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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.

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Dear Referee #2, many tanks for reviewing the manuscript and for your comments and suggestions which have contributed to improve the manuscript. The title of the paper has been changed and the paper structure has been reorganized in accordance with your comments. Point by point answers to your comments are reported below.

General comments

. . . . . .For this reason I believe the present work needs a reorganization of the structure. In the next section I suggest how to differently present the already performed analysis.

Specific comments:

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Interactive Discussion

Discussion Paper

The main points to be highlighted in this paper, on my opinion are: a) how the passage of volcanic aged aerosol affected the local aerosol; b) the validation of FLEXPART model. Keeping in mind these main topics, the paper could be structured as follow:

1. Providing a proof of the presence of volcanic aerosol over the site. This can be done using: - backtrajectories, - a qualitative intercomparison with the FLEXPART simulation in order to check where the volcanic aerosol cloud is located

The structure of the paper has been reorganized as it turns clearly out from the marked-copy where all changes are highlighted. HYSPLIT back trajectories and other published studies have mainly been used to proof the advection of volcanic aerosols over southeastern Italy (Section 3.1), in addition to a qualitative intercomparison with the FLEXPART simulation. Then, volcanic aerosol properties resulting from different measurements techniques have been analyzed.

- Lidar measurements over Lecce compared with those Greek and Turkish.

Lidar measurements have been compared with the corresponding ones over Potenza (Italy), Leipzig (Germany), and Greece and Turky (Section 3.2).

- PM and SO2 measurements.

PM and SO2 measurements are analyzed and discussed in Section 3.4.

- analysis of the time pattern of optical and physical aerosol parameters retrieved by AERONET, in order to spot anomalous behaviour that can be connected to the passage of the volcanic cloud. Concerning this point it is important to analyse “all” the parameters provided by the inversion, (refractive index, single scattering albedo, coarse-fine modal radii) and not only AOD. Infact studies performed with sun-sky radiometers highlighted that many times the presence of volcanic aerosols was not recognisable by looking at the increase of AOD but only by a change for example in the values of the real or imaginary part of refractive indexes.

AERONET measurements are analyzed in Section 3.3. However, as it is stated in the

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revised manuscript, one must be aware that: “AERONET aerosol products (Version 2, Level 2 data) are lacking for the monitoring site of this study from 12 up to 19 April. In addition, only some aerosol products are available from 14:15 UTC of 20 April until 16:11 UTC of 21 April. In particular, refractive index and single scattering albedo values have not been provided for these two days.”

2. Once the presence of volcanic aerosol is assured and in which period it has been recorded, a description of some changes happened during the transportation across Europe can be provided. In particular it can be described: - changes in term of mass (as provided by FLEXPART simulation) in two different sites, Leipzig and Lecce. - changes in terms of the height of the layer (as provided by FLEXPART simulation or by an other EARLINET/LIDAR) in two different sites, Leipzig and Lecce. - Are there other properties whose difference can be analysed?

Measurements and FLEXPART simulations are discussed in Section 3.5, in accordance with your suggestions.

3. I think that the most interesting point is the description of the changes of local optical and physical aerosol parameters in the presence of volcanic aerosol. This analysis can be interesting for further studies on the direct radiative effects of aerosols. The characterization before during and after (if possible) the volcanic aerosol event can be done using - AOD provided by Lidar and by AERONET - refractive index, single scattering albedo, volume size distribution, modal radii, volume concentration of coarse and fine mode, provided by AERONET.

As mentioned: “AERONET aerosol products are lacking for the monitoring site of this study from 12 up to 19 April.”

- PM and SO2 measurements

Done

4. Finally a validation of FLEXPART model can be performed by comparing: -the

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aerosol vertical profile against LIDAR measurements explaining all the problems connected to the not easy direct comparison. - the mass of the coarse mode, against the mass of the AERONET coarse mode both retrieved starting from the volume coarse concentrations. In this case I suggest to divide the volume size distributions in two modes, separated at 0.5 um, and calculating their volume concentrations as described by Dubovik, O., King, M.D., 2000. (A flexible inversion algorithm for retrieval of aerosol optical properties from sun and sky radiance measurements. Journal of Geophysical Research 105, 20673-20696). - the mass of the coarse mode at the layer closest to the ground level, against the mass measured by PM10.

Partially done

Further comments:

Page: 15311 The statement " the time evolution of AOD is similar to that of the ash....". Please quantify the term "similar".

Done

The same comment is for the " similar" term on page 15314 line 19.

Done

Page 15312: Analyse the differences in the volume size distributions during the days with and without volcanic aerosol, in terms of the difference in volume concentrations of the coarse and fine modes (calculated as suggested above). Please avoid using the [delta(dV(r)/dln(r))] espressed in line 24.

Done

Page 15313: Fig8a must be changed as Fig 9°

Done

Please also note the supplement to this comment:

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http://www.atmos-chem-phys-discuss.net/12/C7500/2012/acpd-12-C7500-2012-supplement.pdf

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