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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Detection and characterization of volcanic ash plumes over Lille during the Eyjafjallajökull eruption" *by* A. Mortier et al.

Anonymous Referee #2

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This paper aims at characterizing the properties of the Eyjafjallajökull volcanic plume observed over Lille in April 2010. The analysis based on the retrieval of the optical properties from sunphotometer and lidar indepedently is first presented and combined results are then given. State of the art is well detailed. In the applied method, the sun-photometer AOD is used in the lidar inversion. It is not new but has proven to give good results to retrieve extinction profiles. The paper shows how the mass concentration can be derived as based on the extinction coefficient and on the microphysical properties from the sun-photometer. This is an important point to the proposed approach. The combination helps reducing the error, as compared to lidar measurements alone (no a priori hypothesis), and a good discussion of the error sources is presented. The

paper is clearly written (the phrasing may however be improved in some parts), well presented and gives good quantitative information. I recommend it is published in ACP after the authors have addressed a few points which are listed below

P 31032, line 21 : mention “retrieved” and wavelength again (An effective LIDAR . . . of 48 sr was retrieved at 532 nm)

P 31037, line 9 and after : AODs are more frequently given at 550 nm, and as lidar measurements are made at 532 nm, this may be even more directly comparable, why is the sunphotometer AOD given at 440 nm ?

P 31037, line 15 : 0.4 @ 440 nm ?

P 31037, line line 24 : instead of “size” precise “radii” if so,

P 31037, line 28 : nm is missing . . .0.03 at 440 nm, . . . but some information is missing in the sentence at 870 nm. The sentence should be corrected.

P 31038 : lines 1 to 6 : how do these values compare with results from in situ and other observations ? P 31039, lines 2-5 : mention that trajectories were examined over the whole troposphere (no a priori lidar information)

P 31039, line 11 : give wavelength (. . .below 0.4 @ 440 nm)

P 31040, line 12: the afterpulse alone is not the reason for preventing to get useful data. Saturation and geometrical factor are additional sources of problem in the signal near the emitter.

P 31040, line 20 : the free troposphere is extending from the boundary layer top height to the tropopause height. The discussion here is a little bit confusing due to a mixing of case study and general statements.

P 31040, line 24 : “generally very clean” is not quantitative, what error value is expected ? give a reference.

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P 31042, line 9 : “detector” instead of “receiver”.

P 31042, line 12 : what is the residual error on signal after the correction of afterpulse has been performed ?

P 31043, line 1 : “. . . attributed to molecular scattering.”

P 31043, line 24-25 : after overlap factor correction is performed ?

P 31044, line 9 : there are previous publications (JGR, Tellus, . . .) on this approach assuming two layers with different properties you can refer to.

P 31045, line 7 : a LR value of 48 sr on 17 April does not appear to be consistent with what is written in page 31038 line 12.

P 31046, line 9 : give altitude where this value has been obtained.

P 31046, lines 16-21 : changes in scattering properties with relative humidity as referred to are relative to more hydrophilic aerosols than ashes. The plume may not be pure ash, but the index would change. Need to adjust the discussion to the particle under study.

P 31046, lines 23, 27, 28, 29, 32: give errors after AOD values (+/- xx)

P31048, line 12 : lidar-derived profiles of . . .

P31048, line 25 : why consider a constant modal radius ? What is the impact of changing its value ?

P31048, line 6 : back to the previous question on the impact of relative humidity.

P31051, line 1 and further : retrievals during nighttime are possible using fixed parameters. This is done. The first sentence of this paragraph is to be rephrased (same thing after).

P31069 : remove vertical dashed line in Fig. 8 a, close to 12 UTC.

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