

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

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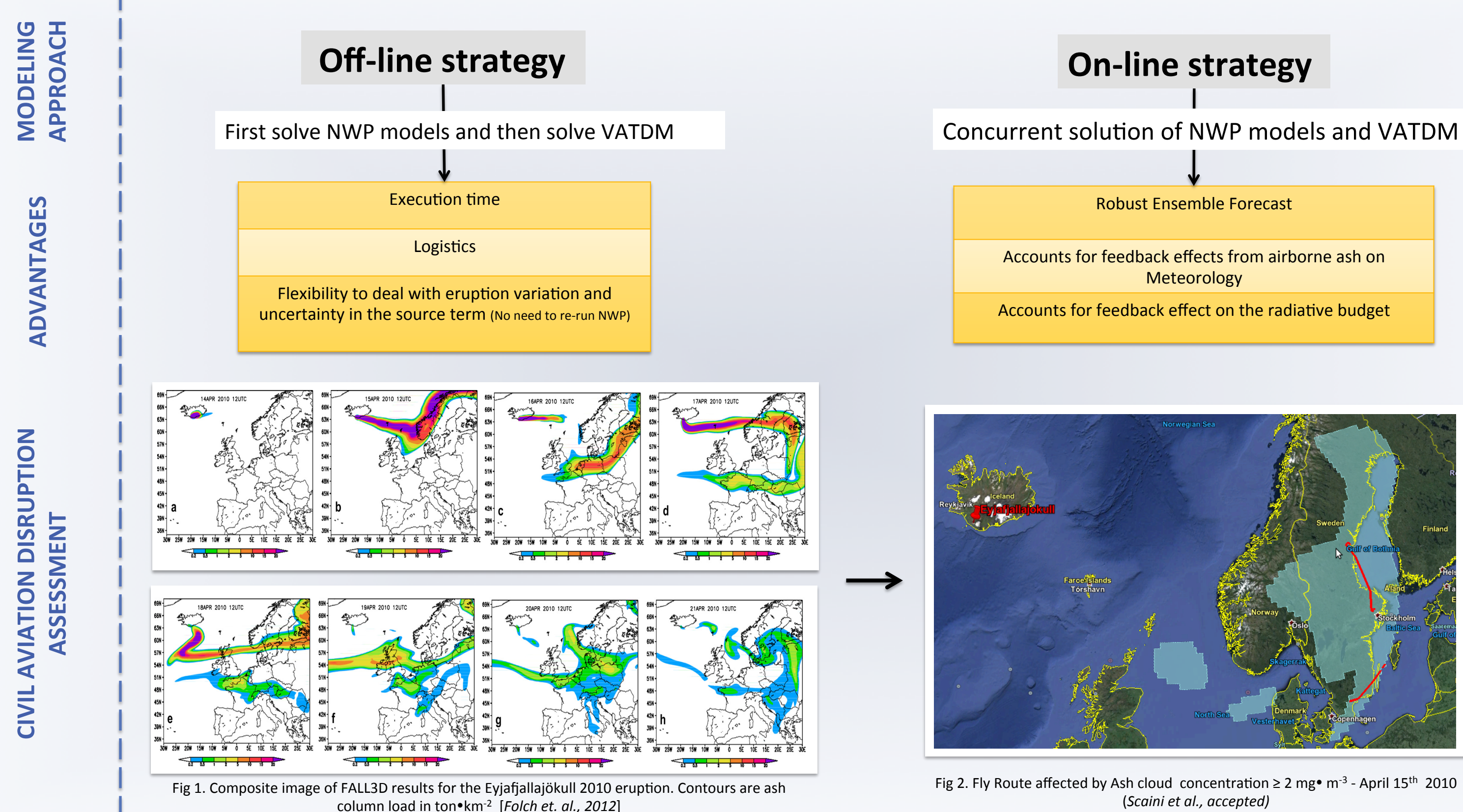
Barcelona Supercomputing Center – Centro Nacional de Supercomputación

