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## ORFEUS AND EIDA

Par Reinoud Sleeman

ORFEUS (Observatories and Research Facilities for European Seismology), is the European, non-profit organization for coordinating seismology in the European-Mediterranean area and to provide open access to high quality data by the geo-scientific research communities. ORFEUS is the European framework to develop common data gathering and dissemination policies, novel data discovery techniques and services and is the vehicle for fund raising for European seismology. The success of ORFEUS as pan-European organization has materialized over the last decades in a solid platform in which financial support, management and technical expertise are coordinated and distributed over a number of European, seismological institutes and organizations.

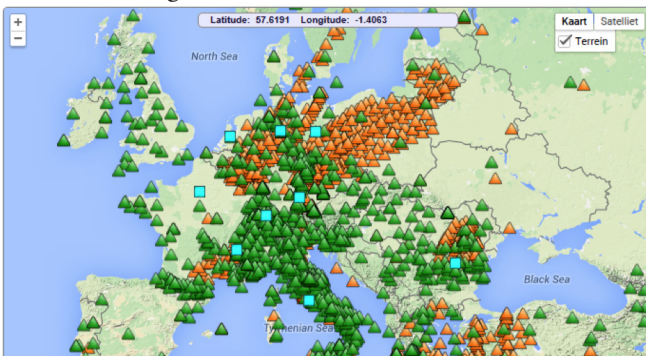


Figure 1 : European seismic stations available through EIDA nodes (currently 9, blue squares). Stations in green are in operation, stations in orange have stopped their operation.

The huge increase in the amount of data available from seismic networks lead or funded by European organizations, the expansion in deploying other types of sensors and the rapid development of novel data services throughout Europe challenged ORFEUS to establish the European Integrated Data Archive (EIDA ; [www.orfeus-eu.org/eida](http://www.orfeus-eu.org/eida)), a distributed but unified data center system that provides transparent access to high quality seismological data from large, interconnected data archives in Europe (Figure 1). RESIF has been one of the co-founders of EIDA which is based on 10 data nodes: currently comprises of ORFEUS Data Center, GFZ, RESIF, INGV, ETH, BGR, NIEP, IPGP, LMU, KOERI (in progress) and contains more than 300 terabytes of data from about 5000 seismic stations. The success of ORFEUS EIDA is reflected by more than 4000 users collecting data from EIDA at a daily average of 30 gigabytes.

The H2020 projects EUDAT2020, ENVRI+ and EPOS IP will provide the framework to design and develop the next generation of EIDA software (webservices) to further expand the distributed system and to provide new techniques and services to the research community for discovering and processing data in a trusted environment, allowing data tracking by persistent identifiers and improved data citing by DOI (digital object identifier). The next generation of software will be based on webservices and allow smart clients (e.g. Mediator or Broker) to discover the best available data, initially based on routing information and data quality parameters. Long term sustainability of the developments is pursued through the development and support of international standards (FDSN).

The success of EIDA in Europe is the result of learned lessons from the past and of the evolution of data archive systems in Europe, from a collection of many local data centers with limited commitments to standardization, to a successful centralized data center with limited resources, into a mature system of a limited number of interconnected, large data centers. Their commitment to ORFEUS and their shared responsibility in terms of management, resources and development are the solid basis for further expansion of data access services. A key element for the robustness of the system (management and technical) is

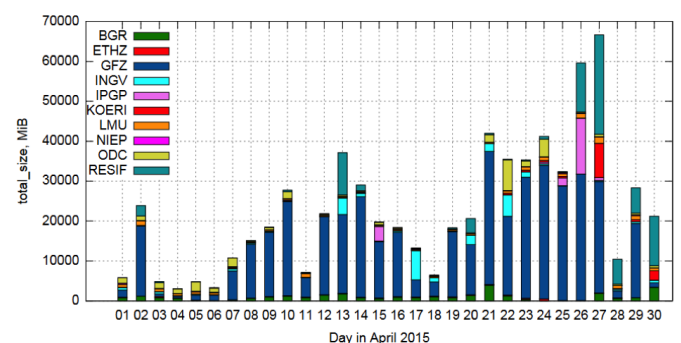


Figure 2 : Data collected from EIDA in April 2015. The colour coding bars indicate the different EIDA data archives.

the limited number of nodes in EIDA. Many nodes act as national or regional center to offer the framework for smaller data centers to join EIDA and have them benefit from the developments taking place in EIDA (Figure 2). Within EIDA, RESIF has this clear role for French seismological data. Each node takes responsibility in the

requirement phase, the design phase and the implementation phase and thus directly contributes to the success of ORFEUS EIDA.

RESIF is an important and very visible organization within ORFEUS and EIDA and contributes significantly to all levels (political, management, technical, data, international). RESIF provides open access to data from more than 330 permanent stations operated by French institutes, and to data from 24 temporary networks deployed between 1998 and 2014. As an example, more than 70 gigabytes of RESIF data

was exported through EIDA in April 2015 only (Figure 2).

The role of RESIF in France to organize French national data archives into one EIDA node in ORFEUS has increased and guaranteed the availability of high quality data (waveforms and metadata) from French networks significantly, and is seen as an example for other countries operating several networks and archives. Finally, RESIF's expertise in managing this process to unify national archives into one has proven to be very valuable in the on-going discussions and evolution of ORFEUS within EPOS.