Geophysical Research Abstracts
Vol. 13, EGU2011-3496, 2011
EGU General Assembly 2011

Ash particles and ice clouds during the Eyjafjalla eruption: Lidar observations and model simulations

Christian Rolf, Martina Krämer, and Cornelius Schiller
Institute for Energy and Climate research 7, Forschungszentrum Jülich, 52425 Jülich, Germany (c.rolf@fz-juelich.de)

The volcano Eyjafjalla in Island ejected a large ash cloud during its eruptions in April 2010. The cloud spreads out over central Europe in a period of 6 days and disrupted the air traffic. Few days after the first eruptions, we detected the ash cloud with a backscatter lidar over western Germany, Jülich (50° 54' north, 6° 24' east).

The lidar, called CORAL (Cloud ObseRvation with Atmospheric Lidar), measures optical properties (i.e. backscatter signals / extinction coefficient) and depolarization of aerosol particles at a wavelength of 355 nm in a high vertical resolution of 15 m. In the depolarization channel we can discriminate between cirrus clouds and aerosol particles. Cirrus clouds mostly create a high signal in the depolarization because of the ice crystal's asphericity. The ash cloud particles create a smaller depolarization similar to thin cirrus clouds with very small ice crystals.

Periods with or without volcanic ash occurred in dependence on the dynamical situation. During some periods, our measurements show a increased depolarization signal in a height above 7 km. In this case volcanic ash, ice particles or a mixture of both could be the reason. First we investigate the origin of the observed airmass by calculating ECMWF backward trajectories. With our detailed microphysical box model MAID we simulate the ice formation along these trajectories. Here, we investigate three different types of observations during the volcanic ash period: Pure volcanic ash, cirrus modified by volcanic ash and natural cirrus cloud.

In case of very thin cirrus with small ice crystals the depolarization signal is similar to pure volcanic ash. Particularly if volcanic ash serve as ice nuclei (IN) in a high concentration cirrus clouds become very small ice crystals. With the combination of lidar measurement and simulation of ice formation it is possible to distinguish pure volcanic ash and thin cirrus clouds induced by ash. The distinction between both cases is very important. The thin cirrus create a high lidar signal with low depolarization, which can be misinterpreted as high pure volcanic ash concentration.