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1. ABSTRACT

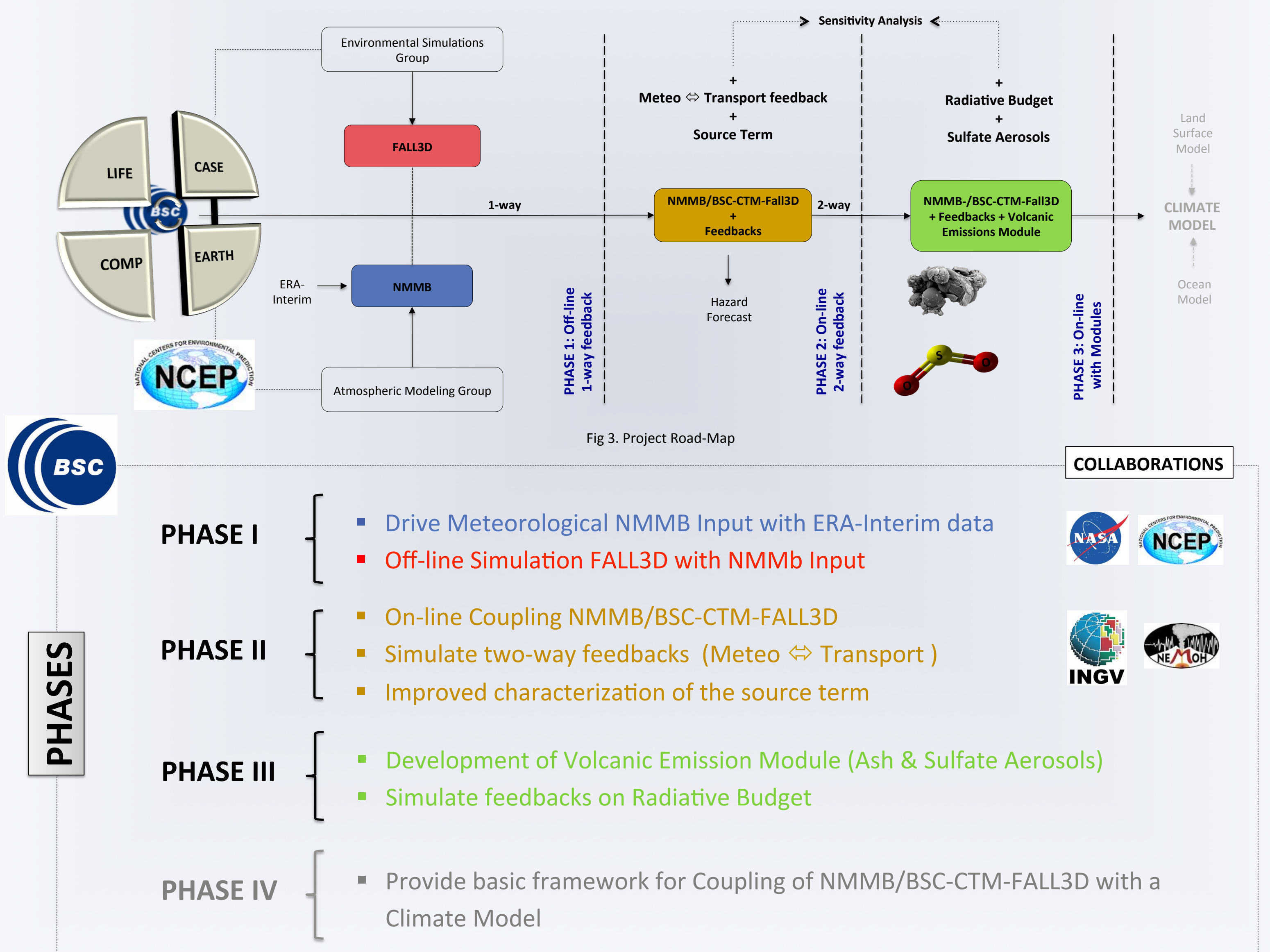
The BSC aims at developing the first on-line atmospheric model capable to simulate the feedback effects of volcanic ash clouds and aerosols emitted during large magnitude eruptions on meteorology at regional and global scales (NMMB/BSC-CTM-FALL3D). This research is sponsored by the NEMOH Network FP7 - An Initial Training Network under the European Community FP7 Program for the numerical, experimental and stochastic modeling of volcanic processes and hazards (<http://www.nemoh-itn.eu>).

