

Interactive comment on “Eyjafjallajökull volcano plume particle-type characterization from space-based multi-angle imaging” by R. A. Kahn and J. Limbacher

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Review of “Eyjafjallajökull volcano plume particle-type characterization from space-based multi-angle imaging” by R. Kahn and J. Limbacher

Recommendation: This paper presents a careful analysis of the optical and microphysical properties of volcanic aerosols particles following the eruption of the Eyjafjallajökull volcano in Iceland in Spring 2010, using a research algorithm applied to Terra/MISR multiangle and multispectral observations. It nicely characterizes the plume evolution, distribution of spherical and non-spherical particles, absorption properties, and size characteristics. The text is quite clear and much improvement in the

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presentation would be accomplished by attention to improving the figures, scales, and labels. I recommend this paper be accepted for publication with only minor editorial changes, especially with regard to figure quality suitable for publication.

General Comments:

1. This important paper is generally well written and easy to follow, but confusion easily arises when referring to the figures (and tables), that could be improved for publication.

Major Comments:

1. Page 14, lines 17-18 – this sentence refers to Figure 1 and ‘the sharp edge along the western side of the ash plume for about the first 100 km from the source’. Figure 1 contains no scale at all. In fact, each panel in Fig. 1 is a different size, and having a scale (and compass orientation) on each subpanel, analogous to what is commonly done in the Earth Observatory web site, would be of great value. In addition, the map inserts in Fig. 1a, b, and c, are incomplete and somewhat misleading. For example, in Fig. 1a, the insert shows one block, but the image is not along the block, but appears to be oriented with North vertically in the frame and containing 3 blocks, and showing the edge of the image (in black at edge)! Fig. 1b also consists of 3 blocks, but is not the entire width of the image (and doesn’t have the black edge of scan part of the image). Fig. 1c is in fact one block, but oriented with North at the top, and the west edge of scan is shown but not the right edge of scan. Hence this is likely not the entire ~400 km width (hence the need for a scale). Fig. 1d doesn’t appear to be part of one block, but is not the full 400 km width. Finally, if each figure is labeled above the figure (i.e., ‘a) 7 May 2010’, etc.), and the a, b, c, and d removed from the graphics themselves, this figure might look cleaner.

2. Figure 4 – must improvement could be accomplished in this important figure by doing the following:

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- Delete '250 km' from the figure, as this seems to refer to the distance downwind of the Eyjafjallajökull volcano and is not necessary for the figure (though it could be in the caption).
- Label each subframe, such as
 - a) General aerosol components
 - b) Aerosol component-optical models
 - c) Aerosol optical depth (558 nm)
 - d) Ångström exponent (447-867 nm)
 - e) Shape
 - f) Effective radius (μm)
 - f) Single scattering albedo (? nm)
- The color bars for each panel should be on the right hand side of the panels. The first one for r doesn't make sense, as I think this is supposed to be the color bar for panel c) and should be in units of optical depth.
- The color bar for effective radius doesn't make sense. Colors for '20.00=1.5' etc. are confusing. I presume the color bar is actually the $20.0 \mu\text{m}$, and the 1.5 represents the % of that effective radius, shown in the pie chart. I don't think it necessary to show the percentages numerically.
- The color bar in the lower left hand part of the figure no doubt refers to panel b) and again shows the percentages of various aerosol models ('=1.5'). These percentages should be deleted. Finally, the name of the models are computer generated (e.g., 'sph_nonabs_0.57'). These models should not have the underscore of computer generation.

Minor Comments:

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1. Title page – Change the affiliation of the authors from 'Laboratory for Atmospheres' to a more appropriate current affiliation (such as Earth Science Division).
2. Page 7, line 7 – Here and in many places, reference is made to the single scattering albedo (SSA), but the wavelength to which the SSA applies is not provided. Since SSA is wavelength dependent, this should be specified here and in the figure captions.
3. Page 10, lines 25-27 – The last sentence of this paragraph refers to a near-source plume vertical-extent characterization that is presented in more detail in a paper by Garay et al. [2012]. Consider eliminating this reference altogether, or alternatively, provide a complete reference (authors, journal being prepared for, etc.). Since this paper hasn't been submitted, it might be inappropriate to mention it at all here.
4. Page 11, line 19 – this is the first mention of the wavelength for the SSA, and it states 'lower mid-visible SSA'. This should be clarified.
5. Page 12, lines 25-26 – reference is made to Fig. 3f, h, and j, but there is no Fig. 3j. Please check which subpanels are being referred here.
6. Page 14, line 25 – the sentence 'Figure 5 provides an overview of the Research Retrievals...' should say 'for a subset of Fig. 1b' or some such. These images are not for the entire 3 blocks shown in Fig. 1b.
7. Page 16, line 3 – change '40 + 100 μm ' to '40-100 μm '.
8. Page 17, line 2 – change 'about 0.1 μm and 2.5 μm ...' to 'between 0.1 and 2.5 μm '. I presume you are referring to radius, not diameter, of the particles, though this is also not stated.
9. Page 19, line 6 – you should probably state that Cabauw is in the Netherlands. Furthermore, Fig. 6 is a subset of the real estate shown in Fig. 1c, and again a scale would be useful. The red arrow in Fig. 1c is presumably the area you analyzed in Fig. 6, but this arrow is not defined. These figures could be improved without much difficulty.

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10. Page 20, line 16 – reference is made to ‘considerably more cloud cover of the land (Fig. 6)’ but the figure does NOT show the land water boundary so it is not possible to easily follow what area is being discussed.
11. Page 21, line 16 – change ‘non-spherical over the remnant’ to ‘non-spherical particles over the remnant’.
12. Fig. 3 caption – the figure caption refers to AOD and ANG. Perhaps ‘aerosol optical depth (AOD)’ and ‘Ångström exponent (ANG)’ should be defined.
13. Page 33, Table 3 footnotes – change ‘40 + 100 μm ’ to ‘40-100 μm ’. Also change ‘Large ($L > 0.70 \mu\text{m}$)’ to ‘Large ($L; > 0.70 \mu\text{m}$)’.
14. Figure 3 – for the image of SSA (Fig. 3d), the wavelength should be stated.
15. Figure 5 – Fig. 5d list P1 – P5 and P7, but P7 should probably be P6, which is discussed in text.
16. Figure 7 – since these panels are subframes of Fig. 1d, the scale should be included in one of these subpanels.

Interactive comment on *Atmos. Chem. Phys. Discuss.*, 12, 17943, 2012.

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