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Forecasting the weather
- ensemble techniques
in probabilistic weather prediction

Quasi-operational modeling of the Eyjafjallajökull volcanic ash episode with COSMO-ART at DWD

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Beginning shortly after the eruption of the Icelandic volcano Eyjafjallajökull simulations of the dispersion of the volcanic ash plume over Europe were performed at DWD. Modules of the COSMO-ART system, developed at the Karlsruhe Institute of Technology (KIT), had to be adapted for this task and were coupled online in a quasi-operational setup of the COSMO-EU. After a hindcast period of several days, daily 78 h forecasts starting at 00 and 12 UTC - as well as 48 h-forecasts runs starting at 06 and 18 UTC were produced.
The emission of volcanic ash was parameterized for six different monodisperse ash particle classes with diameters in the range from 1 to 30 μm. The source height and strength was adjusted to the observed situation every six hours.
The simulations take into account advective and parameterized convective transport, turbulent diffusion, sedimentation, deposition at the ground and washout due to precipitation.

The specifics and benefits of the quasi-operational setup will be presented. The time lagged ensemble allows the derivation of probability products. Furthermore sensitivity studies with regard to several dynamical and physical processes were performed and the results will also be shown. E.g. the change of the emission scenario with a constant emission profile to one with a more mushroom-like shape, the relevance of the washout process, sub-grid scale deep convetion, and the vertical resolution will be quantified.

While the model simulates the relative number concentrations of the different particle classes, one is interested in a more quantitative measure. Therefore we derived scaling factors by taking into account actual measurements of particle size distributions and number concentrations, which then allows us to calculate mass concentrations of volcanic ash.