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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This is a highly interesting paper. The Falcon aircraft used in the observations is a dreamboat of instrumental sophistication, loaded with instruments whose technology is beyond comprehension for any single man.

The problem under investigations is one of the most acute and costly crisis that the aviation industry has been put up too, total economic losses mounting to $ 5 billion on the two sides of the Atlantic. This was mainly due to the inexperience of the London VAAC that did not have the necessary input data and overestimated the danger area infested by hazardous volcanic ash. A thorough assessment of the ash load in the Eyjafjallajökull plume is therefore of the utmost interest and perhaps the single event that the world can learn most from.

But the results reported are a little disappointing. The most interesting variable, the volcanic ash transport is reported 40 TG ash and 10 TG $SO_2$ during the whole period. A tephra/$SO_2$ eruption mass ratio of 4/1 is out of the question for a volcano so this needs more explanation. The most likely one is that the ash observations suffer from the cut-off in one of the instruments at PM_2.5 and the subsequent modelling done to straiten this up has gone astray somewhere. They use the isokinetic sampling method, but the aircraft is really flying too fast for that, it would have been better to use a slip stream from the planes ventilation system at a velocity 5 – 10 m/s and sample from that.

It is also a weakness that the aircraft stays only for few minutes in the plume. The Falcon has the same Achilles heal as the jetliners when it comes to observing volcanic ash clouds, the ash damages the motors. A slow flying ( about 100 knots) light aircraft is much better for this task than an executive jet. They can criss-cross a plume without motor damage and one can operate 10 – 20 of them in the air for the cost of one Falcon.

A cross-wind measurement plan is really needed here. According to data brought in by light aircraft, 40 – 60 points are needed inside a plume in order to cope with the heavy scatter in the concentration values and grainsize distribution inside an ash cloud. Results by the measurement team of University of Düsseldorf[1] show that aged clouds over Germany contained PM_10 and PM_2.5 in the ratio 4/1 so PM_2.5 observations shows only 25 % of the ash load. Moreover, the scatter is so great that filtering is needed to produce reliable values for dispersion models.

We still need to find the right way to wrestle the secrets out of the Icelandic volcanoes. We need to be better prepared the next time, with a number of light aircraft in many countries that can get us the data we need to avoid a new crisis.

[1] WEBER, Konradin *et al*; Airborne Measurements of the Eyjafjallajökull volcanic ash plume over North-Western Germany with a light aircraft and an optical particle counter –first results. University of Applied Sciences Düsseldorf, Germany, Proceedings of the International Conference on Lidar Technologies, Techniques, and Measurements for Atmospheric Remote Sensing 20-23 September 2010, Toulouse, France