Comments by referees are in blue.

Our replies are in black.

Changes to the manuscript are highlighted in red both here and in the revised manuscript.

Reply to referee #1

The manuscript by Li et al. summarized batch leaching protocols affecting aerosol trace element solubility. They compared three items, namely, agitation methods, contact time, and filter pore size to identify the difference in these experimental parameters would affect the aerosol trace element solubility. Moreover, they also compared solubility determined using protocols commonly adopted by four labs (GIG, ZJU, OUC and NIO). Their laboratory research helps to understand the impact of different processing methods on the solubility of metal elements. After addressing the following minor issues, I recommend their research to be published.

Reply: We would like to recommend ref #1 for reviewing our manuscript and recommending it for publication. We have addressed his/her comments which greatly help us improve our manuscript, and revised the manuscript accordingly, as detailed below.

Number of samples should be added in each subgroup in Table 1.

Reply: Although such information is provided in our original manuscript (page 6 line 111-114), as suggested by the referee, we have included a sentence in the caption of Table 1 in the revised manuscript (page 7) to provide relevant information: "For each protocol, 26 subsamples were examined."

There are two points in Figure 2e that show a clear large difference in the solubility of Cu obtained using the two methods, why?

Reply: Indeed there are two points which deviate significantly from the overall trend. This may be caused by contamination during experimental processes. As the two points does not affect the overall result, we choose not to discuss them in specific.

As can be seen from the Figure 3, why element solubility conducted by the contact time from 1 to 2 h higher than that from 2 to 4 h?

Reply: Increase in solubility was larger when contact time was increased from 2 h to 4 h than that when contact time was increased from 1 h to 2 h. As we stated in the original manuscript (page 14, line 249-253), the underlying reason is unclear, and one possible reason is that for a given element, different speciation have different dissolution kinetics. In response to this comment, we

have added one sentence to provide possible explanation in the revised manuscript (page 14-15): "It is still not clear why the increase in contact time from 1 to 2 h would not cause significant change in aerosol trace element solubility while the increase in contact time from 2 to 4 h would, probably because for a given element, different speciation have different dissolution kinetics."

What do the blue lines and texts in Figure 4 represent? What does the red cross represent?

Reply: In response to this comment, we have added the following sentence in the figure caption in the revised manuscript (page 17) to provide necessary explanation: "Black lines represent fitting when all the data points are included, and blue lines represent fitting when outliers (represented by red crosses) are excluded." In addition, similar changes are implemented for figures in SI when necessary.

In this study, the authors only compared the differences between the different pre-treatments, not the differences measured by the different instruments, so there were no significant differences between methods (mainly pre-treatments), which might not be the case if they use different instruments (ICP-MS VS. ferrozine technique methods). Please add a short discussion to discuss this issue and refer to some of the literature, e.g. Zhu et al. 2022, 22 2191–2202.

Reply: We agree with the referee. Accordingly, in the revised manuscript (page 19) we have included the following sentence to discuss this aspect: "Trace elements were analyzed using similar methods (ICP-MS) in our present work and thus essentially we only examined the effects of leaching protocols; nevertheless, other methods were also used by some previous studies to measure trace elements (Fang et al., 2015; Zhu et al., 2022), probably causing additional uncertainties."