

***Interactive comment on* “Open fires in Greenland: an unusual event and its impact on the albedo of the Greenland Ice Sheet” by Nikolaos Evangeliou et al.**

Anonymous Referee #1

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Review of “Open fires in Greenland: an unusual event and its impact on the albedo of the Greenland Ice Sheet” by N. Evangeliou and co-authors.

General comments.

N. Evangeliou and co-authors present a paper dealing with the atmospheric emission of black carbon by peat fires in Greenland during an extreme event in August 2017. They estimate the total amount of BC released in the atmosphere and its impact on the atmospheric radiative balance and snow albedo. The authors conclude that none of those impact are really significant. I found the paper lacking a focused scientific objective and finally it will have a limited interest for the scientific community. The

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methodology is sound but many of the assumptions must be clarify. The validation exercise is too qualitative while the dataset can be used for quantitative assessment. The conclusion that peat fire in Greenland could be of a significant importance for climate is not really supported by the findings of this paper.

Specific comments.

Abstract

Line 43. Your conclusion doesn't support this fact and it's not scientifically based.

Introduction.

The introduction is missing a comprehensive literature review on Arctic peat ecosystem and fire occurrence to better understand why those particular fires have been studied.

Line 83-84. Provide evidence of the significance of this event compared to other events.

Method

L89-118. This section is very important as it is the starting point for the estimation of the BC amount released by fires. However the methodology used (eg. which sensor, when, spatial resolution, who and how has done the estimation, ...) is unclear. On Line 241, we can read that the burnt surface area comes from GlobeCover 2009. So finally, what is your point?

You should rewrite this section with a detailed comment of Table 1 and explain how it compares to active fire mapping. Line 118 needs clarification based on quantitative information.

L155 Explain how you get this number and provide a range of possible values

L180. Provide reference for BC density and size distribution. Peat fires emits large amount of organic carbon. The possible impact of the mixing state of BC and POM on aerosol size distribution, optical properties and residence time should be discuss in

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this paper.

L200 and discussion section 3.3

The apportionment between emission from peat fires and other sources remains unclear for me. The methodology is not same as the one use for assessing impact of peat fire. The figure 4 is not really useful while other figures are in the supplement material.

L204 and section 4.2

The methodology and the discussion section on RF computation must be improved and clearly states how you deal with both surface albedo and atmospheric effect of BC on the radiative balance. Figure 7 is confusing as it deals with both BOA, TOA, time series and geographical distribution as the same time.

L218 and section 4.1 along with Figures 5 and 6. The validation exercise is really too qualitative and based on visual inspection of satellite data that are not really used scientifically. AERONET data can provide detailed information on aerosol optical properties and radiative forcing. CALIOP data products give aerosol extinction profiles which can be used in the RF computations.

L466 Your last bullet point is rather speculative and not supported by the findings of the paper.

Interactive comment on Atmos. Chem. Phys. Discuss., <https://doi.org/10.5194/acp-2018-94>, 2018.

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