

Comment on acp-2022-440

Anonymous Referee #1

Referee comment on "High frequency of new particle formation events driven by summer monsoon in the central Tibetan Plateau, China" by Lizi Tang et al., Atmos. Chem. Phys. Discuss., <https://doi.org/10.5194/acp-2022-440-RC2>, 2022

New particle formation (NPF) at high altitudes is crucial to understand sources of aerosol and CCN in the free troposphere. In this study, the authors conducted intensive measurements at Nam Co station (4379 m a.s.l) in the central TP to understand the new particle formation during pre-monsoon and monsoon seasons. They identified the frequency of NPF during monsoon seasons was significantly higher than during pre-monsoon seasons. This study did provide valuable observation data. But the explanation that higher VOCs triggered the frequent NPF during monsoon season is unconvincing. Therefore, the manuscript is not recommended to be published on ACP unless the authors can address the following major concerns.

- Sulfuric acid (SA), Ultra/Extremely Low Volatility Organic Compounds (U/ELVOCs), and bases, e.g., NH₃ or DMA, are known as the essential precursor of NPF. Their concentrations determine whether NPF can occur, as well as the intensity. However, in this study, all these key precursors were not measured. Even the precursors of these "direct precursors", e.g. SO₂ and VOCs who can form low-volatile oxidation products, were not well measured either. First, the simulated concentration of SO₂ used in this study without any verification by observation data is not convincing. Since SO₂ is a very reactive species, one needs to use the simulated value very carefully. Second, although 99 types of VOCs were measured during pre-monsoon using a GC-MS/FID, they are key precursors of ozone formation and are not suitable as indicator precursors for ELVOCs. The author, at least, needs to provide the concentration of monoterpenes, which are well-known sources of ELVOCs. In addition, the simulation of VOCs during monsoon is needed to be verified. In summary, the authors need to provide more solid evidence to support their main conclusion that higher VOCs triggered the frequent NPF during monsoon season.
- The observation period is a bit too short, especially, with only 10 days during monsoon. One cannot be sure that the high NPF frequency observed during this 10-day observation can be representative of the entire monsoon period.
- The authors grouped their data into "NPF-pre days", "NPF-monsoon days" and "non-event days" in Fig. 3- Fig. 7 and related discussions. I may suggest separating "non-event days" into pre-monsoon and monsoon non-event days.