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www.atmos-chem-phys-discuss.net/14/C7664/2014/

Atmospheric Chemistry and Physics Discussions

Interactive comment on "Long-term variability of dust events in Iceland (1949–2011)" *by* P. Dagsson-Waldhauserova et al.

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Anonymous Referee #2

General The paper discusses dust events in Iceland in 1949 - 2011. It is a long period in any atmospheric observational data. The dust observations are compared with PM10, visibility, and weather conditions, and differences between north and south Iceland are discussed. The paper is definitely worth publishing in ACP. I found some work to be done for a revised version, however. My correction suggestions are not very tedious. The most tedious is to rework the analysis between PM10 and visibility. In the present figure 8 and the related text in section 3.3 only the correlation coefficients are discussed even though the data would be suitable for more interesting and quantitative

analyses. Obviously the authors wanted to make a similar plot as Wang et al. ACP, 8, 545–553, 2008 but also their plots are not as informative as they could. First, visibility is reduced by particles so it is much more sensible to plot visibility as a function of PM10. But don't leave it there. The extinction coefficient can be estimated from PM10 by using some published mass scattering coefficients (e.g., Hand, J. L., and W. C. Malm (2007), Review of aerosol mass scattering efficiencies from ground-based measurements since 1990, J. Geophys. Res., 112, D16203,doi:10.1029/2007JD008484). Just one multiplication. Visibility can then be estimated from the Koschmieder formula (google for that) that gives visibility as a function of extinction coefficient, just one division. How well does the so calculated and actual observed visibility compare? Are they even in the same order of magnitude? Are the shapes of the functions (visibility(PM10)) similar? You may draw some interesting conclusions from this. In the plots use loglog scale because it shows better also the points in the low visibilities and low PM10.

ANSWER: We would like to thank the reviewer for the suggestions, corrections and comments, which have improved the paper considerably. We reworked the analysis between PM10 and visibility and changed the Figure 8 (now 9). However, our visibility data are not obtained by the precise instruments, but manually by the observer, who records only the minimum visibility extending at least a sector of only 45 out of 360 degrees. The PM data are from stations which are not exactly at the same location as the weather stations. Therefore, we are reluctant to lay too much emphasis on this part of the study. However, in the near future, we plan to observe systematically PM and visibility at carefully chosen locations. This will hopefully provide data suitable for an analysis of the kind described in the comment. We included the need for such future analyses in the text.

Detailed comments

P17334,L11-12 "The Hagavatn plume area is the source for frequent dust events towards Reykjavik and North America (the ocean southwest of Iceland)" The text in

parentheses refers to North America which suggests that NA is the ocean SW of Iceland. I would do some rewording. ANS P17334,L11-12:Changed.

Section 2.1 Considering the significance of visibility data for the analyses in the present paper, the method should be explained more detailed. How was visibility measured? Wavelength? Uncertainties? ANS Section 2.1: We present here a long-term dataset beginning in the 1940s. We have chosen stations that report both present weather and visibility. The synoptic code for the present weather requires the observer at the station. Therefore, our data have been obtained during the "manual weather observation by the observer". This is for both, the present weather as well as the visibility. No precise measurements with appropriate instruments were done for the visibility. The weather observer has developed a scale for visibility at each location, based on distance to landscape features seen from the weather station. This is the main reason why we do not wish to present more of analyses on the extinction coefficients. The uncertainty would be too high. We have, therefore, emphasized in this section that we present only the weather reports manually obtained by the observer at each station.

P17335, L10. Dust observations. How is dust observed? With some instrument? ANS P17335, L10. Explained above.

P17336, L6-7. "We have not included these codes in this long-term study except that ww1 or ww2 was 3." I don't understand this sentence. ANS P17336, L6-7. Explained better in the text. This text relates to the text on page 17335, L12.

17337 "There is clear trend of having either the south or the north more active at a time." I would not say it is clear at all. For instance in the 1950's, 1970's and 1990's the peak years seem to be the same. A scatter plot and regression of the annual number of dust days would possibly yield a slightly positive correlation. I would suggest the authors make such a plot, it would bring some more quantitativity to the analysis of the differences between the regions. ANS 17337: Here we talk about the annual number of dust days, not decadal. There is a trend, that for some years, the frequency was

higher either for NE or S (pleae see differences in included graph - stacked bars). Not many years in Figure 3 show, that NE and S would be about the same frequency (to see better, please look at the graph here bellow). However, we skip the word "clear" here. We plotted our data into a scatter graph and the regression was slightly negative with nearly no linear relationship between the two variables. Please see two enclosed figures for the reviewer.

P17340, L3 "The DE wind velocity increased with the DE severity," The DEs are induced by wind and not the other way round so I would rather write that the DE severity increased with the wind velocity. ANS P17340, L3: Of course, thank you! The sentence was changed.

Fig 2. Why are the time series of visibility and number of dust days so different? For visibility there is clearly an increasing trend through the decades. Discuss this also in the text. ANS Fig 2: We agree, more discussion on visibility was added.

New reworked Figure 8 (now numbered 9) was added. Revised document with changes marked in red is added as Supplement.

Please also note the supplement to this comment:
http://www.atmos-chem-phys-discuss.net/14/C7664/2014/acpd-14-C7664-2014-supplement.pdf

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Interactive comment on Atmos. Chem. Phys. Discuss., 14, 17331, 2014.

