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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Characterization of Eyjafjallajökull volcanic aerosols over Southeastern Italy" *by* M. R. Perrone et al.

Anonymous Referee #1

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General comment:

This paper describes the detection of atmospheric aerosol over Southern Italy by a lidar, a sun/sky radiometer and a ground-based particle sizer. The observed aerosol event in the second half of April 2010 is attributed to the strong eruption of Eyjafjallajökull on April 14 by the use of the Lagrangian particle dispersion model FLEXPART and a few surface SO2 data. The result is seen as a contribution to the observation of advected aged volcanic ash and as a validation of the model abilities of FLEXPART. Both aspects are valuable and principally deserve publication.

Specific comments:

This study is another one in a longer series of studies which have appeared in this

journal (and in several other journals as well) after the eruption of this Icelandic volcano since the second half of 2010. Six of these earlier papers which appeared in this journal are already mentioned. Nevertheless, there are two more papers in this series which have some relevance to the topic of this new contribution and which should be taken into account by the authors: there is a special lidar paper by Gasteiger et al. (2011) and a paper which discusses the input of the volcanic aerosol into the atmospheric boundary layer and air quality issues (including size of aerosol particles) by Schäfer et al. (2011).

The major issue which is not fully done in this study is the final proof that the observed aerosol particles are really of volcanic origin. There are no in-situ data from higher aerosol-laden layers (aircraft data giving, e.g., particle consistency, chemistry), and there are no other independent proofs of the volcanic origin (e.g., depolarisiation ratios). The only proof offered in this study are the FLEXPART simulations. Although the general weather situation makes it highly likely that volcanic material has reached atmospheric layers above Southern Italy in those days, this is not a strict proof. This deficiency is worth mentioning because the authors claim in the conclusions that this study has been a validation of the abilities of the FLEXPART model. The argumentation goes a bit along a closed circle: the model results are used to identify the arrival time of the volcanic material over Southern Italy and finally the good simulation of the model is taken as a proof for the quality of the model. Another independent data might be helpful here. Maybe the SO2 information given in Fig. 12 may be helpful in this respect.

But a comparison of Figs. 5 and 12 gives at least a 16-hour delay in the FLEXPART simulations compared to the surface observations at site G. Maybe, the delay is even larger because the measurement at site G is made at the ground and FLEXPART shows the first arrival at about 3 km height (Figs. 3b, 3c). It probably took some time until this material was mixed downward to the surface. This would point to a about one-day delay in the FLEXPART simulations. This aspect should be discussed in more detail and should be included into the FLEXPART evaluation.

Looking at Fig. 12, a further interesting detail is that high peak SO2 concentrations are observed earlier at site G than at site C. This is astonishing because site G is further south than site C. It would be nice to have an explanation for this. Do the dispersion model simulations or the HYSPLIT trajectories give any hint why this happens? Or is this due to local boundary layer downward mixing processes? Anyway, it is an interesting detail deserving a bit closer explanation.

Further technical comments:

The abstract is too long and contains too much details. Please concentrate it to the main facts and conclusions but do not give explicit numbers here.

p. 15312, l. 13: what is SDA?

p. 15324, legend to Fig. 1: it would be desirable to have a hint to HYSPLIT in the Figure legend.

References:

J. Gasteiger, S. Groß, V. Freudenthaler, and M. Wiegner, 2011: Volcanic ash from Iceland over Munich: mass concentration retrieved from ground-based remote sensing measurements. Atmos. Chem. Phys., 11, 2209-2223.

K. Schäfer, W. Thomas, A. Peters, L. Ries, F. Obleitner, J. Schnelle-Kreis, W. Birmili, J. Diemer, W. Fricke, W. Junkermann, M. Pitz, S. Emeis, R. Forkel, P. Suppan, H. Flentje, S. Gilge, H. E. Wichmann, F. Meinhardt, R. Zimmermann, K. Weinhold, J. Soentgen, C. Münkel, C. Freuer, and J. Cyrys, 2011: Influences of the 2010 Eyjafjallajökull volcanic plume on air quality in the northern Alpine region. Atmos. Chem. Phys., 11, 8555-8575.

Interactive comment on Atmos. Chem. Phys. Discuss., 12, 15301, 2012.