

ORFEUS

making seismic waveform data available

from 1987 to EIDA

from a centralized data center to a federated data archive

history and present status

Madrid, 8 March 2018



Some history of International and European Coordination of Seismology: FDSN and ORFEUS

- IDA (International Deployment of Accelerometers) began in 1975 to create a global network of long period seismometers of an advanced design and based on the La Coste gravimeter.
- GEOSCOPE (France; 1981) – global 3-component network of broad-band stations (STS-1)
- IRIS established (1984; US); Incorporated Research Institutions for Seismology; establishment of GSN and PASSCAL
- 1984: BB network deployments in Canada and China
- 1984: proposal by the EGS (European Geophysical Society) working group on global seismic networks for establishing a 'European Copying Center for broad-band data' => ORFEUS

Some history of International and European Coordination of Seismology: FDSN and ORFEUS

- 1986: founding meeting of the FDSN (Federation of Digital Seismograph Networks)

I. Goals

In view of the above, and to take advantage of existing developing global and regional networks the "Federation of Digital Broad-Band Seismograph Networks (FDSN)" is formed to provide a forum for :

- developing common minimum standards in seismographs (e.g. bandwidth) and recording characteristics (e.g. resolution and dynamic range) ;
- developing standards for quality control and procedures for archiving and exchange of data among component networks ;
- coordinating the siting of additional stations in locations that will provide optimum global coverage.

ETHEIDGENÖSSISCHE TECHNISCHE
HÖCHSCHULE
ZÜRICH

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1987 - ORFEUS Foundation into existenceW. Haak
KNMI
PO Pox 201

NL-3730 AE De Bilt

Klass. nr.		07.503	
Ter. hbr.		aan:	
H. HAAK			
	11/2		
Afdelingstermijn:			

Subject: European Copying Center for broad-band seismic data

Dear Hein:

February 5, 1985

The EGS working group on global seismic networks has proposed, at its meeting in Paris on November 30, to install a European Copying Center for broad-band data. It may seem that there is no immediate need for such a center. However the need will arise

European countries plan to set up digital broad-band stations. We have to start thinking now about these data. The proposed center could become a realization for a network of independent but European broad-band stations, and could thus help between national and global networks.

My writing is to collect ideas and wishes for such a center. Enclosed is a draft of my own, incomplete, and possibly unrealistic in detail. I would welcome your comments to that draft. If you have your response by end of February. I will contact the potential host organizations and try to explore the consequences. The topic will then be discussed at the next meeting in Strasbourg,

Sincerely,

Erhard



Riemers & Schuttevaer

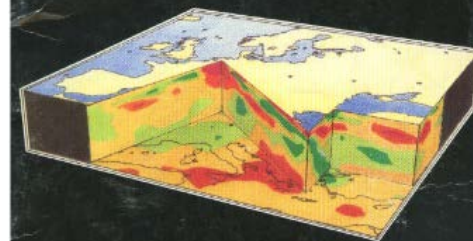
NOTARISSSEN

TE

UTRECHT

AFSCHRIJFT

OPRICHTING STICHTING

Stichting Orfeus
Utrecht.
**Statutes
of the
Foundation**
ORFEUS SCIENCE PLANOBSERVATORIES
AND
RESEARCH FACILITIES
FOR
EUROPEAN SEISMOLOGY**ORFEUS SCIENCE PLAN****1986**

editors

Guust Nolet (Utrecht University)
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Rainer Kind (Graefenberg Observatory)
Erhard Wielandt (ETH, Zurich)

Acknowledgement The following scientists took part in discussions of the ORFEUS working group, or directly contributed text, figures and ideas that make up the substance of this science plan: M.Barbano, H.Berckhemer, M.Bezzeghoud, C.Browitt, W.Bruestle, T.Camelbeeck, M.Cara, C.Chapman, A.Christoffersson, R.Console, A.Correig, M.DeBecker, A.Deschamps, D.Doornbos, B.Dost, S.Faber, J.Gallart, H.Haak, H.Harjes, J.Hjelme, E.Husebye, N.Jobert, R.Kind, H.Korhonen, O.Kulhanek, J.Leveque, R.Madariaga, L.Mendes-Victor, G.Mueller, St.Mueller, G.Nolet, G.Panza, H.Paulssen, B.Romanowicz, G.Roult, D.Seidl, R.Snieder, A.Souriau, W.Spakman, P.Suhadolc, A.Ulug, E.Wielandt, R.Wortel, G.Zonno, W.Zuern.

Orfeus

Romanowicz, B. and A.M. Dziewonski (1987). *Global digital seismographic network: research opportunities and recent initiatives*, in Composition, Structure and Dynamics of the Lithosphere-asthenosphere system, C. Fuchs , C. Froidevaux Eds., A.G.U., Public., Geodynamics series, VOL. 16, 99-110

GLOBAL DIGITAL SEISMOGRAPHIC NETWORK:
RESEARCH OPPORTUNITIES AND RECENT INITIATIVES

Barbara A. Romanowicz

Institut de Physique du Globe, 75230 Paris Cedex 05 France

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tion of these networks.

