

Atmos. Chem. Phys. Discuss., referee comment RC2  
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## Comment on acp-2021-810

Anonymous Referee #1

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Referee comment on "Measurement report: Vertical profiling of particle size distributions over Lhasa, Tibet – tethered balloon-based in situ measurements and source apportionment" by Liang Ran et al., Atmos. Chem. Phys. Discuss., <https://doi.org/10.5194/acp-2021-810-RC2>, 2022

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The manuscript is well organized and should be accepted after a minor revision, especially related to the method section.

Here below the specific comments:

Line 15, page 1: "boundary layer (BL)", better "planetary boundary layer (PBL)"

Line 17, page 1: "aerodynamic diameter (PM<sub>2.5</sub>) within the BL was around 3  $\mu\text{g m}^{-3}$ "; please add the confidence interval at 95%.

Line 22 page 1: "One mode was exclusively coarse particles up to roughly 15  $\mu\text{m}$  and peaked around 5  $\mu\text{m}$ ", please detail the count mean diameter and the geometric mean standard deviation of each mode.

Line 80, page 4: It should be nice to add (in supplementary) a picture of these religious burning events.

Line 100-103: Using different calibration standards (ammonium sulfate and polystyrene latex sphere) would affect the detected size distribution. Indeed the two standards are characterized by different refractive indexes thus generating different responses of the optical particle counter to the ambient aerosol. Please add a discussion on this methodology point considering the expected size distribution distortion.

Line 104: Please add the relative humidity ensured by the diffusion dryer.

Line 106-107: A direct conversion of PNSDs into PMSDs can bring to some errors as the density of the fine and coarse mode can be different. Please compute and add to the paper also the Volume Size Distribution analysis (PVSD) for scientific consistency. Consider that the POPS suffer of a truncation error and an ambient aerosol density application will bring to a mass concentration underestimation.

Line 110-112, page 6: "Mass concentrations of particulate matters smaller than 1  $\mu\text{m}$  and 2.5  $\mu\text{m}$  in aerodynamic diameter (PM1 and PM2.5) were obtained under the assumption that the optically equivalent diameter could be considered equal to geometric diameter". Here there is a big mistake. Please consider that the PM1 and PM2.5 are defined in function of an aerodynamic diameter and of an efficiency collection curve in inertial impactors (or similar cut-off devices such as cyclones). The authors should add at least a comparison between their PM1 and PM2.5 estimation and the same data obtained using gravimetric samplers.

Line 113-114: Was the GRIMM 11-C equipped with a dryer. If yes was it deployed on the balloon?

Line 133-134: Are there any radiosoundings in Lahsa that should be used to unravel the situations in which the top of ML was above the top of the profiles?

Line 149: "strong species"; maybe better "strong aerosol types"? Species remind to chemical speciation which is not present in this work.

Line 163: better "ranged from" ... "to"...