2. BACKGROUND



3. DEVELOPMENT

This multidisciplinary project is a joint effort between the CASE and Earth Sciences Departments at the Barcelona Supercomputing Center along with other international collaborators. The project takes place over the course of a three years PHD program:



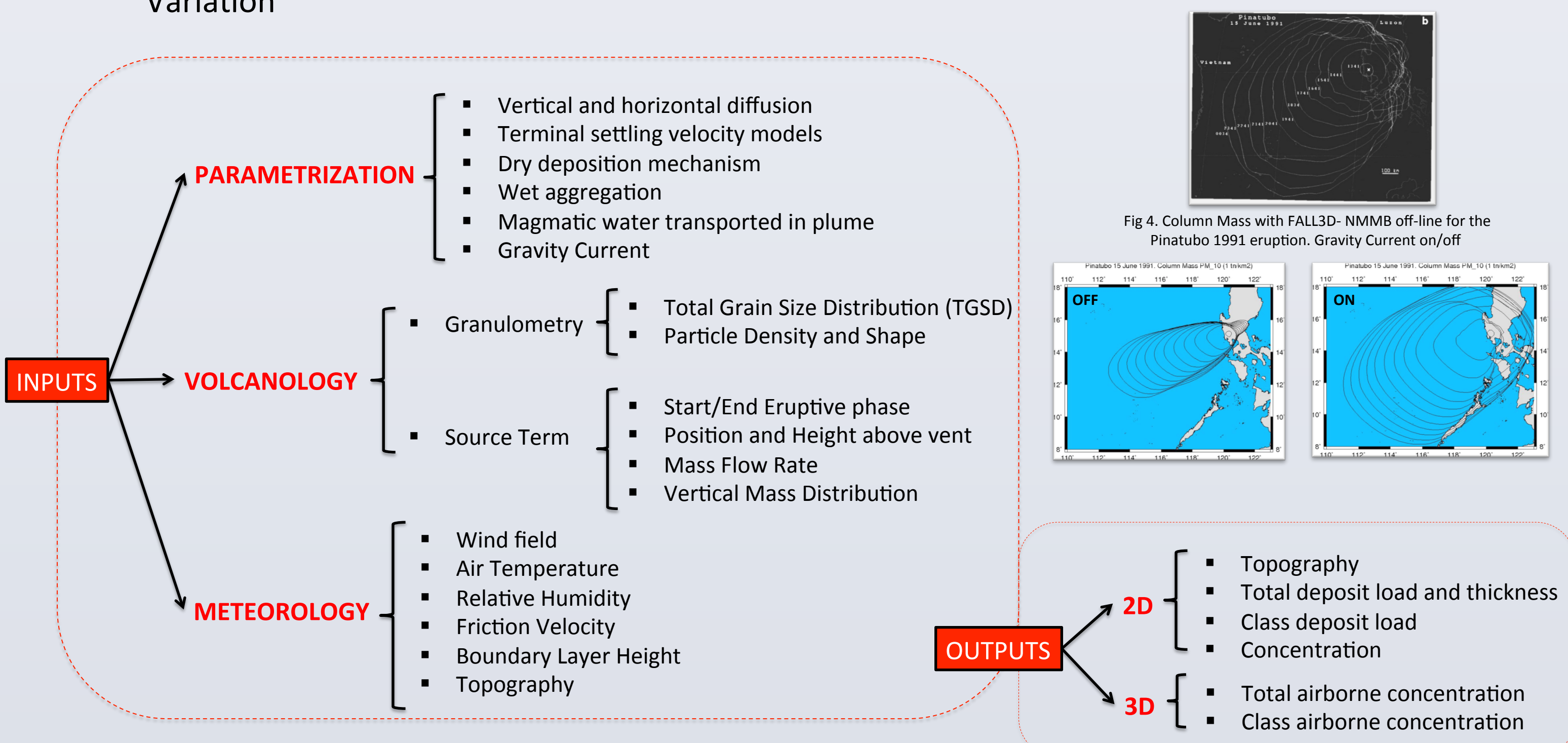
4. MODEL DESCRIPTION

FALL3D

[Costa et. al., 2006; Folch et. al., 2009]

- Off-line 3-D time-dependent Eulerian model for atmospheric transport and deposition of volcanic particles
- Solves the Advection-Diffusion-Sedimentation (ADS) equation using an explicit finite difference numerical algorithm
- Operational at the Buenos Aires VAAC and other institutions worldwide

$$\frac{\partial C}{\partial t} = \underbrace{-\nabla \cdot (\mathbf{u} C)}_{\text{Mass Variation}} + \underbrace{\nabla \cdot (\mathbb{K} \nabla C)}_{\text{Advection}} - \underbrace{\nabla \cdot (\mathbf{u}_s C)}_{\text{Diffusion}} + \underbrace{S_o}_{\text{Sedimentation}} + \underbrace{S_k}_{\text{Source Sink}}$$



