



Ground-based and airborne in-situ measurements of the Eyjafjallajökull volcanic aerosol plume in Switzerland in April and May 2010

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The volcanic aerosol plume resulting from the Eyjafjallajökull eruption in Iceland in April and May 2010 was clearly detected over Switzerland during two time periods (April 17-19, 2010 and May 16-19, 2010). In-situ measurements of the airborne volcanic plume were performed both within ground-based monitoring networks and with a research aircraft up to an altitude of 6000 m asl. The wide range of aerosol and gas phase measurements performed at the High Altitude Research Station Jungfraujoch (3580 m asl) allowed for an in-depth characterization of the detected volcanic aerosol. Both the measurements at Jungfraujoch and the aircraft in-situ measurements showed a consistent volcanic ash mode in the aerosol volume distribution with a mean optical diameter around $3 \pm 0.3 \mu\text{m}$. These particles were found to have a chemical composition similar to rock samples collected near the volcano, and they showed both crystalline and glass-like structures. Beside the ash particles the volcanic aerosol also strongly contributed to the accumulation mode of the observed volume size distributions. The chemical composition of the volcano related accumulation mode particles was dominated by ammonium and sulfate. The combination of the in-situ data and plume dispersion modeling results showed that a significant portion of the first volcanic aerosol plume reaching Switzerland on April 17 2010 did not reach Jungfraujoch directly, but was first dispersed and diluted in the planetary boundary layer. Maximal PM₁₀ mass concentrations at Jungfraujoch reached $30 \mu\text{g m}^{-3}$ and $70 \mu\text{g m}^{-3}$ during the April and May episode, respectively. Other low altitude monitoring stations registered up to $45 \mu\text{g m}^{-3}$ of volcanic ash related PM₁₀ (Basel, April 18/19 2010). The flights with the research aircraft on April 17 2010 showed number concentrations of one order of magnitude higher over the northern Swiss plateau compared to Jungfraujoch, and a mass concentration of $320 (200-520) \mu\text{g m}^{-3}$ on May 18 2010 over the northwestern Swiss plateau.