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# Integrating Near Fault Observatories (NFO) for EPOS Implementation Phase

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Following the European Plate Observing System (EPOS) project vision aimed at creating a pan-European infrastructure for Earth sciences to support science for a more sustainable society, we are working on the integration of Near-Fault Observatories (NFOs). NFOs are state of the art research infrastructures consisting of advanced networks of multi-parametric sensors continuously monitoring the chemical and physical processes related to the common underlying earth instabilities governing active faults evolution and the genesis of earthquakes. Such a methodological approach, currently applicable only at the local scale (areas of tens to few hundreds of kilometres), is based on extremely dense networks and less common instruments deserving an extraordinary work on data quality control and multi-parameter data description.
These networks in fact usually complement regional seismic and geodetic networks (typically with station spacing of 50-100km) with high-density distributions of seismic, geodetic, geochemical and geophysical sensors located typically within 10-20 km of active faults where large earthquakes are expected in the future.

In the initial phase of EPOS-IP, seven NFO nodes will be linked: the Alto Tiberina and Irpinia Observatories in Italy, the Corinth Observatory in Greece, the South-Iceland Seismic Zone, the Valais Observatory in Switzerland, Marmara Sea GEO Supersite in Turkey (EU MARSite) and the Vrancea Observatory in Romania. Our work is aimed at establishing standards and integration within this first core group of NFOs while other NFOs are expected to be installed in the next years adopting the standards established and developed within the EPOS Thematic Core Services (TCS). The goal of our group is to build upon the initial development supported by these few key national observatories coordinated under previous EU projects (NERA and REAKT), inclusive and harmonised TCS supporting the installation over the next decade of tens of near-fault observatories monitoring active faults in different tectonic environments in Europe. We will assist these new NFOs in their design, installation and inclusion in EPOS. These infrastructures will substantially enable advancements in our fundamental understanding of earthquakes generation processes and associated ground shaking due to their high quality near source multidisciplinary data retrieval. While guaranteeing the continuous acquisition and storage of long time-series of such data, we will allow also an easy and direct data discovery and access to the whole community. This implies to strengthen the collaborations with other related EU and global initiatives devoted to the multidisciplinary monitoring and study of active fault zones (such as the GEO Geohazards Supersites initiative).

Another key goal is the establishment of a legal governance for such a young community to ensure the long-term sustainability of the services and data access to databases to be used for scientific investigations and accessible via the Integrated Services that will be implemented within the EPOS IP project.

The availability of real-time data retrieved by dense and multi-parametric networks located at close distance from the fault provides the unique opportunity of observing all phase of preparation, nucleation and propagation of the earthquake rupture. It is thus of crucial importance to develop methodologies that follow in real-time the evolution of the event. Hence the NFO is the unique and ideal infrastructure for hosting testing centers where a variety of scientific algorithms for real-time monitoring can be operated side-by-side and their performance independently evaluated. Besides the high interest for fundamental science, such developments have obvious societal impact, as they allow precise and timely release of alerts as the seismic event develops, and can attract new stakeholders such as industry partners who are interested in adopting and investing in early warning technologies and evolutionary ground shaking maps.

Finally, we will describe how we intend to implement novel tools for visualization and analysis of multidisciplinary data and products to describe the anatomy of active faults and the physical processes governing earthquake generation and faulting. A sort of virtual laboratory aimed at promoting and disseminating Earth

sciences at different levels.