The paper by Zhu et al. summarizes observations of several amino acids and $\delta^{15}N$ of these in PM2.5 in 4 cities in Northern China during a week in March 2018. This period included some days under the influence of dust storms from the Gobe Desert. Along with $\delta^{15}N$ of soil and plant samples from the Gobe desert and values of $\delta^{15}N$ of amino acids in PM2.5 during non-dust events, they estimated the contribution of Gobe desert dust and plants to proteinaceous material in PM2.5 in these cities during the dusty days. They also estimated deposition rate of amino acids in these regions and concluded that the Gobe desert can be a significant source of proteinaceous N for downwind regions, potentially influencing biogeochemical cycling of N and delivery of nutrients.

The results are interesting, but a discussion about uncertainties and limitations of the results are needed. The paper is overall well-written. I support its publication after the following concerns are addressed:

The main limitation of the work in my opinion is about sample representativeness. Line 110: how many soil and plant samples from Gobe were analyzed? Was there any difference in the results from soil samples at different depths within the 0-10 cm? What area of the desert were the samples collected from? Only one latitude and longitude in indicated in the text. How representative are the samples? Similarly, how many local samp. A table summarizing, number of different samples, average and standard deviation of the values determined in these samples, and a map showing location of the collected samples in Gobe and each city are needed (in SI). How confident can we be because of this limitation in the estimated fraction of proteinaceous PM2.5 originating from Gobe Desert?

1. Line 1 of abstract: Particulate matter transported in dust storms can influence biogeochemical cycles of many elements and not just nitrogen so I suggest removing the reference to nitrogen in this introductory sentence.
2. Line 40, I'm not sure how presence of primary particles from proteinaceous material can affect new particle formation. Can you please clarify?
3. Line 75, define GLY
4. Line 84: "…representative urban centers…"
5. Figure S1: The figure lacks geographical references (i.e., borders, city markers with legends, etc) to guide the reader to the relative location of dust sources in Gobe and receptor sites. Also, please add the color scale.
6. Line 106: remove "1 from"
7. Section 2.2: details on extraction efficiency of the developed methods need to be discussed
8. Line 159: This sentence is not clear to me. Based on the previous sentence, I thought concentration of asparagine and glutamine cannot be determined, but total concentration of asparagine+ aspartic acid and glutamine+ glutamic acid can be. Is that not the case?
9. Line 169: As you mention, deposition velocity for particles is size dependent. What ranges of Vd is expected for the larger sizes of fine aerosols that are the focus of this paper? How much uncertainty would this bring to the estimates of deposition fluxes calculated for the different cities?
10. Figure 1. Are the indicate date stamps indicating midnight or noon? Please clarify in the caption. Either way, it doesn't look like the peak in PM10 in Shijiazhuang occurred 11:00 to 18:00.
11. Line 239: I believe the reference here should be to Figure 2
12. Line 261: consider changing 'increment' to 'increase'

13. Figure 4: Please indicate in the caption what the gray border indicates. I'm also confused if the PM2.5 CAA data are from non-dusty days or from all days?! The caption indicates that CAA to the left of the blue dashed line are depleted in 15N compared to Gobe soil, but that's not the case at all sites (e.g., Ala and Val values are very similar to Gobe for TJ and TY)
14. Figure 5. The lower case alphabets supposedly indicate statistical significance by ANOVA, but what is the difference between a, b, and ab? Please explain further in the caption.
15. Line 339-342: The data in Figure 4 do not support the conclusions mentioned in these sentences: "During the non-dust period, δ15N-CAAs patterns in PM2.5 at four urban sites were generally consistent, with glycine, leucine, isoleucine, alanine and valine exhibiting relatively higher δ15N values than other CAA species (Figure 4, left side)." This is not the case at all the sites. "Besides that, δ15N values of individual CAAs in PM2.5 all fell within their respective ranges observed in local dominant plants, soil, and burning sources at four cities (Figure 4, left side)." And this is not the case for all the CAAs. Please modify the sentences to be consistent with the data.
16. Line 391: add standard deviations to the numbers to indicate uncertainty
17. Figure 8- add city names to the map. Also add standard deviations or actual ranges for the numbers in the table.
18. Line 407: FAA?
19. Line 415: Consider adding "between the total CAAs in PM2.5"
20. Line 438: I believe the reference is to Figure 3
21. Line 451: "would be more negative". Indicate compared to what?
22. Line 478-482: Add a reference to the previous work that's mentioned here. Also, what variability in changes in $\delta^{15}N$ was observed through combustion? Please add standard deviations and carry that variability to the estimated values of the local burning samples.
23. Line 499: what specific amino acid was used to provide these estimates? Is that Gly? What are these two amino acids only used for determining the fraction? Is it because they have the lowest $\delta^{15}N$ ? Please explain.
24. Line 538: "were elevated"