



## **Online-coupled modeling of volcanic ash dispersion with COSMO-ART and ICON-ART at DWD**

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Since the eruption of the Icelandic volcano Eyjafjallajökull in April 2010 and its huge implications for civil aviation, the German Weather Service (DWD) and the Karlsruhe Institute of Technology (KIT) formed a close collaboration to establish and further develop an operational forecasting system for volcanic ash dispersion at DWD.

COSMO-ART and ICON-ART realize the online coupling of the current operational limited area model COSMO respectively the next generation pre-operational global non-hydrostatic model ICON with the ART modules (“aerosols and reactive trace gases”) developed at KIT.

The actual source strength, the vertical profile, and the particle size distributions of the emissions are crucial parameters for the simulations. We use the combination of a published empirical function and actual aircraft measurements to parameterize the emissions and recalibrate our model results. Thereby we are able to provide quantitative forecasts of mass concentrations of volcanic ash to the forecast scientists at DWD complementing as a secondary source of information the results from the VAACs.

Due to the online coupling the basic aerosol-processes are treated in a consistent way to the actual meteorological fields. The simulations take into account advective and parameterized convective transport, turbulent diffusion, sedimentation, deposition at the ground, and washout due to precipitation.

In the operational configuration we use six different monodisperse ash particle classes with diameters ranging from 1 to 30  $\mu\text{m}$ . For more complex scientific studies the complete ART system allows to investigate aerosol-cloud- and aerosol-radiation-interaction problems.

The operational framework with runs every six hours provides a time-lagged ensemble of forecasts for a specific date for which probabilistic products can be derived.

Results for the two volcanic ash events in April 2010 and Mai 2011 will be shown.

More specifically sensitivity tests, calibration of the model results, and their comparison with measurements will be addressed.

With the introduction of ICON at DWD in spring 2014 we aim at a global forecast of volcanic ash concentrations for major events. The main features of the new model system and implementation as well as coupling details will be given.