It is, perhaps, the developments in Europe that potentially may point the way for the future organizational structure of the global seismographic network. In the summer of 1984 the European Geophysical Society created a Working Group for the Global Seismographic Network. Representatives of nine west European countries were present at the initial meeting and 13 countries participated in the subsequent one. It led to the formation of a multi-national consortium under the name of Observatories and Research Facilities for European Seismology (ORFEUS). ORFEUS published its Science Plan in 1986. It is hoped that its activities would be supported by the European Science Foundation through contributions from individual countries. The consortium would sponsor new efforts on the regional (European) as well as global scales. It is planned that a European Seismic Data Center would be developed for the management of the collection and distribution of the data.

THE FEDERATION OF DIGITAL SEISMOGRAPHIC NETWORKS

M.J. Berry

Report prepared for
Workshop on Downhole
Seismometers in the
Deep Ocean at
Woods Hole
Oceanographic
Institution,
April 26-28, 1988

During the 1970's a number of institutions developed digital seismographs and deployed these in specific scientific or technical (to 1 hour) International Deployment an important example providing mu structure and the nature of earth

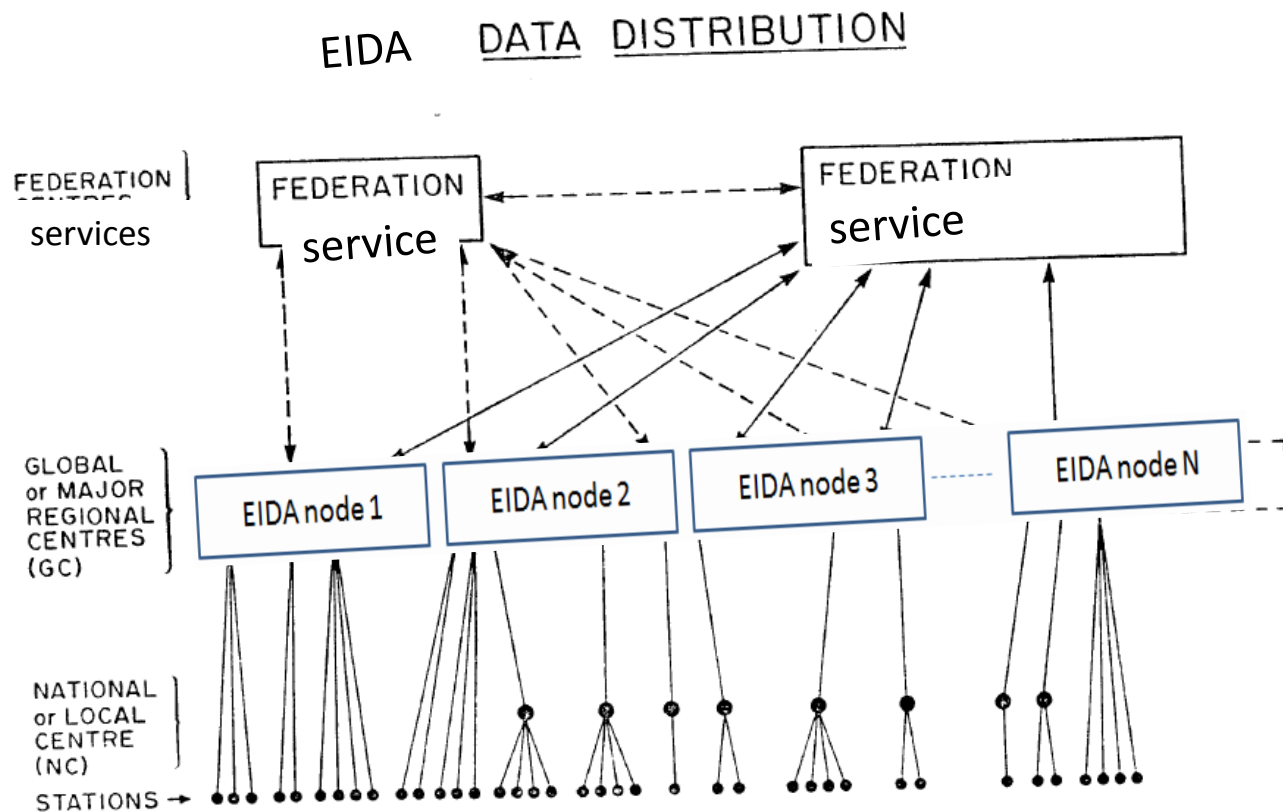


FIGURE 3

Evolution of European Seismological Data Management, Exchange and Services

- 80's – early 90's: *'Loose sand'*
 - off-line data collection by ODC (tapes: e.g. GRSN, BN, NARS, G)
 - event data only; visual quality check
 - data distribution: CD-ROM
- Mid 90's:
 - ftp, CD-ROM
 - AutoDRM (uncoordinated growth & decline of 'nodes')
- Late 90's: *'Brick building'*
 - towards continuous data
 - increased number of networks/stations
- Early 00's:
 - start of the real-time data exchange protocols (e.g. SeedLink, Antelope, SCREAM)
- Mid/Late 00's:
 - Website services (e.g. Spyder, Wilber)
- Today: *'Solid fundament'*
 - Distributed & federated archive and standardized services (EIDA)

