Geophysical Research Abstracts
Vol. 16, EGU2014-12834, 2014
EGU General Assembly 2014

On-line coupling of volcanic ash and aerosols transport with multiscale meteorological models

Alejandro Marti, Arnau Folch, and Oriol Jorba
Barcelona Supercomputing Center, Barcelona, Spain (alejandro.marti@bsc.es)

Large explosive volcanic eruptions can inject significant amounts of tephra and aerosols (e.g. SO_2) into the atmosphere inducing a multi-scale array of physical, chemical and biological feedbacks within the environment. Effective coupled Numerical Weather Prediction (NWP) models capable to forecast on-line the spatial and temporal distribution of volcanic ash and aerosols are necessary to assess the magnitude of these feedback effects. However, due to several limitations (users from different communities, operational constrains, computational power, etc.), tephra transport models and NWP models have evolved independently.

Within the framework of NEMOH(an Initial Training Network of the European Commission FP7 Program), we aim to quantify the feedback effects of volcanic ash clouds and aerosols emitted during large-magnitude eruptions on regional meteorology. As a first step, we have focused on the differences between the off-line hypothesis, currently assumed by tephra transport models (e.g. FALL3D), and the on-line approach, where transport and sedimentation of volcanic ash is coupled on-line to the NMMB (Non-hydrostatic Multiscale Meteorological model on a B grid) meteorological model; the evolution of the WRF-NMME meteorological model. We compared the spatiotemporal transport of volcanic ash particles simulated with the on-line coupled FALL3D-NMMB/BSC-CTM model with those from the off-line FALL3D model, by using the 2011 Cordón-Caulle eruption as a test-case and validating results against satellite data. Additionally, this presentation introduces the forthcoming steps to implement a sulfate aerosol module within the chemical transport module of the FALL3D-NMMB/BSC-CTM model, in order to quantify the feedback effects on the atmospheric radiative budget, particularly during large-magnitude explosive volcanic eruptions.

Keywords: volcanic ash, SO_2, FALL3D, NMMB, meteorology, on-line coupling, NEMOH.