

Atmos. Chem. Phys. Discuss., referee comment RC2
<https://doi.org/10.5194/acp-2021-1017-RC2>, 2021
© Author(s) 2021. This work is distributed under
the Creative Commons Attribution 4.0 License.

Comment on acp-2021-1017

Anonymous Referee #2

Referee comment on "Fluorescence lidar observations of wildfire smoke inside cirrus: a contribution to smoke–cirrus interaction research" by Igor Veselovskii et al., Atmos. Chem. Phys. Discuss., <https://doi.org/10.5194/acp-2021-1017-RC2>, 2021

The paper presents a methodology based on fluorescence lidar measurements, that allows to detect and to quantify the smoke content in upper troposphere and lower stratosphere (UTLS). The methodology is based on several assumptions which are not well validated.

My major concern is about the methodology to retrieve the values of N_F , S_F , V_F (lines 193-199, and 217-219). For instance, the authors explain that they retrieve the N , S , V values from optical data $3\beta+2\alpha$. Then they introduce C_N , C_S , C_V parameters (eq. 3), based on the previous retrieval of the β_F values. They state that these factors *allow the estimation of N , S , V from fluorescence backscatter*, although N , S , V values are already known from the optical data $3\beta+2\alpha$. This is a point of confusion.

Another issue is how they retrieve the N_F , S_F , V_F values. This is not at all clear in the manuscript. Do these values come from the comparison with the N , S , V ones from different cases studies?

These points need clarification, along with putting error bars in all parameters shown in the various profiles.

Some minor corrections have to be made, based on the uploaded annotated manuscript. In many places the article "the" is missing. The English text should be revised, as in some places it is unclear.

PS. I propose to introduce in an appendix or supplement a flow chart showing each calculation step for every retrieved parameter [eg. $(3\beta+2\alpha) \rightarrow N, S, V$; $\beta_F \rightarrow \beta_{532}^S$, etc]. This will facilitate the reader to follow the estimation of the different parameters.

Please also note the supplement to this comment:

<https://acp.copernicus.org/preprints/acp-2021-1017/acp-2021-1017-RC2-supplement.pdf>