Karlsruhe Institute of Technology

Institute of Meteorology and Climate Research
Department Troposphere Research (IMK-TRO)

DWD

Simulation of Volcanic Ash Particle Transport and Aging after the Eyjafjallajökull Eruption in April 2010 with ICON-ART

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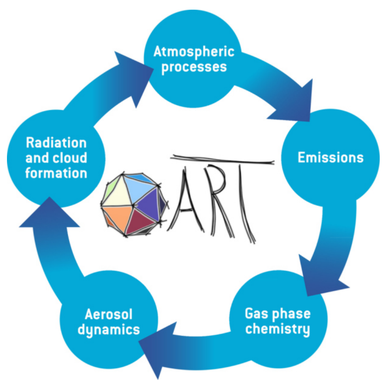
Motivation

- Calculating volcanic gas and particle concentrations in the atmosphere
- Estimating the impact of volcanic ash on flight routes
- Enhancing and improving ICON-ART by a comprehensive aerosol description

Model Framework



Aerosol and **R**eactive **T**race gases

- Developed at the Institute of Meteorology and Climate Research (IMK)

AEROsol **DYN**amics allows

- Formation of secondary particles
- Aging of aerosol particles

Volcanic Aerosols in ICON-ART

Ash

Emission parametrized by Mastin et al. (2009)

- Gaussian emission profile between surface and plume top
- Time resolved plume height
- Source strength parametrized by $E_{tot} = 3.295 \cdot h^{4.15}$

SO_2

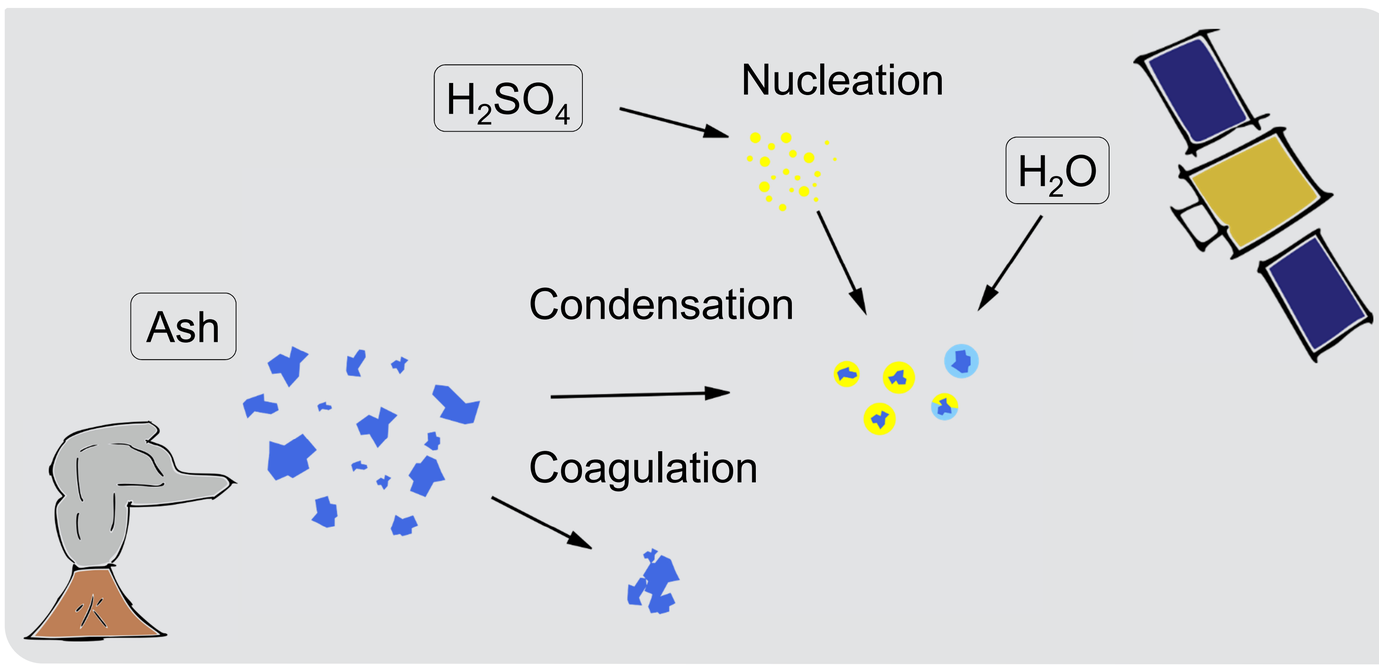
Emission following Schmidt et al. (2014)