Huge increase in number of stations and amount of data:

- Supported by European projects on infrastructure developments
- Requires European coordination on data management / technical challenges

Infrastructure developments in Europe since 2000 (ORFEUS)

ORFEUS NGO (since 1987) www.orfeus-eu.org

Observatories and Research Facilities for European Seismology

MEREDIAN EC-project FP5 (2000 – 2005)

Mediterranean-European Rapid Earthquake Data Info- & Archiving Network

NERIES EC-Research Infrastructure (I3) Project FP6 (2006 - 2010)

Network of European Research Infrastructures for Earthquake Seismology

NERA EC-Research Infrastructure (I3) Project FP7 (2010 – 2014)

Network of Europ. Research Infrastructures for Earthquake Risk Assessment and Mitigation

→ *commencement of European Integrated Data Archive (EIDA) in 2013*

EPOS Preparatory Phase Project (2010 – 2014)

Preparing the governance, legal, financial structure and technical concept of EPOS

EPOS Implementation Phase Project (2015 – 2018)

Implementation of a realistic roadmap toward EPOS construction (TCS, ICS, EPOS-ERIC)

SERA INFRAIA-01-2016-2017 (2017 – 2020)

Seismology and Earthquake Engineering Research Infrastructure Alliance for Europe

EPOS operational Phase (2019 - ...)

Integrated access to European seismological data: challenges

Technical challenges

- Data Gathering (inhomogeneous data; connecting)
- Quality Control (metadata, time, ...)
- Archival (multiple data centres; data identifications: DOI, PID)
- Access and exchange (standardized, DB → service speed)
- Multidisciplinary data integration (standards)
- Analysis and Interpretation tools (data products + meta data + workflows)
- Handling large data sets (analysis, workflows, transfers, ...)

Non technical challenges:

- What more waveform data do we archive (SP, SM, OBS, synthetics, ...)
- Geography / distributed observations (> 100 observatories)
- Financial (different national priorities and budgets)
- Political boundaries and constraints

EIDA - The European Integrated Data Archive

EIDA is the European Integrated Data Archive infrastructure within ORFEUS to provide access to seismic waveforms in European archives.

Currently 11 archives are distributing their own data (self operated networks) as well as data on behalf of other network operators in standard formats.

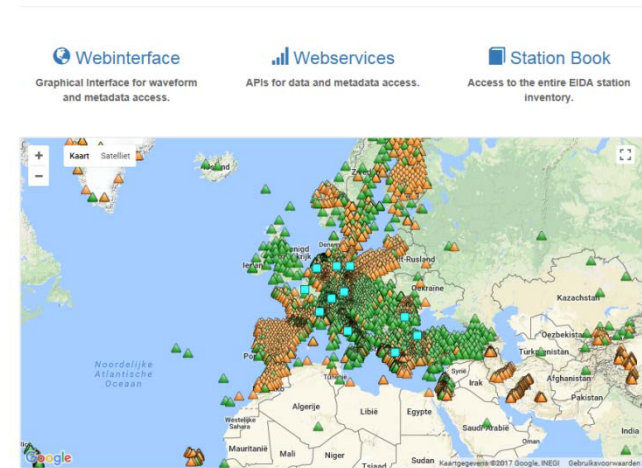
EIDA data holdings:

- 8000+ stations
- 99 permanent networks
- 97 temporary deployments
- 400 TB federated in 11 nodes

