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Biogeosciences Discussions

Interactive comment on "Monitoring presence and streaming patterns of Icelandic volcanic ash during its arrival to Slovenia" *by* F. Gao et al.

Anonymous Referee #2

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After the Icelandic volcanic eruption of April 2010, more and more research and papers come out, which is very good for our understanding of its impact on envirnment, economy, climate and so on. The paper presents several measurements, based on in-situ sensors, lidar, airborne in-situ sensors and model simulations, to monitor the presence and steaming patterns of Icelandic volcanic ash to Slovenia. The multisensor way is very important and good for this aim. With those kinds of measurements, the arrival time of the ash should be given carefully since each sensor has its own limitations, locations and positions. Morever, satellite images and Time-Height Indications of lidar range corrected signals are also necessary. Detailed comments are listed here:

Abstract-

-Row 7-8 of P3864: "The initial arrival of volcanic ash to Slovenia was detected at

ground level using in-situ measurements during the night of 17 April 2010". Please clarify what kind of measurements to prove this. If PM10 and SO2 were used, Fig. 2 shows a peak of concentration on 16 April. If anions of F- was used, Fig.3 shows it arrived on 17 April. There was no precipitation on 16 April, if there were, F- would apear or not?

2 Synoptic situation over Europe after the eruption-

-Row 13-15 of P3866: Satellite images show the volcanic ash reached during the night of 17 April. Row 23-24 of P3876 (6 Discussions and conclusions) says "The second arrival of volcanic ash, which could not be predicted from satellite images due to lower ash concentrations and lower streaming altitudes". That means satellite images may "miss" the first arrival since it may be "invisible" for satellite. (see the above comments on Abstract). Authors should check the satellite images, PM10 and SO2 data, anions in precipitation and model simulations again. The precise time of the first ash arrival should be pointed out with the hour detail, which may be different for various measurements and sites.

3.1 Ground based measurements-

-Row 13 of P3867: Since some large particles exist (as authors said in the row 1 of P3875 and showed in Fig.10), TSP (Total Suspended Particles) or TPM as did by airborne measurements, if available, seems more appropriate.

-Row 20-23 of P3867: Detailed information of the instrument positions and situations should be explained, since it may affect the measurement.

-Row 7 of P3868: How about the results in Nova Gorica?

-Row 18 of P3868: SO4- should be SO42-. Please correct others in manuscript and those in Fig.3.

3.2 Lidar-Based remote sensing-

-Row 18 of P3869: Time-Height Indications of the lidar range corrected signal may give more details of the presence and variations of the ash layers.

-Row 25 of P3869: More details for calculation by Klett method: reference altitude, reference value, molecular effects...

-Row 5 and 16 of P3871: Since the complete overlap range is >1000m, any quantitative value in the "part-blind" aera should be careful, if without any correction.

-Row 27 of P3871 to Row 3 of P3872: the dependency of the aerosol optical thickness, or aerosol extinction coefficient on wavelength, usually refered to Angström exponent, is inversely related to the average size of the particles in the aerosol. Here the Angström exponent is almost -1?

- Fig.4: There are position shifts between the profile data and it's successive mark, i.e. curve 4 marked with "(e)" instead of "(d)", curve 5 marked with "(f)" etc.

3.3 Airborne Measurements-

-Row 17-18 of P3872: "Every 300m of altitude, a new adhesive tape was exposed for the next 90m to a direct, unfiltered stream of air." This means sampling of 90m for every 300m of altitude, then 210m sampling gap? Please give more details about the adhesive tape and sampling.

-Row 4 of P3873: here "1.0 micrometer" means "profiles of 1.0 micrometer", (c) of Fig.8? Please clarify.

4 Identification of ash particles-

-Row 25-28 of P3874: It seems the adhesive tape can give or measure the particle density profile as the laser particle counter did at the aircraft. How about the concentration profiles from the tape, with similar results shown in Fig.8 and Fig.9? For the title of Fig.9, please make it clear with "from the laser particle counter" instead of "from the airborne measuements".

-Row 15-18 of P3874: I was puzzled by the Table 3 and Fig. 11. There are "Mn" peaks (blue and red line) in Fig.11 but no "MnO" observed. Those peaks stand for other elements, such as O, Fe? Or the measurement error of the X-ray sensor made it "disappear"?

5 Simulation of air flow trajectories-

- For clear discriptions, please use the precise timing instead of "night", "afternoon"....

6 Discussion and conclusions-

-More details of the precise timing for airborne mission should be given, Row 4 of P3872 isn't enough. I wonder when it started from Divaca, how long it took for the spirtal climb, when to Vrhnika...

-With the precise timing of the airborne measurement, linear regression shouldn't be done with the sumultaneous measurements between Divaca and Nova Gorica. I mean, the aerosols above Nova Gorica at 15:20 CET are definitely not the same above Divaca at 15:20 CET. They were different aerosols even they might be from the same valcanic ash. The wind speeds, directions should be considered, then we may know when the aerosol above Nova Gorica was blowed to Divaca (or inverse). Ok, maybe this is too ideal.

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