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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Variability of black carbon deposition to the East Antarctic Plateau, AD 1800–2000" *by* M. M. Bisiaux et al.

Anonymous Referee #2

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General comments

This paper reports new and interesting data of rBC concentrations obtained from 6 ice cores extracted from various remote locations on the Eastern Antarctic plateau. The temporal and the spatial significance of this study is high, illustrating very well the complexity of the mechanisms of emission, transport and deposition of rBC to East Antarctica. I have no hesitation to state that the records obtained deserve publication in ACP.

In addition to the very remarkable experimental effort, the authors use interesting statistical methods for extracting the significant variability embedded in this large data set. This is a very difficult task as variations in rBC concentrations are low as well as the level of apparent coherence between the different records.

In general, I believe that the text illustrating the statistical methods and their applications should be made much clearer for a readership that is not necessarily familiar with these procedures. In addition, the authors should try to better display the conclusion obtained, highlighting (for instance also in Fig 2 where rBC concentrations are reported) also the periods where they have inferred monotonic, linear and non linear trends, significant intervals of low/high concentrations etc. This may provide a better sense/appreciation of the conclusions suggested.

The authors should also discuss their assumption of Na as a "proxy of local transport". While it is largely accepted that this element is a proxy of marine aerosol (or frost flowers developing on sea ice), it is not obvious that Na is a specific tracer of relatively local transport. The origin of Na might be linked to coastal sea ice, seawater surrounding Antarctica but also far distant portions of the oceans. Being most of the surface of the Southern Hemisphere constituted by oceans, I'm not sure there are in the literature really striking arguments supporting the local vs. more distant origin of Na entrapped in Antarctic ice cores. The atmospheric trajectory of marine aerosol is also uncertain and both low (as assumed by the authors) and high paths in the troposphere cannot be ruled out.

Specific comments

21-31092 "because of their low albedo light absorption properties". Albedo is a general physical property of large surfaces that is eventually influenced by a large amount of rBC particles deposited on large snow fields. Thus I believe albedo cannot be refereed as a property of the individual particles in themselves. Please, consider rewording.

21 31095 nssS data from these six ice cores and the match performed for dating purposes with the WAIS divide ice core are important information that should be provided as supplementary electronic information. Alternatively the appropriate reference should be offered.

4-10 31096 The method used for "further refinement of the 07-1-5 and 08-4 depth age

ACPD
11, C14365–C14367, 2012

relationship", as described at this point of the paper, is quite obscure.

3-31097 Were Z scores calculated using the arithmetic or the geometric mean? The standard deviation or the geometric standard deviation? Or the Z-score was calculated by using the log of the measured rBC concentrations? Please, clarify.

14-16_31098 Please, indicate the time periods when the monotonic trends are significant. Please show also the linear trends.

24-25_31098 Please, describe in the text the time periods where significant non-linear trends were identified. Please, also introduce the concept of Z-scores of non linear trends reported in Fig. 3. Or were you meaning non-linear trends of Z-scores?

1 31099 Here non-linear trends normalized by Z scores are mentioned. It is very confusing. Please, clarify extensively the procedure adopted, adding some more background, if needed.

1-31099 Please, display the identified periods of low (1890-1920) and high (1920-1940) concentration also in Fig. 2 as well as the periods of low/high variance from 1940 to 1980. In the Fig. 3 caption, the NADA variance is not introduced.

15_31100 Please, refer to Fig. 4c in the text.

21_ 31100 The authors should explain how they extrapolate from Fig. 4 an 80% of difference of rBC due to elevation change.

26_31100 The monotonic trends as well as the temporal variation in the accumulation should be displayed in the figures.

5_31101 Non-linear low frequency trends in the rBC records and those not found in Na record should be displayed.

Interactive comment on Atmos. Chem. Phys. Discuss., 11, 31091, 2011.

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11, C14365–C14367, 2012

Interactive Comment