



A comparison of DOAS observations by the CARIBIC aircraft and the GOME-2 satellite of the 2008 Kasatochi volcanic SO₂ plume

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The 2008 Kasatochi volcanic eruption emitted $\approx 1.5 - 2.5$ Tg SO₂ into the upper troposphere and lower stratosphere. Parts of the main volcanic plume (gases and particles) reached central Europe a week after the eruption and were detected there by the CARIBIC (Civil Aircraft for Regular investigation of the Atmosphere based on an Instrument Container) flying observatory. A detailed study on the CARIBIC observation of the plume will be given, focusing in the aerosol concentration and composition but mainly on the DOAS observation of the SO₂ column densities.

The plume was also observed by the GOME-2 satellite instrument, only a few hours after the CARIBIC aircraft had crossed the plume, thus giving a unique opportunity to compare results. Trajectory models are applied to consider the advection, for better comparison of the results from these two observational systems. A comparison of the spatial pattern with the local observations of the wind speed and the trajectory models TRAJKS and HYSPLIT showed a slight discrepancy, which has to be considered for satellite validation. The online measured wind speed and wind direction agreed quite well with the model data, and therefore also led to the same discrepancy as the models. Hence, it appears that detailed analyses of wind speeds are required.

Emitted and secondary particles, partly measured and sampled by the CARIBIC in situ instruments, affected the DOAS SO₂ measurements, of both CARIBIC and GOME-2. Moreover the plume was situated above a cloud by which the observed radiation and the column densities were strongly affected. Overall GOME-2 and the CARIBIC SO₂ measurements agree very well. The major uncertainties remain the actual wind speed needed to properly correct the advection of the plume between the different overpass times, and to smaller degree the effect of clouds and aerosol.