

Review of "Biomass burning aerosol transport from Indo-China Peninsula to South China: fluorescence lidar observation and analysis" by Zhekai Li et al.

Recommendation: Minor Revisions

This manuscript presents a valuable application of multi-channel laser-induced fluorescence (LIF) lidar for observing long-range transported biomass burning aerosol (BBA) over Nanping, South China. The study demonstrates the high sensitivity of the LIF technique by detecting weak fluorescence signals from relatively low-intensity fires in the Indo-China Peninsula (ICP), a region where such observations remain scarce. The integration of multi-source datasets, including satellite fire products, reanalysis data, backward trajectories, and radiosonde profiles, provides a comprehensive framework for source attribution and analysis of transport pathways. Notably, the observation of co-transported water vapor with the BBA layer offers new insights into the humid processing environment during transport.

Overall, the paper is well-structured and presents a compelling case study. However, several aspects require clarification and expansion to strengthen the manuscript's conclusions and ensure its reproducibility. I recommend publication in Atmospheric Measurement Techniques after minor revisions. My detailed comments are as follows:

Major Comments:

1. Given the LIF lidar's 30° elevation angle, is the y-axis label in Figures 2-3 correctly indicating altitude? Please verify and clarify if the displayed values represent vertical altitude or slant range.
2. Regarding the lidar ratio assumption in line 187, it is suggested to reorder the discussion. The assumption of a lidar ratio of 55 sr should only be applied after first establishing that the observed aerosol layer is indeed smoke. The current logical flow could be improved for clarity.
3. Please ensure uniformity in the font style used for numbers and equation symbols throughout the manuscript.
4. The term "N₂ Overtone" in Table 1 requires a brief explanation.

5. In line 265, the statement "our measurements show the fluorescence signal was roughly an order of magnitude lower than the water vapor signal, indicating that fluorescence interference is unlikely to be the primary cause of the observed β_{H2O} enhancement." The causal link presented here may be somewhat tenuous.
6. While these case studies successfully identify transported smoke, the potential influence of local urban aerosols cannot be excluded. What are the known fluorescent components of local aerosol in the Nanping urban area? Although distinguishing between sources is challenging, a brief discussion of these local fluorophores would provide valuable context for interpreting the observed fluorescence spectra.
7. Line 140: "standard atmosphere model (Shang et al., 2018)." Please specify which standard atmosphere model was used (e.g., US Standard Atmosphere 1976) for calculating the nitrogen concentration profile.
8. Some variables in the equations are not defined upon their first appearance in the text. For instance, the system constants C_R and C_F (for the Raman and fluorescence channels) in Equation (3) should be explicitly defined.