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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Impact of a Strong Biomass Burning Event on the Radiative Forcing in the Arctic" *by* Justyna Lisok et al.

Anonymous Referee #1

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The paper deals with radiative impact of biomass burning plume reaching to Svalbard, Arctic. It is very interesting topic and important for radiation budget and climate in the Arctic. However, the presentation of the result is so limited that sometimes it is difficult to follow exactly. In the manuscript, large part of the results are devoted to the comparison of the radiation code between MODTRAN and Fu-Liou (Fig. 4 and 5), and not so much description was made for the comparison with actual observed radiative fluxes. For example, Fig. 3 should be one of the main result to be shown; however, it is of some poor expression. In the figure caption, no explanation was made for observed flux (Rad F) and RF (Rad RF). I could not find any curves for Fu-Liou in the figure! If you stick to this comparison with large weights, then it be better to change your title. Also, why observed flux or RF has large gaps? The major aim of the paper is only

radiative effect, but that of BB plume. As for BB plume, we can only know very limited information from Fig. 2 (vertical distribution of extinction coefficients). I know that your group (including yourself as co-author) has already several papers related to this same BB and Markowicz et al. (2016a) shows comprehensive feature of BB plume. Even duplicated, some information be helpful to be shown in this paper also (for example, just like Fig. 2, 3, 4 or 10 in Markovicz et al., 2016a). (Specific comments) - Ny Alesund should be written "Ny-Ålesund". - Fig. 1: Though the figure occupies whole page, the information it shows seems to be not so interesting for the reader. Also, what is "white-sky albedo"? - P14, L5, 15, P16, L6: Relations with clouds are explained in several parts; however, we have no information on clouds in any figures. It is difficult to follow. - P15, L32, 34: What is Fcin or Fcout? There are no such symbols in Fig. 3. - Fig. 3: Explanation/ figure caption of Fig. 3 is limited. What is the large gaps in observed radiative fluxes (P16, L7 says radiometer data are removed – not easy to understand). There are no flux or RF of "within the atmosphere (subscript atm)" in the figure! There is no results by Fu-Liou. What is "Rad"? There is no explanation in the caption. We would like to know the data of τ (tau) itself. - P17, L17: RFE appears first, but no explanation here (only shown afterwards in P19, L16). - P20, L6: I have never heard of "Ny-Ålesund valley". Normally it is said as Ny-Ålesund fjord. - P23, L5: What is "LESs"? - Fig. 7: Is the wavy pattern in (a) meaningful? It seems to be rather artificial due to small change of vertical gradient of θ (T). - Conclusion: Items of conclusion seems to be different from results and discussions. To indicate these conclusions, you need to add more discussions to connect to these conclusions. - P25, L 8: What is "the first" and "the latter"? - P25, L10-11: RFEssurf obtained for wild fires from boreal regions, -→ any reference? - P25. L19: What is "ILES"? - P25, L24: Impact on the atmospheric dynamics is not clearly described in the manuscript. - P25, L26-27: The meaning of the sentence "Thus, it is expected. . ." is not clear. - References: Descriptions are not complete in some, for example, Markowicz et al., 2002, or — 2017b, Stone et al., 2008, Wang et al., 2006.

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