EGU24-6365, updated on 20 May 2024
https://doi.org/10.5194/egusphere-egu24-6365
EGU General Assembly 2024
© Author(s) 2024. This work is distributed under
the Creative Commons Attribution 4.0 License.

Workflows for volcano hazard assessment in cloud and HPC research infrastructures

Arnau Folch
Geociencias Barcelona (GEO3BCN-CSIC), Barcelona, Spain (afolch@geo3bcn.csic.es)

Short and long-term probabilistic volcano hazard assessments entail the fusion of data from multiple sources with the realisation and subsequent combination of hundreds/thousands of scenarios spanning the range of system uncertainties (model inputs and parameterisations, boundary conditions, etc). Computational workflows are middleware software layers that manage and orchestrate in an automated way the multiple steps and tasks involved in this process, from data acquisition and preparation, to model executions and post-process in centralised (HPC) and/or cloud computing infrastructures. This contribution presents some examples from on-going European projects tackling computational geohazards on HPC/cloud infrastructures. For the short-term hazard assessment, the DT-GEO project (2022-2025, Grant Agreement No 101058129) is implementing a number of workflows conducting precise data-informed early warning systems and hazard assessments by harnessing world-class computational (FENIX, EuroHPC) and data (EPOS) research infrastructures. The volcano-related workflows in DT-GEO include: (i) merging of multi-parametric data from ground-based and remote observation systems (on-site monitoring networks and satellites) with global modelling of magma and rock dynamics and with AI approach; (ii) merging of real-time geostationary satellite observations with the FALL3D model to generate deterministic and ensemble-based probabilistic forecast products; (iii) merging of real-time multi-parametric data from ground-based and remote observation systems with deterministic modelling of lava flow propagation and inundation areas and; (iv) air-quality data and AI in a volcanic gas dispersal forecast context to improve operational Early Warning Systems. On the other hand, the EuroHPC ChEESE Center of Excellence (CoE) is conducting an ensemble-based volcanic dispersal across multiple scales that will lead to the first European tephra hazard map at scale covering, simultaneously, long-range dispersal and short-range fallout telescopically. This will be integrated in the EPOS Volcanic Observations TCS (VO-TCS). All these initiatives liaise, align, and synergise with EPOS and longer-term mission-like initiatives like Destination Earth.