

Review of “Measurement report: Quantifying source contribution and radiative forcing of fossil fuel and biomass burning black carbon aerosol in the southeastern margin of Tibetan Plateau” (ACPD-2020-408, Liu et al)

General comment

This paper reports on measurements and modeling regarding the contribution of fossil fuel and biomass burning sources to black carbon (BC) aerosols abundance and radiative forcing at a site south-east of the Tibetan Plateau. Methods used in the study are robust, and the results are sound. However, it is difficult to ascertain the novelty and actual contribution to the overall understanding of, for instance, how BC aerosols are affecting the Tibetan Plateau. In my opinion, authors may turn this study into a relevant one if they would consider using the data at hand by better explaining the reasons that make these data important for improved understanding. In its present form, detailed measurements and modeling are more suited for a technical report not suitable, in my opinion, for this prestigious journal.

Specific comments

- The text would improve in clarity and possibly be shortened if reviewed by a native English writer/speaker. Also, some results could be summarized in tables improving the readability of the text.
- Abstract: Re-write according to suggestions below. What do we learn from this study? In what context is this useful? What is the novelty?
- Introduction
 - Page 2, lines 13-14. In addition to characterizing source regions and their contributions to aerosol burden downwind it is also important to assess the timing in which this impact occur, how is the aging process, etc.
 - Page 2, lines 22-24. Uncertainties in modeling studies not only depend on uncertain emission estimates but also on how well chemistry, transport and deposition processes are represented, initial/boundary conditions, etc. It appears necessary to review other studies to get an idea of the uncertainty when using models to simulate long-range transport, particularly over complex terrain.
 - Page 3, lines 1-24. This is a lengthy discussion about distinguishing between biomass and fossil fuel black carbon according to multiple observational and methodological studies. Rather than listing the pros and cons of the different methods, it would be good to have a clearer idea of which is the method fit for purpose to be discussed in the work. For that, it is key to establish a clear purpose, and how this will help improving understanding of a given phenomenon.
 - Page 4, lines 1-6. You state that previous studies have dealt with radiative impacts of bulk BC, no distinguishing BC sources. Furthermore, you state that this study would be unique as it provides the first estimate of BC radiative forcing split by source regions. However, you estimate the instantaneous forcing over one site which is, by definition, locally representative, and not necessarily climatically important. Other studies may have estimated bulk BC forcing but over much longer periods of time, and over large areas, including the Himalayan cryosphere. Hence, I urge the authors to make their study unique by better establishing the purpose of it.
- Methodology
 - Page 4, line 17. Improve the precision of attitude and longitude to allow a proper location of the site.

- Page 4, lines 18-19. As per your reference, Wang et al (2019a), your observation site is located along a “transportation channel”. Describe the overall transport patterns affect. Is the period of observations representative of which transport/circulation pattern? An overall meteorological description is missing.
- Page 4, lines 19-20. You say that the population surrounding your observational site is small. Small compared to what? Then you go onto establishing that limited anthropogenic activities are found there. However, your results show a non-negligible contribution. The site should be better described, including a brief description of aerosol sources.
- Page 7, section 2.5. HYSPLIT can be used with large-scale (synoptic) meteorological fields. Do you have an assessment of how well this approach works over complex terrain? Why do you choose 3-day back trajectories instead of 2 or 5 days?
- Results and discussion
 - Page 11, lines 20-25. Your BC aerosol appears to have aged. Can’t you use your WRF-Chem simulations to attempt providing further insights on this issue?
 - Page 12, section 3.2.
 - Some of your results could be better appreciated if summarized in a table.
 - You make multiple references to FigS3. Maybe it is better to bring it to the main manuscript. If so, it could be useful to split the graphs for daytime and nighttime periods as it would better fit with Figure 2.
- Conclusion
 - Stress the novelty, and make it explicit that the period studied correspond to a given set of transport/circulation patterns.