Cities on Volcanoes 9
November 20-25, 2016
Puerto Varas, Chile
'Understanding volcanoes and society: the key for risk mitigation'

ATLAS: Atmospheric Lagrangian Dispersion Model to forecast volcanic ash transport and deposition

Reckziegel Florencia [1], Folch Arnau [2], Viramonte José [1]

[1]INENCO/GEONORTE, Univ. Nacional de Salta, CONICET, Salta, Argentina

[2]Barcelona Supercomputing Center (BSC), Barcelona, Spain

Keywords: Volcanic ash dispersion, trajectories, computational model, atmospheric Lagrangian dispersion, Advection-Diffusion-Sedimentation equation

Forecast of volcanic ash dispersal and deposition is essential for public safety. Regarding civil aviation, a crucial aspect is to predict timely the temporal evolution of volcanic clouds and to constrain particle mass concentration. We present ATLAS (ATmospheric LAgrangian diSpersion), a new Lagrangian model to calculate volcanic ash dispersal designed from scratch to be parallelized in general purpose and hybrid hardware architectures to minimize the model execution cost. The model solves the Advection-Diffusion-Sedimentation equation on multiple scales (global to regional) and can be driven by different meteorological models in combination. For example, on a large domain, data from the mesoscale Weather Research Forecast (WRF) model can be combined with data from the Global Forecast System (GFS) model so that ATLAS automatically switch to select the highest resolution data available at any given region. The model can be used both in forward mode to forecast ash dispersal form a volcano or a virtual (extended) source and in backwards trajectory mode to constrain unknown source characteristics. In forward mode, the source term can be derived from a buoyant plume theory model or initialized downwind from observations. In addition, the code has been designed to include, in a near future, the possibility of ensemble forecasts assimilating data from satellite retrievals to redefine the ensemble members on different assimilation cycles. A test case application for the 2015 Calbuco eruption is presented.