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Atmospheric Chemistry and Physics Discussions

Interactive comment on "History of desert dust deposition recorded in the Elbrus ice core" *by* S. Kutuzov et al.

Anonymous Referee #2

Received and published: 2 July 2019

This paper presents a very interesting dataset from a deep ice core extracted from Elbrus in 2009. Several variables are measured and the record shows interesting trends in dust deposition in the Caucasus. The paper is generally well written and fits the aim and scope of ACP. I suggest it can be published after some minor revisions mainly related to the structure of the paper. In fact, often results and methods are mixed together. More details on the statistical data analysis should be added in the Methodology section. Herafter, my specific comments on the paper.

pg1-ln23 Please define the acronyms (PDO, SOI)

pg1-ln25 Further information regarding anthropogenic activities will be helpful here

pg2-ln4 Please add some references and examples regarding the usage of satellite

data for dust monitoring

pg2-ln15 please correct: "proxy data are fundamental"

pg2-ln26 please correct: "the caucasus is a natural trap"

pg2-ln28-29 not clear, please rephrase

pg3-ln18-21 This is more an "abstract-like" sentence. I don't think is necessary to introduce the results in this Section

pg4-ln1 here is not clear how you separate winters and summers, please add details

pg4-ln10 "Dating the ice core"

pg4-ln15 Remove "Susanne" from the reference

Section 3.3 I think that this section should be reshaped. Important methodological descriptions are introduced here, but they are mixed up with the results. This does not help the reader. I suggest to move all the methodological information to Section 3.1 and to create a new paragraph in Section 4 where the authors introduce the structure of their results.

p5-ln31 here other impacts of dust in the cryosphere should be mentioned. For example the impact on snow and ice melting throung snow-albedo feedback (see. Gabbi et al. 2015 Cryosph.; Di Mauro et al. 2019 Cryosph.)

pg6-ln13 are there other studies focusing on these peaks? If yes, please add some references.

pg6-17 the trend analysis should be described in the Methods. Further details on the statistical analysis should be addedd. How the authors checked the significance of trends? They used a parametric or non-parametric methods?

pg6-ln28 here the authors may reference to recent large dust transports happened in spring 2018.

pg7-ln28 here the authors should briefly describe the possible impact of this increase of dust concentration. For example, earlier snow melt at lower altitude, (more) negative mass balance of glaciers, higher frequency of avalanches etc.

pg7-ln28 is this increase reflected in ERA-interim data? Please add details on it. ERA-interim data are referenced only in the caption of Figure 9. Please add details on how and why you used this dataset.

pg8 ln2: add a comma after Sahara.

pg8-ln12 add this in the methods. How it was calculated, from which data? SPEI 3 was the most correlated with Ca2+, you tried other indices? why the average of three months results in a higher correlation?

pg8-ln33 "number of days", of what?

pg9-ln12 not clear. Please rephrase.

pg9-ln22-23 these indices were never introduced. Acronyms are not defined. Add this information in the methods section. Describe why you selected those indices.

pg10-ln26 Add brackets to "Dai (2011)"

pg10-ln26 Define SST

References: De Angelis and Gaudichet 1991, De Angelis et al. 1997 and De Chatel 2014 are not listed in alphabetical order, please correct.

Figure 1: This map needs a legend. Colors are derived from hysplit backward trajectory but they are not clear to the reader, who cannot interpret them without a legend. I suggest to create a new figure with a clear evidence of possible dust sources. Furthermore, a map depicting the location of the drilling site on Elbrus could be useful.

Figure 2: describe in the caption what's in the different panels

Figure 4: delete "RAW DATA" from the legend. Please mark the zoom the in upper

panel.

Figure 7: please add the labels to both plots

Figure 10: is this a piece-wise regression? How the authors identified the break? This is important since the detection of the break strongly influences the correlation they show with SPEI. Here the authors show the Pearson's coefficient r, whereas in Figure 7 they show Rˆ2. I suggest to use Rˆ2 across the whole manuscript.

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