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The influence of the direct- and semi-direct effect on the weather conditions in Europe caused by the volcanic ash plume of the Eyjafjallajökull eruption during April and May 2010 with WRF-Chem

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Volcanic eruptions, with gas and/or particle emissions, directly influence our environment, with special significance when they either occur near inhabited regions or are transported towards them. In addition to the well-known impact of air traffic, with large economic costs, the ground touching plumes can directly contaminate soil and water and lead to a decrease of air quality. Aerosols are also known to have an impact on weather and climate via their direct effect on radiation and via their impact on cloud formation. These feedbacks between atmospheric aerosol particles and meteorological processes were known for quite some time and have been implemented into several regional models.
This study reveals first results obtained with the on-line coupled meteorological and chemical transport model WRF-Chem which is used to simulate the dispersion of the volcanic ash plume caused by the Eyjafjallajökull eruption in 2010. The main emphasis is to determine the influence of feedback processes caused by aerosol-meteorology interactions which can be simulated with WRF-Chem. The model is used with different set-ups (e.g. direct-effect turned off/on) to quantify the influence of the ash plume on the meteorological conditions during the main episode from April until end of May 2010.
This contribution focuses on the investigation/quantification of the direct- and semi-direct effects of the ash plume. The simulated changes caused by the presence of the ash cloud on radiation and other atmospheric parameters such as temperature and wind are presented. A comprehensive observation data set from in-situ and remote sensing instruments is used to evaluate the model simulations.