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Airborne and groundbased measurements of ash particles on Iceland and over Germany during the Grímsvötn eruption May 2011

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The eruption of the Grimsvötn volcano in May 2010 posed with its ash plume a thread to the aviation in northern Europe. Because of ash plume forecasts of the VAAC London the airport of Keflavik in Iceland as well as airports in England, Scotland and Scandinavia were closed for some time, which caused the cancellation or change of about 500 flights in Europe. Even in Germany the airports of Bremen, Hamburg and Berlin were closed for several hours on 25 May 2011.
During this eruption period in May 2011, a team of the Duesseldorf University of Applied Sciences, the University of Iceland, the University of Reykjavik and the IMO has performed airborne in-situ measurements over Iceland and Germany as well as ground based measurements in the south of Iceland. The ground based measurements were performed continuously during the whole eruption period at two significant positions (Skogar and Hvollsvöllur) with optical particle counters (OPCs). The measurement method was based on measuring the airborne concentrations of the classic aerosol components (PM10, PM2.5 and PM1) and TSP (total suspended particles) every 6 seconds.
Additional measurement flights on Iceland were started already one day after the beginning of the eruption (twelve in-situ measurement flights) and marked the spatial and temporal spread of volcanic ash in the atmosphere. For the flights light slow flying piston engine powered airplanes where used.
The flights over Iceland focused on the western part of Iceland in the region of Reykjavik and Keflavik and over the international airport in Keflavik and were mostly coordinated by ISAVIA. The measurement flights helped to keep Keflavik International Airport open for many additional hours despite of adverse predictions by the London VAAC model, because it was possible to observe the particle concentration on-line during the flights.
In Germany a measurement flight was performed on 25 May 2012 over the northern part of Germany where the volcanic ash cloud was forecasted from the dispersion model of the London VAAC. This flight was performed on the behalf of the German Weather Service (DWD).
The measurement flights revealed most time relative low airborne ash concentrations over western Iceland, although the groundbased measured ash concentrations in the south of Iceland nearer to the Grimsvötn were very high.
In Germany the measured concentrations during the flight were low enough to be consistent with the re-opening of the airports Bremen, Hamburg and Berlin, which were closed by the authorities for several hours on 25 May 2011 because of high concentration predictions by the VAAC-model.
The measurement flights clearly proved that OPCs, based on slow flying piston-motor driven aircrafts, are very suitable for the determination of airborne ash particles during volcanic eruptions. This is an important issue for air traffic safety.