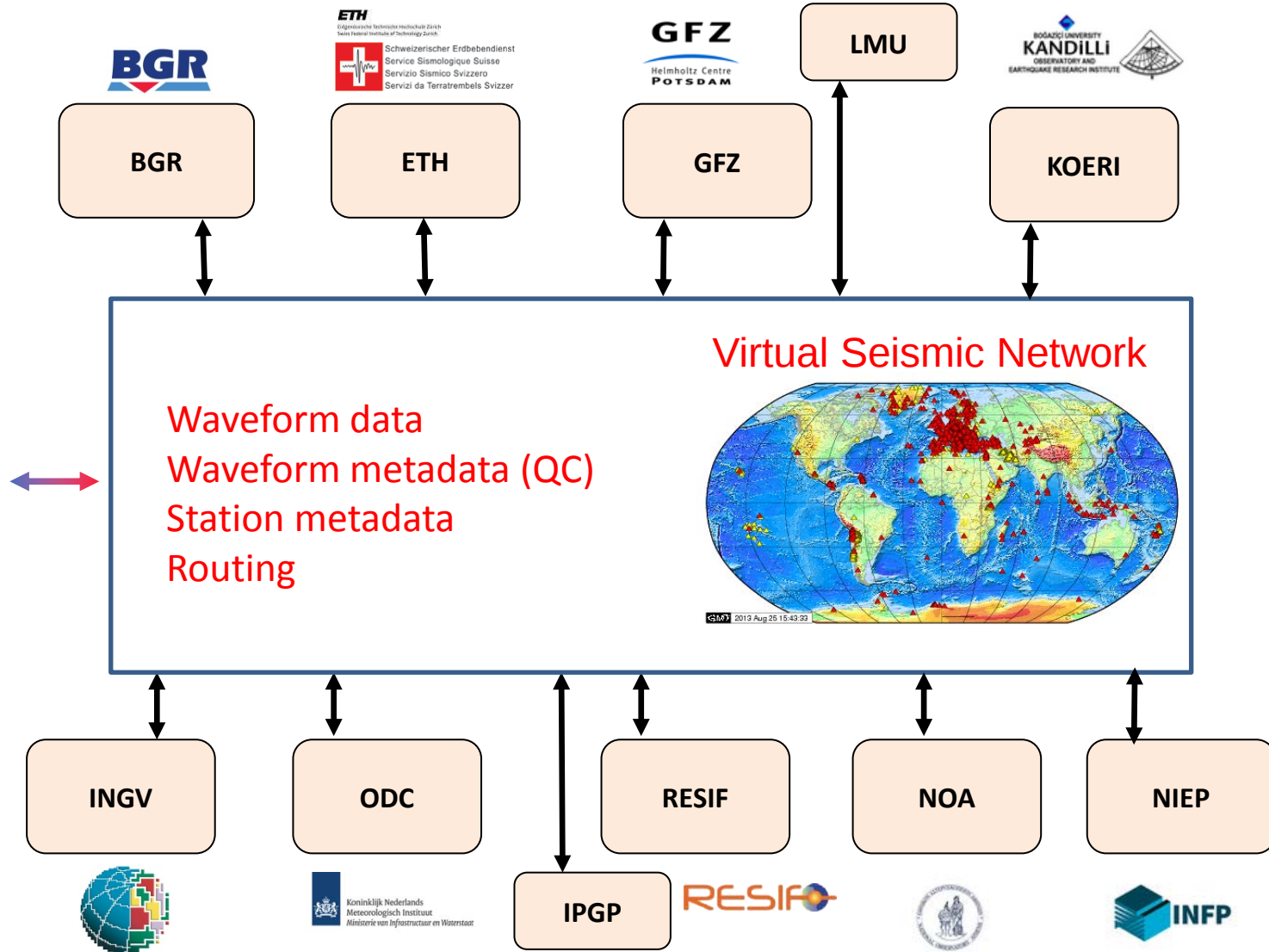
European Integrated Data Archive EIDA

EIDA, an initiative within ORFEUS, is a distributed federation of datacenters established to securely archive seismic waveform data and metadata gathered by European research infrastructures, and provide transparent access to data for the geosciences research communities. EIDA's **organization and management** is handled by the EIDA Management Board. The **EIDA nodes** are data centres that collect and archive data from seismic networks deploying broad-band sensors, short period sensors, accelerometers, infrasound sensors, and other geophysical instruments.

Seismic networks that participate in EIDA are listed as **contributing networks**.



- Operation of EIDA nodes rely on national/institutional funding
- Some European funding available for software developments (e.g. projects; small number of nodes)



EIDA - The European Integrated Data Archive

EIDA Management Board (EMB) and Technical Commission (ETC)

EIDA Management Board

Board Members

- Helle Pedersen, RESIF (Chair)
- John Clinton, ETHZ
- Angelo Strollo, GFZ
- Klaus Stammler, BGR
- Peter Danecek, INGV
- Ali Pinar, KOERI
- Constantin Ionescu, NIEP
- Reinoud Sleeman, ODC - KNMI
- Christos Evangelidis, NOA