- Constant emission profile between surface and plume top

Simplified OH chemistry

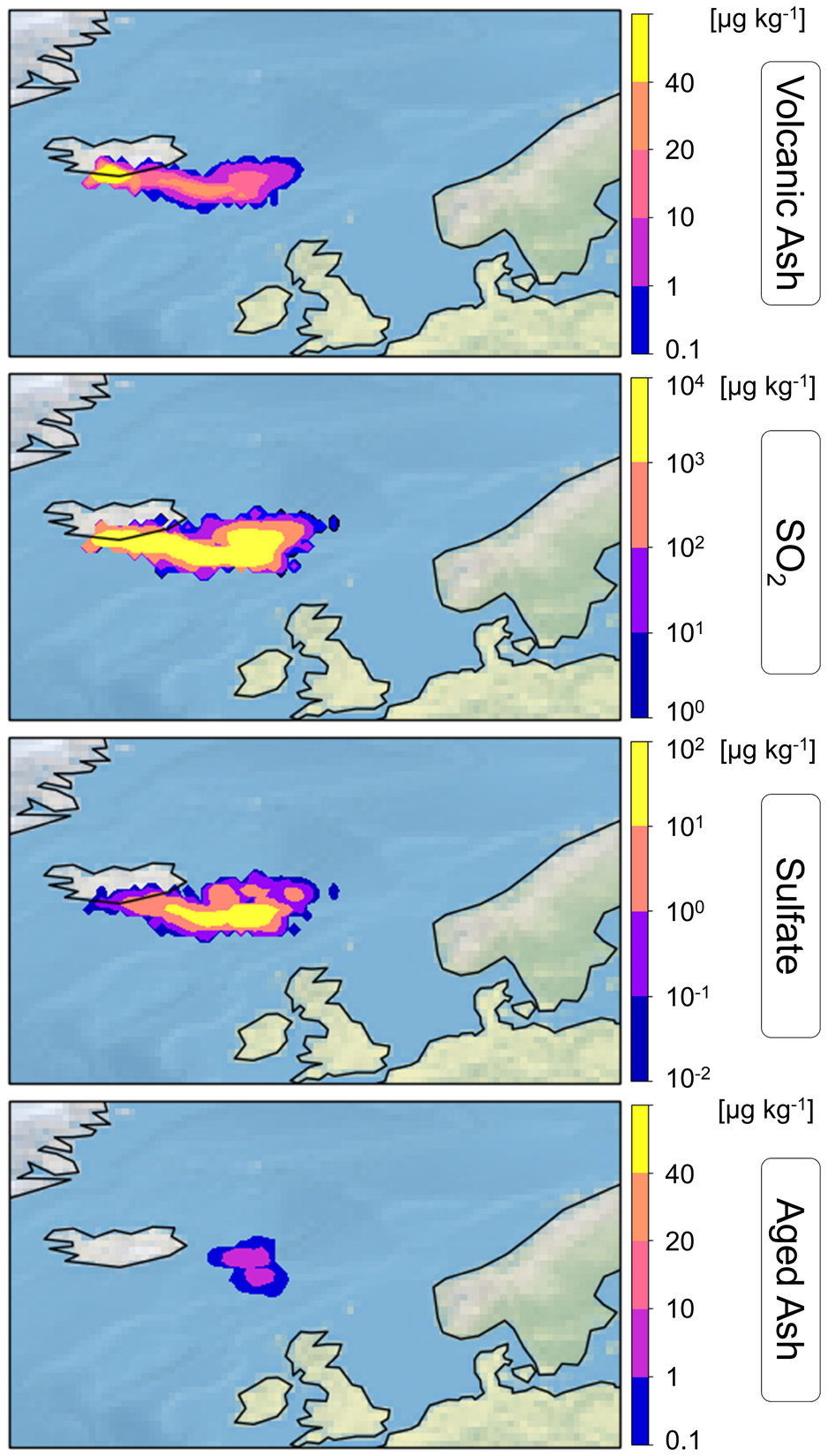
Sulfuric Acid (H_2SO_4)

AERODYN



Aged Ash and Sulfate Particles

2010-04-14 19:00 UTC



Outlook

- Parametrization of optical properties of anthropogenic and secondary aerosol particles
- Development and integration of observation operators for natural and anthropogenic aerosol

References

Mastin, L.G. et al., *A multidisciplinary effort to assign realistic source parameters to models of volcanic ash-cloud transport and dispersion during eruptions*, Journal of Volcanology and Geothermal Research, Volume 186, Issues 1–2, 2009

Schmidt, A., et al. (2014), *Assessing hazards to aviation from sulfur dioxide emitted by explosive Icelandic eruptions*, *J. Geophys. Res. Atmos.*, 119, 14,180–14,196

Weimer, M. et al., *An emission module for ICON-ART 2.0: implementation and simulations of acetone*, Geosci. Model Dev., 10, 2471-2494, 2017

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