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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 #2

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General comments

The aim of this paper is the characterization of volcanic aerosol over a site of Southern Italy, located 4000 km far from the volcanic eruption. As stated by the authors, the optical and physical properties of aged volcanic aerosol is not well known and they are interesting to be studied. For this reason I consider the paper suitable for a publication. However measurements refer only to one site and it is not possible to perform a deep study of how the aerosol characteristics changed during the transport across Europe. Moreover the first feeling reading the paper in that it is mainly focused to certify that volcanic aerosol was really over the site. On my opinion there are different points, already treated in the paper, that must be highlighted to make this work scientifically interesting and really original. 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:

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 - Lidar measurements over Lecce compared with those Greek and Turkish - PM and SO2 measurements. - 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.

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?

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

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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. - PM and SO2 measurements

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

Further comments: Page: 15311 The statement " the time evolution of AOD is similar to that of the ash....". Please quantify the term "similar". The same comment is for the " similar" term on page 15314 line 19.

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.

Page 15313: Fig8a must be changed as Fig 9a

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