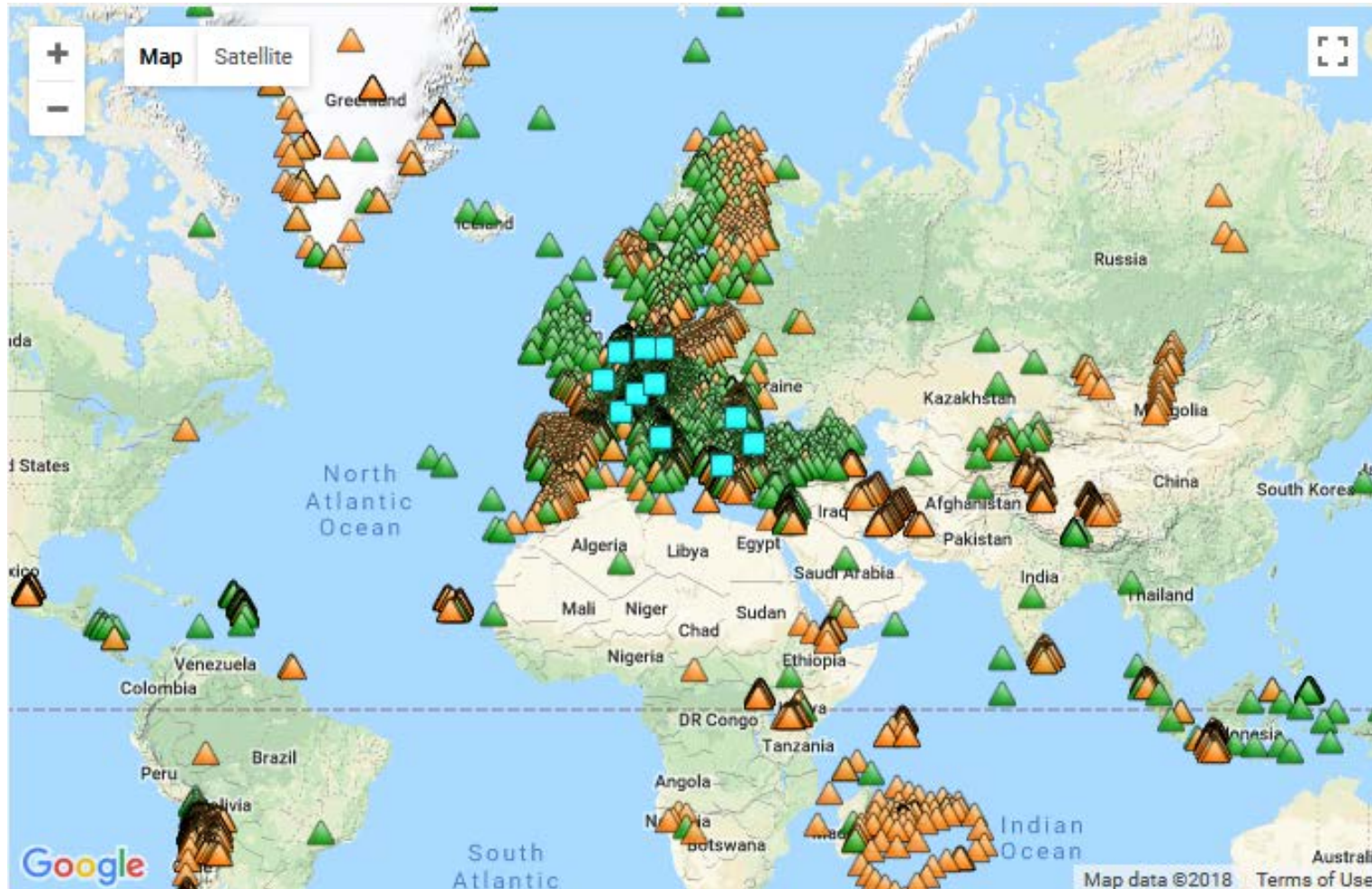
EIDA Technical Commission

Commission Members

- Javier Quinteros, GFZ (Chair)
- Luca Trani, Mathijs Koymans, ODC - KNMI
- Andres Heinloo, Peter Evans, GFZ
- Matthias Hoffmann, Erich Odon Muhire, BGR
- Daniel Armbruster, Stefan Heimers, Philippe Kaestli, Carlo Cauzzi, ETHZ
- Valentino Lauciani, Andrea Bono, Massimo Fares, INGV
- Costanza Pardo, IPGP
- Mustafa Comoglu, KOERI
- Cristian Neagoe, Lucian Palangeanu, NIEP
- Gregory Arnedo, RESIF
- Nikos Triantafyllis, Kostas Boukouras, NOA

How to become an EIDA node: www.orfeus-eu.org/data/eida/guidelines/

EIDA virtual network (2018)



