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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Atmospheric aerosol compositions and sources at two national background sites in northern and southern China" *by* Qiao Zhu et al.

Anonymous Referee #1

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The work of Zhu et al. reports HR-AMS measurements from two China sites. It reports the mass loading, chemical compositions, and PMF source apportioment results from ofãĂĂthe organics aerosols in both site. The paper is generally written clearly, but this reviewer finds a few major issues thus the paper may need major revision before its publication in ACP.

major comments (1)The introduction part is clearly not comprehensive and valuable. First, as the application of AMS in China increased significantly in recent years, the authors should do a bit more thourough summary of the current status; More recent studies should be mentioned, for example, AMS studies conducted in Beijing by Sun yele's group, in lanzhou ïijĹAtmos. Chem. Phys., 14, 12593-12611, 2014.ïijĽ, and a

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more recent SP-AMS study in Nanjing (Environmental Science & Technology Letters, 3, 121-126,2016) and more. Secondly, if this paper intends to discuss the aerosol characteristics from background sites, the authors should summarize previous studies and major findings regarding the aerosol chemistry in background sites, and this should not be limited in china, but all over the world. What is the difference between the background sites and urban/polluted sites, and then what new findings do we expect in this manuscript?

(2)As there already are so many AMS papers published in the past 15 years, it is difficult to see what is the significance and novelty of this paper. This should be made more clear, the novelty should not because you did AMS measurements at sites that are different from others, but instead you should state what scientific questions and what valubale findings you gained from your measurements that can advance our current understanding on aerosol chemistry?

(3)As the two measurements were conducted at different years, they have very different meterological parameters, the discussion should consider and discuss more the meterological effects, while current version is clearly lacking of such discussion. No meterological data are shown. If so, the findings might be only for these two cases, having very limited scientific values for future and other studies.

(4)Regarding the quantification of organic nitrates, do the authors consider influences of metal nitrates? The AMS can measure nitrate that associated with sodium etc., although it is difficult to measure metals. Previous studies also pointed out that metal nitrates can have higher NO/NO2 ratios, so youe estimation method is incorrect without considering this point.

(5)The Vk diagram is quite limited in describing the formation processes of ambient OA in the reviewer's viewpoint. As there are so many possibilities that can influences the O/C and H/C ratios of ambient OA. The variation of O/C and H/C may not reflect the evolution processes at all. It maybe useful for chamber studies but should be discussed

with cautions for ambient data.

(6)Why a 3-factor solution was chosen for NCB site? It seems like 2-factor solution is also fine. In the supplement, it seems like the 2-factor solution is similar as the SCB site, Then why for NCB you chose 3-factor solution? Also, the Mass spectra of OOA1 and OOA2 in your 3-factor solution are quite similar, their diurnal patterns are similar too. Even if the authors insist to keep a POA factor for NCB site, this reviewer thinks OOA1 and OOA2 can be combined as one OOA factor.

A few technical comments (there maybe more, please check the MS carefully): page 2, line 15: "Valuable insights into the composition, sources, and evolution processes of was mostly found to be a submicron in China were obtained by the powerful on-line tools". What meaning? Please re-write this sentence.

Page 5, line 7: a flow rate of 80 l min−1? should be 80 ml min-1.

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