Ensemble-based data assimilation of volcanic aerosols using FALL3D+PDAF

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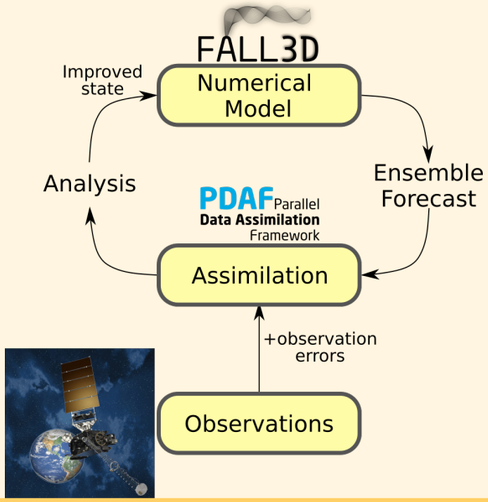
1. Introduction

> The generation of high-quality forecasts depends on the accuracy and reliability of the input data for models

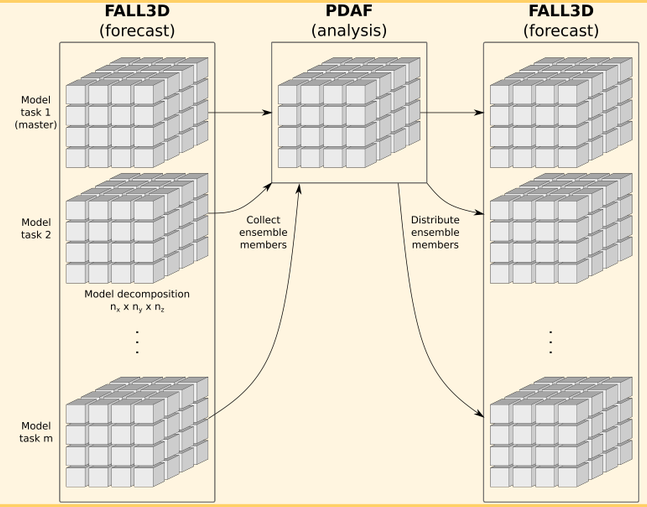
> Uncertainties in key parameters such as column height injection, physical properties of particles, or meteorological fields, represent a major source of error in forecasting airborne volcanic ash

> **Data Assimilation** is one of the most effective ways to reduce the error associated with the forecasts through the incorporation of available observations into numerical models.

2. Data assimilation



3. Implementation



4. Twin experiment

> Case study based on an idealized eruption of Etna, run on Irene supercomputer at CEA/TGCC.

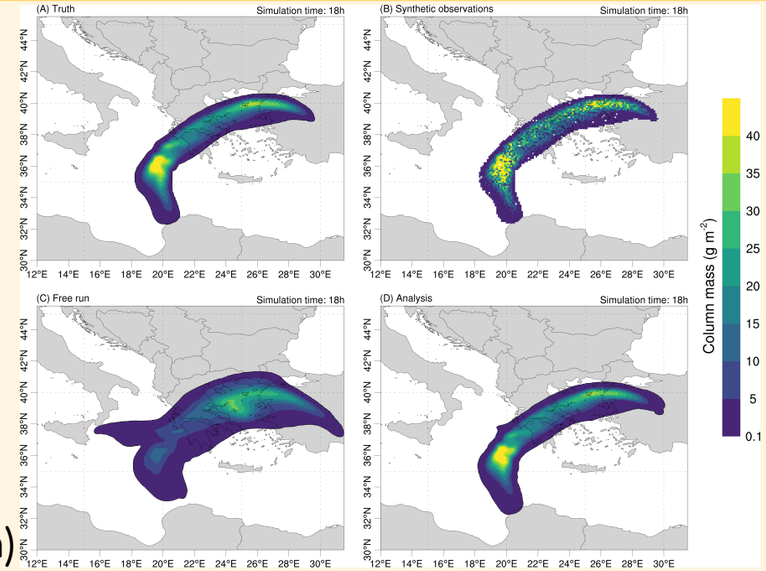
> Local Ensemble Transform Kalman Filter (LETKF), a localised version of ETKF described by Hunt et al. (2007)

> A common approach to assessment of data assimilation methods is to perform twin experiments:

- A **truth state** is generated by the model to define a reference
- **Synthetic observations** are generated by adding random perturbations to the true state (non-correlated observation errors)

Truth

Free run (no assimilation)



Synthetic Observations

Analysis