Green

Open stations

Orange

Restricted
Stations

Total: 8089

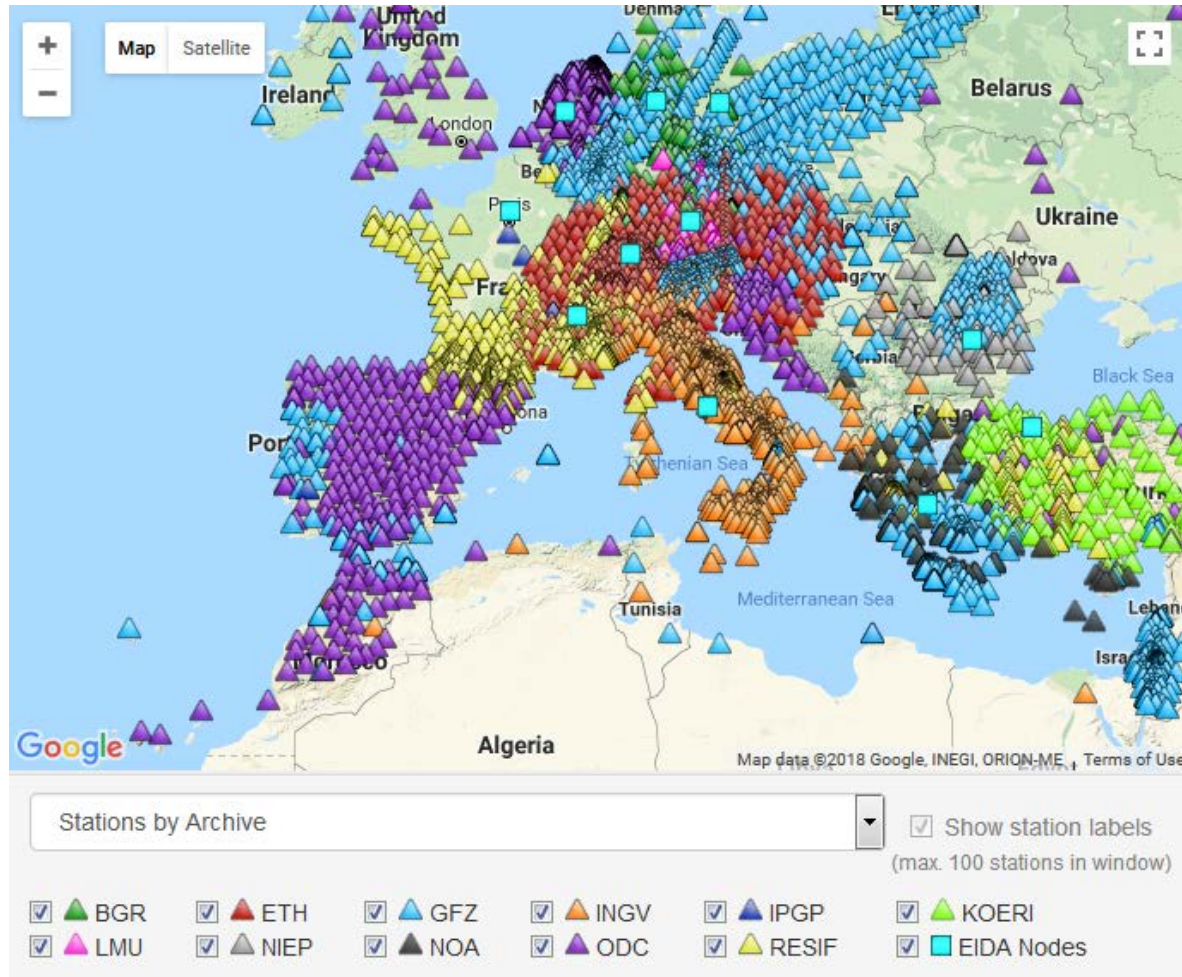
In operation: 3365

Stopped: 4724

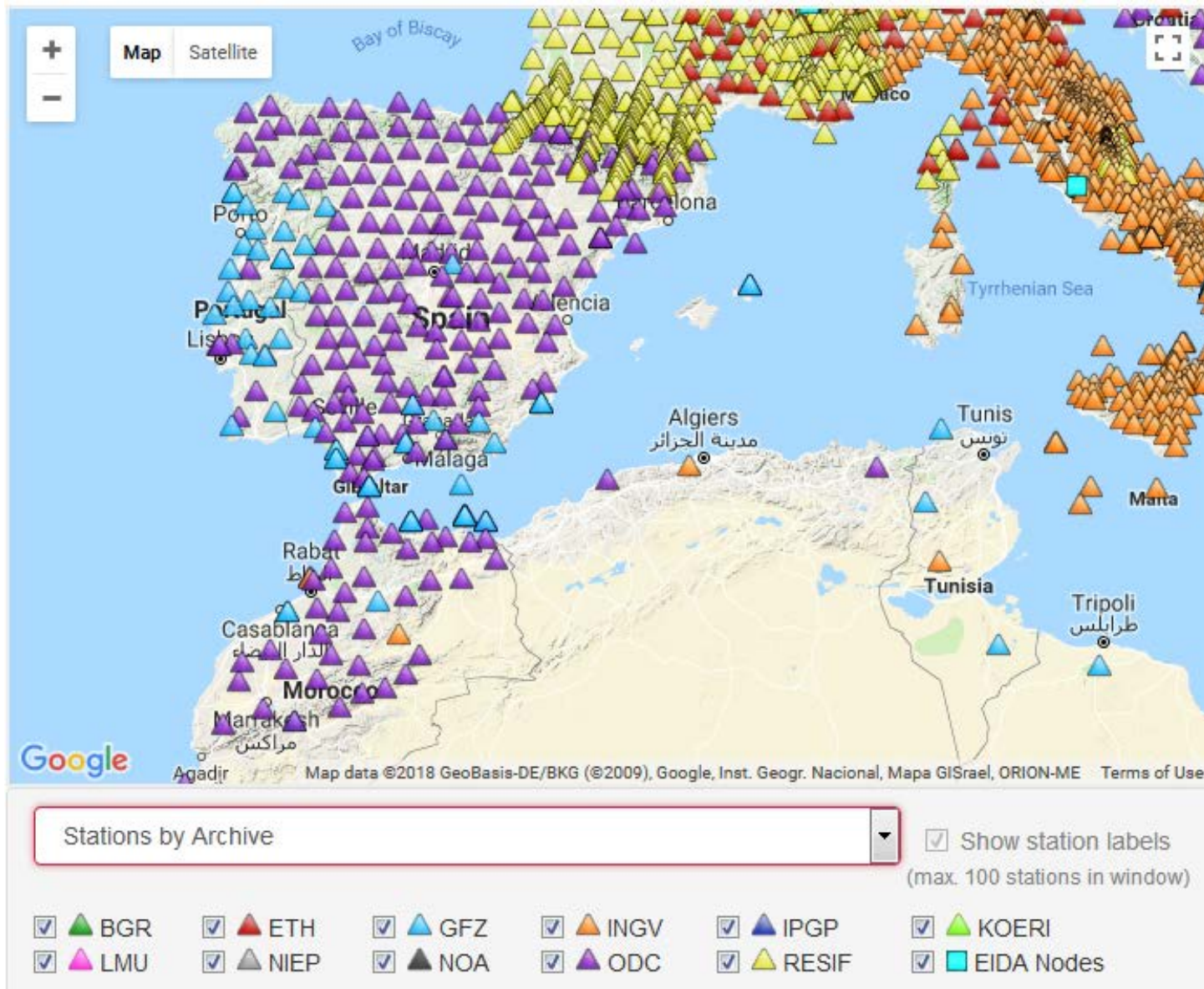
EIDA nodes



Station distribution by EIDA node

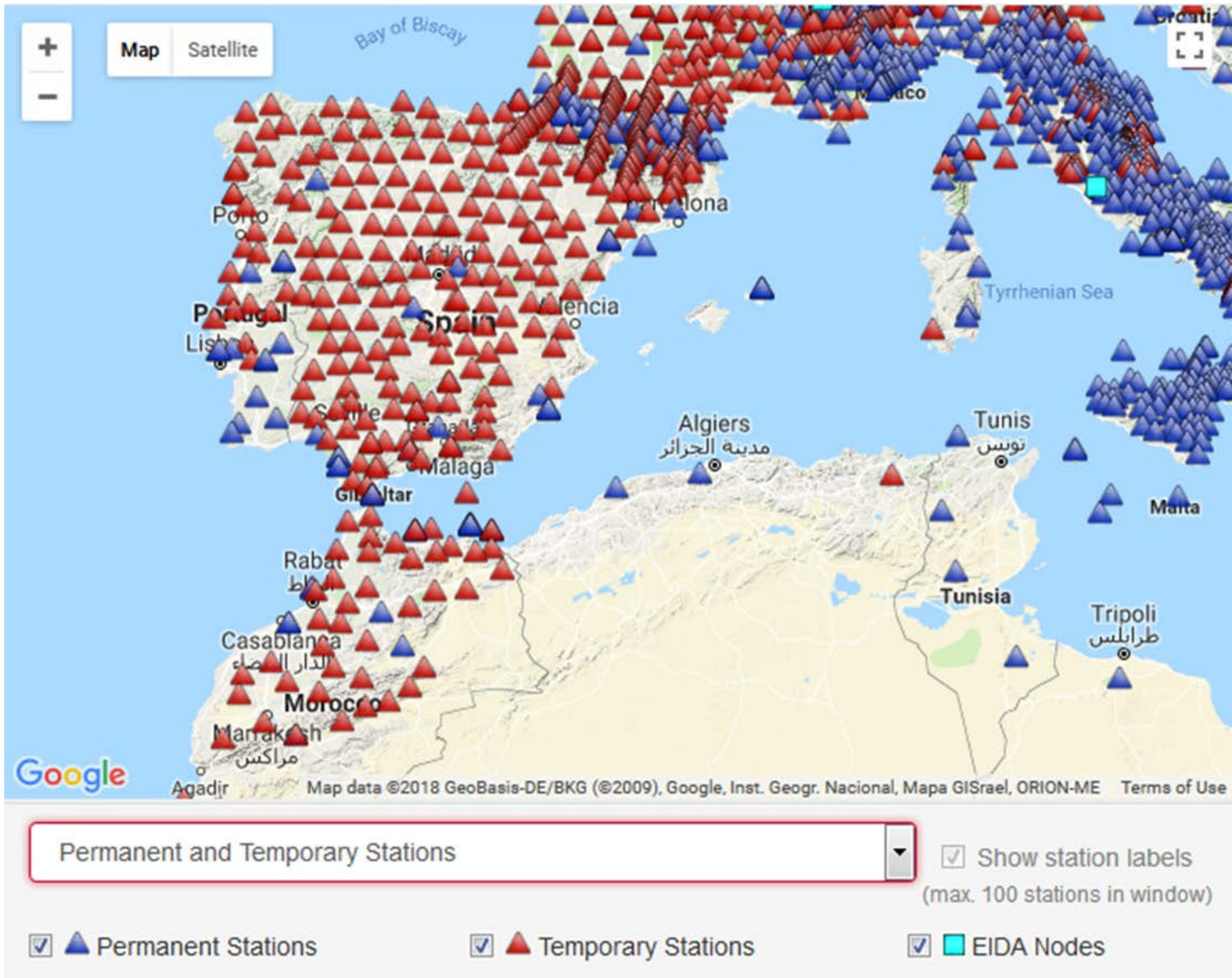


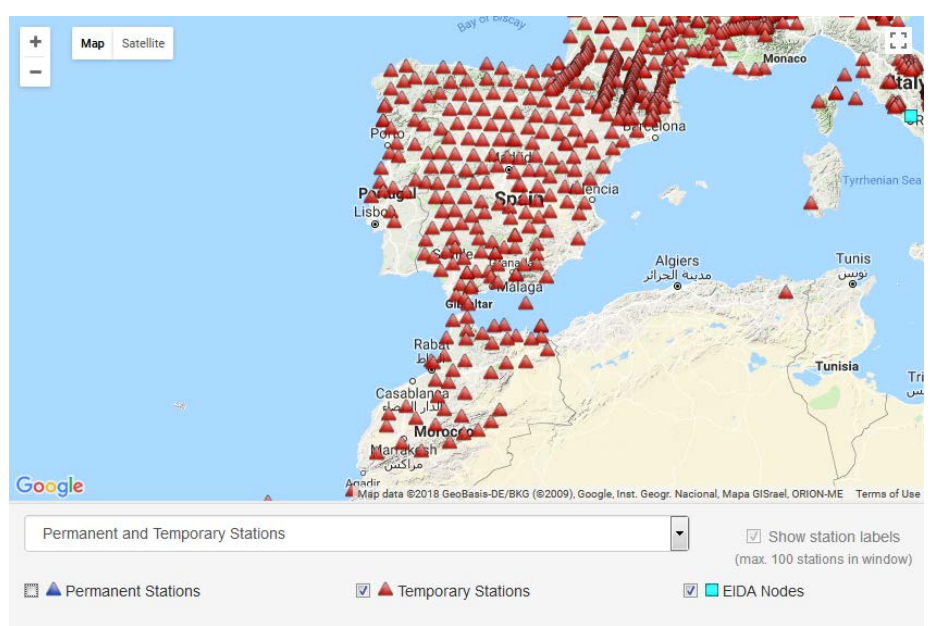
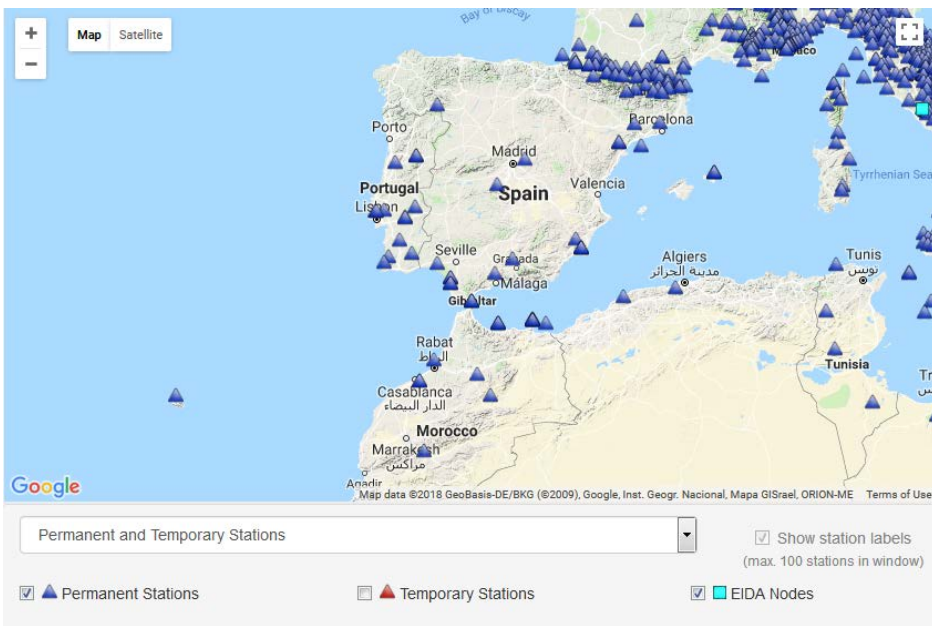
