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## The EPOS open source platform for multidisciplinary data integration and data analysis in solid Earth science

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Established as a European Research Infrastructure Consortium (ERIC) in 2018, the European Plate Observing System (EPOS) Research Infrastructure represents a significant advancement in solid Earth sciences. Its aim is to harmonize and integrate data, services, and computational resources across diverse solid Earth science domains. These include Seismology, Near-Fault Observatories, GNSS Data and Products, Volcano Observations, Satellite Data, Geomagnetic Observations, Anthropogenic Hazards, Geological Information and Modeling, Multi-Scale Laboratories, Tsunami Research, each leveraging EPOS for the integration of domain specific data and services into a wider European multi-disciplinary context.

The EPOS platform (<https://www.epos-eu.org/dataportal>) provides access to harmonized and quality-controlled data from thematic solid Earth science services through over 250 interoperable multidisciplinary services. The platform adopts a microservice-based architecture serving RESTful APIs, ensuring seamless interoperability between thematic core services (TCS) and the integrated core services central hub (ICS-C). The ICS-C, as the central system underpinning the EPOS platform, enables interoperability by adopting a multidimensional approach using metadata, semantics, and web services. Released under a GPL license as open-source software (<https://epos-eu.github.io/epos-open-source/>), EPOS adheres to the FAIR Principles, fostering interdisciplinary collaboration and technological advancement in Earth sciences and beyond.

In addition to data access, the EPOS platform also integrates complementary visualization tools and computational services. These Integrated Core Services - Distributed (ICS-D) enhance the user experience by simplifying complex interactions, offering functionalities like visualization, coding,

and processing for data analysis, including machine learning applications.

This presentation will explore how the EPOS platform facilitates the entire research data lifecycle, connecting integrated multidisciplinary data provision to remote data analysis environments. By leveraging third-party cloud and supercomputing facilities equipped with specialized APIs (eg. SWIRRL <https://gitlab.com/KNMI-OSS/swirrl/swirrl-api>), we will demonstrate how EPOS seamlessly integrates with external services for reproducible data analysis and visualization, relying on common workflows to gather and pre-preprocess the data. External service examples include Jupyter Notebooks developed by domain-specific communities, using which the users can immediately analyze and process the data online. This adaptability streamlines scientific research and also promotes data reusability and collaboration within the portal, showcasing the EPOS platform's role in advancing Earth sciences research.

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