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Volcanic ash dispersal and deposition workflow on HPC

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DT-GEO is a project proposed to deal with natural or anthropogenically induced geohazards (earthquakes, volcanoes, landslides and tsunamis) by deploying a Digital Twin of the planet. The prototype will provide a way to visualize, manipulate and understand the response to hypothetical or on-going events by integrating data acquisition and models.

Due to the complexity of the development, the project has been divided into different work packages and components. The volcanic phenomena package includes 4 Digital Twin Components (DTCs): volcanic unrest, volcanic ash clouds and ground accumulations, lava flows, and volcanic gas dispersal. The volcanic ash and dispersal deposition component implements a workflow for atmospheric dispersal and ground deposition forecast systems. The workflow is composed of four general units. The first one is the Numerical Weather Prediction (NWP) acquisition (provided by external institutions) refers to both: automatic obtention of the forecast (up to few days ahead) or the reanalysis (preprocess data from the past) in global or regional scales at different resolutions. Then, the Triggering and Eruption Source Parameters (ESP) is based on predefined communications channels and prioritized by an accuracy rank. The FALL3D model setup and run ensemble simulations, resulting from perturbing ESP values within a range. Finally, the postprocess refers to the compilation of the simulations into hazard maps.