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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Airborne observations of the Eyjafjalla volcano ash cloud over Europe during air space closure in April and May 2010" *by* U. Schumann et al.

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The comment raises some issues to which we respond as follows:

Issue: A tephra/SO2 eruption mass ratio of 4/1:

Response: This ratio is a direct consequence of the ratio of mass concentrations of ash and SO2 in the plume.

Issue: The cut-off of the instruments and isokinetic sampling method:

Response: The reported mass concentrations do not suffer from this cut-off. As reported in detail in the paper, we measured the particle concentration of particles in the

size range of 0.3 to 30 um with the FSSP at the wing station, i.e. without inlets. Our 2D-C probe would have detected even large particles if present. Only for the aerosol particles smaller than about 2 um we use instruments which sample air via an isokinetic inlet. In fact, it is a point of our paper that sampling aerosol via inlets is not suited for the larger ash particles, which carry a larger fraction of the aerosol mass.

Issue: “the aircraft stays only for few minutes in the plume”.

Response: This is true for the flight near the volcano on May 2, but not true for other cases (e.g. one hour of measurements on May 17). The limitation near the volcano was clearly stated in the paper. We simply could not risk the aircraft. A slow flying light aircraft may have some advantages at low altitudes, if the pilot carries the risk to fly into high concentration ash clouds. But such aircraft cannot sample ash in a vigorous ash plume reaching the upper troposphere. The inhomogeneity of the ash concentration in the plume is covered by the Lidar observations across the whole plume cross-section,

Issue: Results by the measurement team of Weber et al.

Response: We are aware of the study by Konradin Weber and his team. For May 18, his results support ours: His measurements of particle mass concentration with a small piston-motor driven aircraft showed inhomogeneous ash layers with concentrations between 100 and 200 μg/m3 at altitudes slightly above 2.5 km and increased SO2 column densities over North-West Germany. We too found that most mass is in the range of particle sizes larger than 2.5 um

Issue: “We need to be better prepared the next time, with a number of light aircraft in many countries.”

Response: We agree that one light aircraft will not be sufficient. In order to reach a sufficiently complete picture, several observation methods are needed, including ground based Radar near the Volcano, several aircraft for low and high altitudes with short and large ranges, satellite observations, multispectral Lidar systems at ground stations,

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model predictions, and quick data exchange. Moreover, besides in-situ instruments, Lidar instruments on board the aircraft are needed as path finder when the plume is not clearly visible and for survey of plume cross-sections containing high and variable ash concentrations.

Interactive comment on Atmos. Chem. Phys. Discuss., 10, 22131, 2010.