Online-coupled modeling of volcanic ash and SO_2 dispersion with WRF-Chem

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We included a volcanic emission and plume model into the Weather Research Forecast Model with inline Chemistry (WRF-Chem). The volcanic emission model with WRF-Chem has been tested and evaluated with historic eruptions, and the volcanic application was included into the official release of WRF-Chem beginning with WRF version 3.3 in 2011. Operational volcanic WRF-Chem runs have been developed using different domains centered on main volcanoes of the Aleutian chain and Popocatépetl Volcano, Mexico. The Global Forecast System (GFS) is used for the meteorological initialization of WRF-Chem, and default eruption source parameters serve as initial source data for the runs. We report on the model setup, and the advantages to treat the volcanic ash and sulphur dioxide emissions inline within the numerical weather prediction model. In addition we outline possibilities to initialize WRF-Chem with a fully automated algorithm to retrieve volcanic ash cloud properties from satellite data.

WRF-Chem runs from recent volcanic eruptions resulted in atmospheric ash loadings, which compared well with the satellite data taking into account that satellite retrieval data represent only a limited amount of the actually emitted source due to detection thresholds. In addition particle aggregative effects are not included in the WRF-Chem model to date.