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

JournalArticle (Originalarbeit in einer wissenschaftlichen Zeitschrift)

ID 4519789
Author(s) Bukowiecki, N.; Zieger, P.; Weingartner, E.; Juranyi, Z.; Gysel, M.; Neininger, B.; Schneider, B.; Hueglin, C.; Ulrich, A.; Wichser, A.; Henne, S.; Brunner, D.; Kaegi, R.; Schwikowski, M.; Tobler, L.; Wienhold, F. G.; Engel, I.; Buchmann, B.; Peter, T.; Baltensperger, U.
Author(s) at UniBasel Bukowiecki, Nicolas ;
Year 2011
Title Ground-based and airborne in-situ measurements of the Eyjafjallajökull volcanic aerosol plume in Switzerland in spring 2010
Journal Atmospheric Chemistry and Physics
Volume 11
Number 19
Pages / **Article-Number** 10011-10030
Mesh terms Science & TechnologyLife Sciences & BiomedicinePhysical SciencesEnvironmental SciencesMeteorology & Atmospheric SciencesEnvironmental Sciences & EcologyMeteorology & Atmospheric Sciences
The volcanic aerosol plume resulting from the Eyjafjallajokull eruption in Iceland in April and May 2010 was detected in clear layers above Switzerland during two periods (17-19 April 2010 and 16-19 May 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 ma.s.l. The wide range of aerosol and gas phase parameters studied at the high altitude research station Jungfraujoch (3580 ma.s.l.) allowed for an in-depth characterization of the detected volcanic aerosol. Both the data from the Jungfraujoch and the aircraft vertical profiles showed a consistent volcanic ash mode in the aerosol volume size distribution with a mean optical diameter around 3 +/- 0.3 mu m. These particles were found to have an average chemical composition very similar to the trachyandesite-like composition of rock samples collected near the volcano. Furthermore, chemical processing of volcanic sulfur dioxide into sulfate clearly contributed to the accumulation mode of the aerosol at the Jungfraujoch. The combination of these in-situ data and plume dispersion modeling results showed that a significant portion of the first volcanic aerosol plume reaching Switzerland on 17 April 2010 did not reach the Jungfraujoch directly, but was first dispersed and diluted in the planetary boundary layer. The maximum PM10 mass concentrations at the Jungfraujoch reached 30 mu g m(-3) and 70 mu g m(-3) (for 10-min mean values) during the April and May episode, respectively. Even low-altitude monitoring stations registered up to 45 mu g m(-3) of volcanic ash related PM10 (Basel, Northwestern Switzerland, 18/19 April 2010). The flights with the research aircraft on 17 April 2010 showed one order of magnitude higher number concentrations over the northern Swiss plateau compared to the Jungfraujoch, and a mass concentration of 320 (200-520) mu g m(-3) on 18 May 2010 over the northwestern Swiss plateau. The presented data significantly contributed to the time-critical assessment of the local ash layer properties during the initial eruption phase. Furthermore, dispersion models benefited from the detailed information on the volcanic aerosol size distribution and its chemical composition.
Publisher European Geosciences Union
ISSN/ISBN 1680-7316 ; 1680-7324
edoc-URL https://edoc.unibas.ch/74010/

Full Text on edoc No;
Digital Object Identifier DOI 10.5194/acp-11-10011-2011
ISI-Number 000296357300001
Document type (ISI) Article