Atmos. Chem. Phys. Discuss., 11, C3660–C3664, 2011
www.atmos-chem-phys-discuss.net/11/C3660/2011/


Atmospheric Chemistry and Physics Discussions



# *Interactive comment on* "Influences of the 2010 Eyjafjallajökull volcanic plume on air quality in the northern Alpine region" *by* K. Schäfer et al.

**K. Schäfer et al.**

klaus.schaefer@imk.fzk.de

Received and published: 20 May 2011

We thank the referee no. 3 for the constructive comments to our paper. We answer during the interactive discussion with the following and repeat the referee statements first.

"In the meantime, a paper about measurements of the volcanic ash plume in Switzerland has been published in ACPD (Bukowiecki et al., 2011). It would be good to refer to this paper (e.g. at page 9096, lines 15-18, and at page 9107 lines 21/22). In addition, the results for the mass concentration of volcanic ash estimated for sites in Southern Germany (page 9000, lines 27-30 and page 9001 lines 1-2) should be compared with similar estimations for Mulhouse (France) by Colette et al. (2010) and for Basel (Switzerland) by Bukowiecki et al. (2011)." We are thankful for these comments and

included the references at these places already (it should be page 9100 and 9101 instead of 9000 and 9001).

"The discussion about the impact on the volcanic ash plume on accumulation mode particles remains unclear and contradictory. At page 9102, line 23 the authors write that "the mass concentration of smaller particles (0.1-1um) was not increased". At line 25 the authors say that "The small increase of this accumulation mode particles : : :", and at page 9103 at line 3 it is stated that "This is also corroborated by a small increase of accumulation mode particles". These statements are conflicting and need to be changed. There is also no graph which shows the evolution of accumulation mode particles. This would of course help as well." A similar comment of reviewer no. 2 was answered above. At page 9102 we found confusing PNC discussion which is corrected – it is mass concentration because Fig. 11 (mass concentration) is discussed. The sentence 'the mass concentration of smaller particles (0.1 - 1 $\mu$m) was not increased' is changed into 'the mass concentration of smaller particles (0.1 - 1 $\mu$m) was not strongly increased'. The sentence 'The small increase of this accumulation mode particles . . .' is changed into 'The mass concentration increase of the particles in the size range 1 - 2.5 $\mu$m . . .'. This is a clear description of Fig. 11. The whole paragraph is now the following: 'Time series of further parameters of PM (size ranges 0.1 - 1 $\mu$m, 1 - 2.5 $\mu$m and 2.5 - 10 $\mu$m) and sulphate concentrations measured in PM2.5 at AUHS from 17 April to 20 April are shown in Figs. 11a and b. Beginning on 19 April, 18:00, an increased mass concentration was observed. This could be seen as a consequence of the meteorological conditions described above and associated downward mixing and horizontal replacement, i.e. the exchange of air mass which is loaded with volcanic material. The mass concentration is essentially pronounced for particle sizes larger than 1 $\mu$m (Fig. 11a). The mass concentration of smaller particles (0.1 - 1 $\mu$m) was not strongly increased compared to other days, i.e. on 17 April. The mass concentration increase of the particles in the size range 1 - 2.5 $\mu$m is consistent with the increase of sulphate concentration in PM2.5 (Fig. 11b). It is also in line with the only very small PNC increase of PM with sizes from 100 to 800 nm (see Chap. 4.2).'



ACPD

11, C3660–C3664, 2011



"At page 9109 lines 20 and 21 it is stated that ": : : the transported mass of particles in populated areas was largely in the size range between 2.5 and 10um. This is not clear from the presented data and the shown Figures (can e.g. not be clearly seen from Fig. 11a). It would be worth to present this more clearly as this is an interesting result." We changed here 'in the size range between 1 and 10 $\mu$m' because this was discussed in Chap. 4.4.1. together with Fig. 11.

"Figs. 5 and 10 should be printed large enough so that the text and other information can be read. Especially Fig. 10 contains a lot of information and should be easily readable." We will ask the Journal staff if this is possible.

"Page 9095, line 12: The word "down" can be deleted here." Thank you. We did it.

"Page 9098, lines 1 and 2: "The number of larger particles (PM1, PM2, PM4, PM5 and PM7.5) however increased significantly". This phrasing is somehow confusing, PMx is typically associated to mass concentrations and not particle number concentrations and do in any case include the particles smaller than the given cut-size. The sentence should be changed, e.g. give the corresponding size bins in brackets." The sentence is changed: 'The number of larger particles (300 – 1,000 nm, 300 – 2,000 nm, 300 – 4,000 nm, 300 – 5,000 nm and 300 – 7,500 nm) however increased significantly on 17 April'.

"Page 9098, lines 4/5 and line 25. Please provide the time resolution of the discussed SO2 peak values (hourly or daily values?). Similarly on page 9099, line 7: Should be changed to "The composition of daily PM10 samples : : :"." All data we are using are hourly mean data (see page 9089, line 13-14). We think that it should not be mentioned later if these data are used. It is different for PM10 sampling and wet deposition. Here it should be mentioned and we add it as proposed at page 9099, line 7.

"Page 9100, line 13. It is stated that different elements are enriched, without defining what enrichment means. A definition of the used concept of enrichment is given in the legend of Table 2, I would appreciate a similar sentence here as well." Thank you. It is



ACPD

11, C3660–C3664, 2011



important and we completed it.

“Page 9102, line 22 and following lines: This section is unclear and should be changed. The authors write that “PNC is essentially pronounced for particle sizes larger than 1um (Fig. 11a).”. The sentence itself makes not much sense, and referring to Figure 11a helps not much as in Figure 11a particle mass is shown (PM) and not PNC. In Figure 11b the label on the y-axis states “BC”, should be changed to “Sulphate”.” We agree (see answers to review no. 2 also) and changed the sentence ‘PNC is essentially pronounced for particle sizes larger than 1 $\mu$m (Fig. 11a).’ into ‘The mass concentration is essentially pronounced for particle sizes larger than 1 $\mu$m (Fig. 11a).’. The section is in general improved. In Figure 11b (mass concentration) we changed BC at the ordinate into sulphate.

“Page 9102, line 29: The words “was observed” should be deleted.” Thank you. We did it.

“Page 9104, 1st line: “the dewpoint declined from about 1500m : : :”. This sentence should be corrected because of the wrong unit for dewpoint.” The data are given in Fig. 10 in Emeis et al. (2011). We changed the sentence: “The average ozone concentration in the lower 3000 m decreased from 140 to 95 $\mu$g m-3 and the height of the maximum in the dewpoint profile indicating the upper rim of the mixing layer declined from 1500 to 800 m.”

“Page 9104, lines 18: “very small aerosols” should be changed to “very small aerosol particles”. Again on page 9105, line 5.” Thank you. We did it.

“Page 9104, lines 19: Should be corrected, the given size range in Figure 7 is 10-30nm not 10-20nm as stated here.” Thank you. We corrected it.

“Page 9105, line 10: Should be in past tense, change to “dominated”.” Thank you. We made it.

“Page 9106 lines 13/14: The elevated observation sites listed include IBK (570m a.s.l.).



ACPD

11, C3660–C3664, 2011

This is probably an error." Thank you. We corrected into '. . . at the elevated observation sites ZSF (2670 m a.s.l.) and SSL (1200 m a.s.l.) as well as at IBK (570 m a.s.l.)'.

Interactive comment on Atmos. Chem. Phys. Discuss., 11, 9083, 2011.