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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Volcanic ash from Iceland over Munich: mass concentration retrieved from ground-based remote sensing measurements" *by* J. Gasteiger et al.

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This paper proposes a new approach to retrieve microphysical parameters (e.g., relative frequency of prolate spheroids ζ, aspect ratio ratio parameters μ and σ) of volcanic ash particles using multi-wavelength polarization Raman lidar data. As the results, the authors estimate the mass-extinction conversion factor η and mass concentration M of ash particles assuming its density. They applied the algorithm to the measured lidar data and provided the microphysical data for the Eyjafjallajokull volcano ash. They check the algorithm performance using the skyradiometer data and suggest combined use of the lidar and skyratiometer data. This paper includes new findings (i.e., retrieval

method and volcanic ash information) and is appropriate to this journal issue. Thus, this paper should be published, however, I had two major comments. I hope that the authors modify this paper considering the comments.

1) You emphasize the mass concentration retrieval in this paper as shown in the title, however, they explain its importance by only one sentence, i.e., "Page26708 Line16: because it is a critical parameter for flight safety". Why important? If "flight safety", are the optical properties such as extinction coefficient more important, aren't they? Related to this question, how do you use this retrieved mass concentration in the future? It is essential in this paper to mention why you must convert extinction to mass concentration.

2) More detailed description on the retrieval algorithm, especially on the following points, is needed. In addition, a flowchart on the algorithm helps readers to understand the algorithm well. 2-1) I understood that you used 7 observed parameters (extinctions at 2 wavelengths, backscatters at 3 wavelengths, and depolarization ratios at 2 wavelengths) and retrieved 10 parameters (No, ro, σ, mr, mi, ζ, μp, μo, σp, σo), and finally you estimated the mass concentration using the retrieved No, ro, and σ. You should summarize all the retrieved parameters in Table2 as well as their range. 2-2) I understood that this algorithm estimated all candidates (ensemble) of solutions (each candidate consists of 10 parameters and matched the observed 7 parameters within the measurement uncertainties) and considered the median of the candidates as the best solution (i.e., equal (or closest) to the true value of the estimates). To indicate this clearly, you should show a simple simulation result. For example, you make an aerosol vertical profile, simulate a profile of the observed parameters using the made aerosol vertical profile, and apply the algorithm to the simulated profile. 2-3) How did you separate the ash (spheroid) and non-ash (spherical) particles? You should mention the method clearly. 2-4) You should mention the relationship between the observed parameters and aspect ratio distribution. For example, you should describe qext(r,) as qext(r, fp) in Eq(4), and qsca(r)F11(r,180) as qsca(r, fp)F11(r,fp,180) in Eq(5). In

addition, you should mention assuming size-independent aspect ratio distribution.

Interactive comment on Atmos. Chem. Phys. Discuss., 10, 26705, 2010.