interesting, but the discussion can still be improved. For example, the two most important sections (3.3 and 3.4) are quite descriptive, and conclusions they drew are not very well supported in the current version. Therefore, further data analysis is encouraged, and the authors may think about if they could deeper insights into dust chemistry from the unique event they observed.

Minor comments:

Line 53: The authors may consider citing a recent review paper (Tang et al., 2017) which discussed impacts of dust on tropospheric chemistry.

Line 71: Guo et al. (2019) investigated hygroscopicity of a number of Ca and Mg salts, and suggested that atmospheric aging could greatly enhance hygroscopicity of mineral dust.

Line 379-382, line 395-398: Sulfate and nitrate formation is quite complicated in the troposphere. These conclusions currently drawn by the authors are merely based on correlations, and further discussion is needed.

Line 436-451: Sea spay aerosols also contain soluble Ca^{2+}. The authors may want to subtract the contribution of sea spray aerosol on soluble Ca^{2+} using the Ca^{2+}/Na^{+} ratio in sea water.

Line 493-494: This sentence sound strange. I am not sure if sulfate can be aged in the atmosphere, as sulfate cannot be further oxidized. In addition, the co-variation of sulfate with Na^{+} may indicate important contribution of sea spray aerosol (which is a major source of Na^{+}) to sulfate.

References:

Tang, M. J., Huang, X., Lu, K. D., Ge, M. F., Li, Y. J., Cheng, P., Zhu, T., Ding, A. J., Zhang, Y. H., Gligorovski, S., Song, W., Ding, X., Bi, X. H., and Wang, X. M.: Heterogeneous reactions of mineral dust aerosol: implications for tropospheric oxidation capacity, Atmos. Chem. Phys., 17, 11727-11777, 2017.