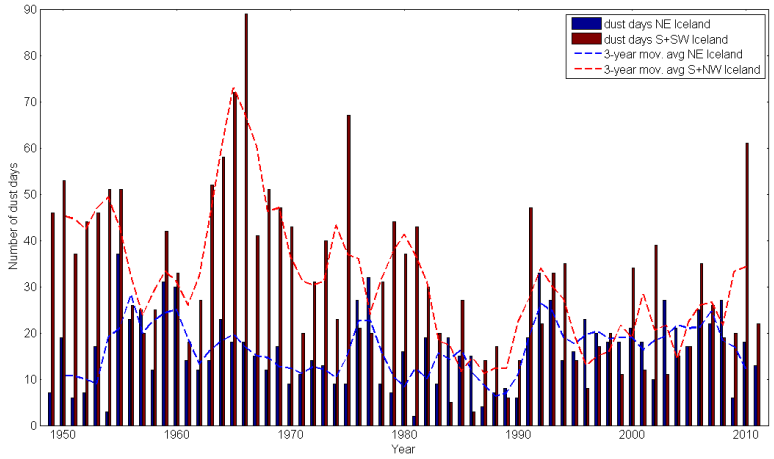

Fig. 1. 17337-graph of annual dust days in NE and S Iceland

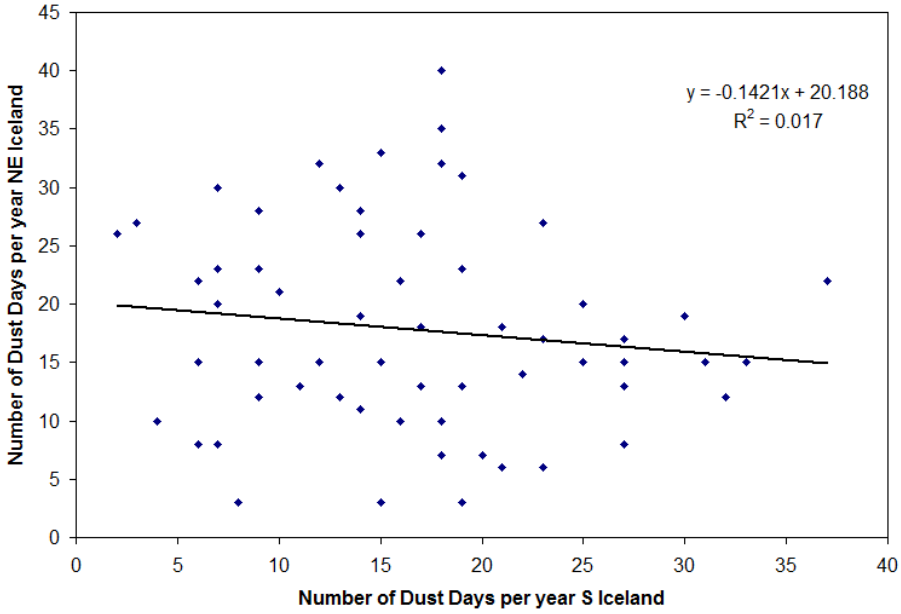

Fig. 2. 17337 - scatter graph of dust days in NE vs. S Iceland

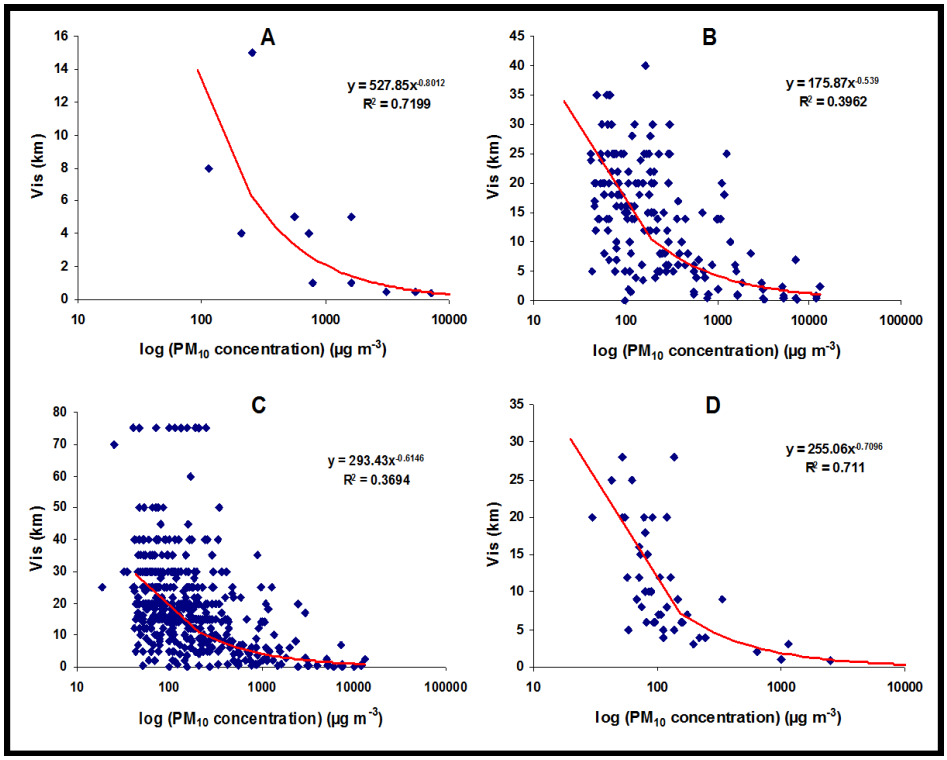

Fig. 3. reworked figure 8 (now9)