

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

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Italic font style denotes the Referee comments, while normal font - our answer.

General comments

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.

C1

Thank you for your prompt and kind review also for specifying issues and points that we can improve. We hope that the changes we proposed, listed below, shall satisfy the reviewer.

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)

In the revised version the chapter "3.3 The comparison of RF derived from MODTRAN and Fu-Liou simulations" is shortened - only a main outcome is left for this section, namely a brief information on the performance of our custom code to a robust model, as this is not the main result we wanted to emphasize. We moved both figures (Fig. 4 and 5) to the appendix.

not so much description was made for the comparison with actual observed radiative fluxes.

In the revised manuscript, this comparison is added together with the according figure.

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!

Indeed, the Referee is right. We missed that the caption is ill-copied and should be as following:

C2

Temporal variability of (a) radiation fluxes: total incoming flux with the presence of aerosols (black) and without aerosol load (blue) as well as total outgoing flux (red) at the surface simulated (dots) by MODTRAN and measured by radiometers (lines). Sub-figure (b) presents radiative forcing at the surface (black) and at the top of atmosphere (red).

Also, why observed flux or RF has large gaps?

The explanation is included on P15 L12-L16, quoted below: *Figure 3 presents the comparison of irradiances (Fig. 3a) and clear-sky RF (Fig. 3b) obtained by the means of MODTRAN simulations and estimated both by the radiometers' measurements in Ny-Alesund and model calculations (reference case) for the BB2015 event. The latter represent all-sky conditions since the discussed BB event is extremely complicated and therefore a possible cloud contamination seems to be impossible to separate entirely. However, periods with a clear influence of clouds 15 were removed, therefore presented the mean value of RF lacks most intense period (see Fig. 3b).*

We added a short note in the figure caption to emphasize the above information. As this chapter is one of the main results in the paper, we will work on its better expression as now we realized that not everything is clear to the reader.

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 Markowicz et al., 2016a).

C3

Thank you for this comment. We added a new (brief) chapter about the overall characteristics of the event in terms of aerosol optical properties. It is based on the similar figure to Fig. 10 from Markowicz et al., 2016a, highlighting the temporal variability of extinction coefficient profiles and AOD. Please see the appendix for this comment. (hint: black lines refer to cloud occurrence retrieved from observations).

Specific comments

In the revised version all of the specific comments were followed and corrected. Thank you very much for careful revision.

Interactive comment on Atmos. Chem. Phys. Discuss., <https://doi.org/10.5194/acp-2017-1035>, 2017.

C4

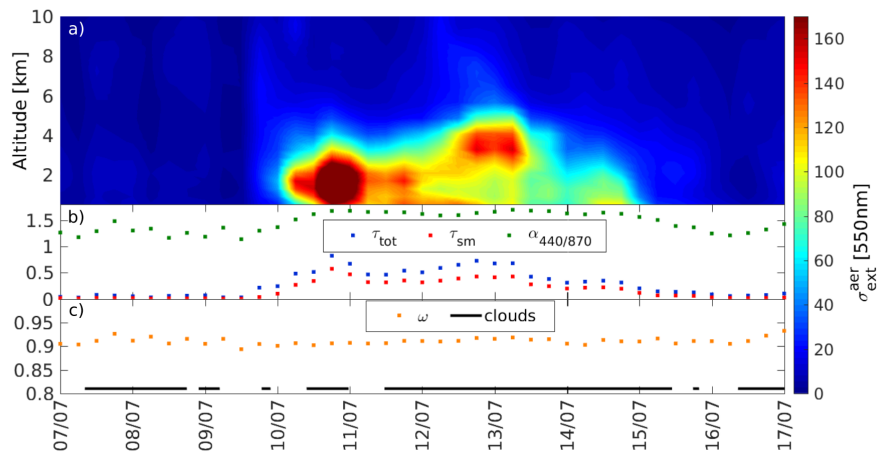


Fig. 1. Aerosol optical properties during the biomass-burning event retrieved from NAAPS model and from observations.