

Atmos. Chem. Phys. Discuss., referee comment RC2
<https://doi.org/10.5194/acp-2020-1279-RC2>, 2021
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Comment on acp-2020-1279

Anonymous Referee #2

Referee comment on "Isotopic constraints on atmospheric sulfate formation pathways in the Mt. Everest region, southern Tibetan Plateau" by Kun Wang et al., Atmos. Chem. Phys. Discuss., <https://doi.org/10.5194/acp-2020-1279-RC2>, 2021

This study presents triple oxygen isotope data on sulfate aerosols sampled in the Tibetan Plateau. The data reveal an interesting $\Delta^{17}\text{O}$ -seasonal trend with the monsoon season which would be explained by an enhanced O_3 oxidation pathway in SO_2 oxidation. The data obtained are valuable, the quality of the measurement seems solid to me. The importance of the alkalinity on the sulfate aerosols emphasized in this study is relevant as there are still many uncertainties on the sulfate formation, highlighting the exploration of new perspectives.

However, I have some comments and some suggestions related on how the results are discussed as listed above:

- I am not sure to understand why the Tibetan Plateau is an important region and why it is called "Third Pole". Please describe the importance of this area.
- In the Method I.155. It is unclear how the authors reported the $\text{D}_{17\text{O}}$. Is it the raw or the corrected values? In the latter case, how did the authors proceed? A reference is at least required.
- I expected to see a calculation based on Na to exclude the contribution of sea-salt, which would be confirmed by the study of Cong et al. Using only Cong study seems insufficient to me.
- Knowing that the Ca/Al ratio vary in Asian dust from 0.1 to 35%, how would this affect your result? Ratio from anthropogenic dust is also expected to vary. I also didn't find the values cited by the authors in the literature.
- It is unclear if the SO_2 concentration has been measured, but adding a discussion using the SO_2 concentration in particular with the use of SOR could help convince me about the predominance of secondary sulfate.
- I. 320 Are the HYSPLIT results consistent with your conclusion ?
- I. 341 A comparison and discussion with the $\text{D}_{17\text{O}}$ modelled using GEOS-Chem would have been a great addition to the paper. Considering the O_3 concentration, and the kinetic reaction, what $\text{D}_{17\text{O}}$ values are expected and how does it compare to both min and max fraction you deduced ? I am confused on the fact that GEOS-Chem model is only used in cloud pH model