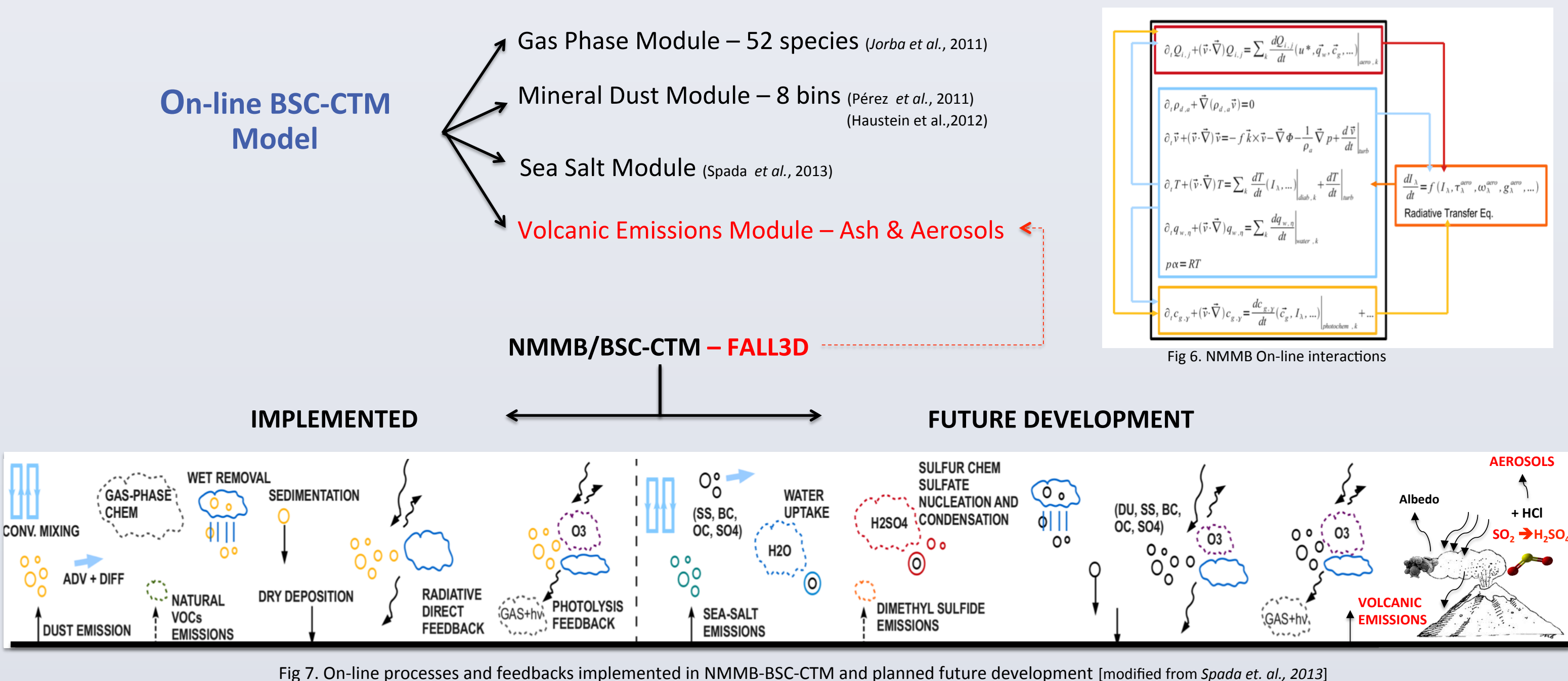
NMMB

[Janjic, 2006; Janjic and Black, 2007; Janjic et. al., 2011]

- The Nonhydrostatic Multiscale Model on the B grid (NMMB) developed at the NCEP and is an evolution of the operational WRF-NMME (E-grid) extending from meso to global scales
- NMMB is expected to become the next generation NCEP mesoscale model used for operational weather forecasting in North America

NMMB/BSC-CTM

- The NMMB/BSC-CTM (Chemical Transport Model) is a new chemical weather prediction system used for short-term forecasting developed at the BSC
- First specialized centre for Mineral Dust prediction of the WMO



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