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Simulation of the dispersion of the Eyjafjallajökull plume over Europe with the German operational weather forecast system

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After resting for 187 years the vulcano Eyjafjallajökull, Island wake up again at March 20th, 2010. Starting at April 14th massive emissions of volcanic ash occurred and finally lead to a shut down of civil aviation over entire Europe. We transferred the comprehensive online coupled model system COSMO-ART (Vogel et al., 2009) so far used for research purposes into the operational forecast mode at Deutscher Wetter-dienst (German Weather Service, DWD). COSMO-ART is the extension of the operational weather forecast model of DWD. Six individual size distributions were simulated starting from 1 [U+F06D]m up to 35 [U+F06D]m. Deposition, sedimentation, and below cloud scavenging were taken into account. Source heights were taken as published by the volcanic ash advisory centre London (VAAC), UK that is responsible for making the official forecast of ash coming from volcanoes in Island according to international agreements.
During the first days of the eruption volcanic ash was injected into the atmosphere up to 11 km. Therefore, it was transported rapidly at higher levels towards Europe. A comparison of the simulated ash-plume with the satellite pictures shows that the model captures the horizontal distribution of the ash-plume quite well. Even the volcanic ash that was located above a narrow band of clouds is nicely reproduced. The temporal development can be also compared to Lidar measurements at different sites. These comparisons will be also presented.
Our simulation results show the capability of an operational weather forecast model that is extended by aerosol processes to simulate the spatial and temporal distribution of volcanic ash qualitatively. As the source strength was not know and will not be known during future eruption events only a combination of ground based and satellite born remote sensing instruments together with in-situ observations and model results facilitates the work of decision makers during future events.

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