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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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We thank Dr. Gobbi for his very useful comments. They help us to improve the paper. In the following, comments by Dr. Gobbi are in italic font, answers by the authors in normal font.

The aerosol scattering model employed in this manuscript is analogous to the one developed by Barnaba and Gobbi, (JGRd, p3005, 2001), later employed to provide the mass to extinction ratios of Saharan dust published in Barnaba and Gobbi (ACP, p2367, 2004, Figure 13). This latter figure showed the ratio to have a strong dependence on the distribution extinction coefficient, i.e., modal radius (m/ext=0.47 g m^{-2} *at Ext*$_{550}$*=*

10 Mm^{-1} *, m/ext=1.3 g m*$^{-2}$ *at Ext*$_{550}$*= 100 Mm*$^{-1}$*, and m/ext=2.16 g m*$^{-2}$ *at Ext*$_{550}$*= 300 Mm*$^{-1}$ *(particle density 2.6 g cm*$^{-3}$*)). As a consequence, attributing extinction to coarse rather than fine mode particles strongly increases their estimated mass.*

Thank you for pointing at these papers and their computed η (m/ext-ratios). The outcome with respect to the size dependence of the estimated mass is similar for these papers and ours. The absolute values of η are a bit lower for the volcanic ash case over Munich than for desert dust in the Mediterranean region (for Ext$_{550}$= 300 Mm^{-1}), suggesting slightly smaller particles for the volcanic ash for same Ext$_{550}$. The uncertainty ranges of η are still overlapping, however.

Why the authors search for a single conversion factor when their m/ext frequency distribution (Fig. 3) shows the presence of an analogous large variability of such ratio as a function of particles size? This choice can seriously impact an extended application of their method. Wouldn't the paper benefit from exploiting the size (or extinction) dependence of the computed ratios?

We agree that the paper benefits from a more explicit exploitation of the size dependence of η. To demonstrate that r_{eff} is the most important parameter for η in Equation 11, we replace Figure 3 by a figure showing the m/ext-ratio plotted over r_{eff} for the different compatible ensembles. A straight line is fitted and the parameters of the line are reported in the revised paper.

How can the authors be sure the plume extinction coefficients they observed were generated by monomodal, coarse ash particles alone, with optical properties as in their Table 3?

No in-situ microphysical data is available for the observed ash plume over the Munich area. We would like to refer you to our answer to an anonymous referee because similar questions were raised by him/her (see supplement of 16 Jan 2011). In point 1) of his/her review, the issue of potential non-ash components is raised, and part of point 4) is the mono-modality.

Even if such condition were satisfied, the authors should made clear in the paper the conversion factor they derive is specific to the state of the plume they observed, i.e., it cannot be generalized.

We agree that the conversion factor is specific for the observed plume. We reformulate some parts of the summary and conclusions.

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