DT-GEO: A Digital Twin for GEOphysical extremes

Description

With present computational capabilities and data volumes entering the Exascale Era, digital twins of the Earth system will be able to mimic the different system components (atmosphere, ocean, land, lithosphere) with unrivalled precision, providing analyses, forecasts, and what-if scenarios for natural hazards and resources from their genesis phases and across their temporal and spatial scales.

DT-GEO aims to develop a prototype for a digital twin on geophysical extremes, including earthquakes, volcanoes, tsunamis, and anthropogenic-induced extreme events. The project harnesses world-class computational and data Research Infrastructures (RIs), operational monitoring networks, and leading-edge research and academia partnerships in various fields of geophysics.

The project will merge and assemble the latest developments from other European projects and Centers of Excellence to deploy 12 Digital Twin Components (DTCs), intended as self-contained containerized entities embedding flagship simulation codes, Artificial Intelligence layers, large volumes of (real-time) data streams from and into data-lakes, data assimilation methodologies, and overarching workflows for deployment and execution of single or coupled DTCs in centralized HPC and virtual cloud computing RIs. Each DTC addresses specific scientific questions and circumvents technical challenges related to hazard assessment, early warning forecast, urgent computing, or resource prospection.

DTCs will be verified at 13 Site Demonstrators (SD), and their outcomes will contain rich metadata to enable (semi-)automatic discovery, contextualization, and orchestration of software (services) and data assets, facilitating its integration into the European Open Science Cloud (EOSC). The proposal aims at being the first step of a long-term community effort toward a twin on Geophysical Extremes integrated into the Destination Earth (DestinE) initiative.

Barcelona Supercomputing Center - Centro Nacional de Supercomputación