Geophysical Research Abstracts
Vol. 20, EGU2018-7819, 2018
EGU General Assembly 2018

Modelling and data assimilation of hazardous volcanic ash plumes in the chemical-transport model MOCAGE

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Volcanic eruptions pose serious threats to aviation transport, as volcanic ash and sulfur compounds damage aircrafts, turbojet engines and may endanger passengers health. In the framework of the EUNADICS-AV project, our research deals with spatial and temporal improvements of volcanic aerosols and sulfur dioxide in the chemical-transport model MOCAGE, the operational air-quality and fast-response model of Météo-France. The main uncertainty source in volcanic ash prediction is still the emission term. To improve the estimation of the ejected mass and the ash vertical size distribution we introduce the plume rise model FPLUME in MOCAGE, which also takes into account the effects of meteorological conditions and of important physical processes like wet aggregation, air and particle entrainment, sedimentation, etc. An important attention is also given to the estimation of the initial size distribution at the vent. Assimilation of aerosol data and of sulfur dioxide satellite columns is also performed to provide 3D analyses of the hazardous compounds. The results are demonstrated on the case of the eruption of Grimsvotn, Iceland in 2011.