Iberian seismic stations currently available through EIDA



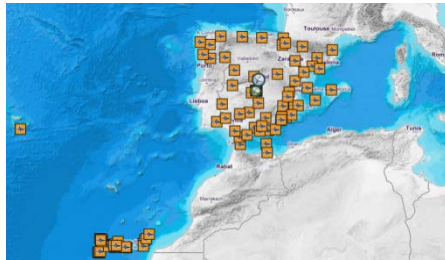
Iberian stations @
ODC & GFZ

Iberian seismic stations currently distributed by EIDA





ES: IGN network

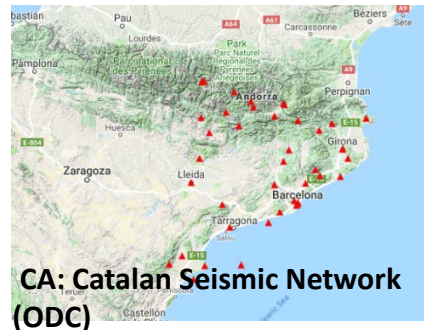


WM: Western Mediterranean Seismic Network



FDSN networks:

- ES: Spanish Digital Seismic Network (ODC)
- IG: Southern Spain Broadband Seismic Network (ODC)
- WM: Western Mediterranean Seismic Network (GFZ)
- CA: Catalan Seismic Network (ODC)
- PM: Portuguese National Seismic Network (GFZ)
- LX: University of Lisbon Seismic Network (ODC)
- IP: Instituto Superior Tecnico Broadband Seismic Network (ODC)
- IB: Topo Iberia seismic network (ODC)



ORFEUS EIDA waveform services

EIDA Node	FDSNWS-Dataselect	FDSNWS-Station	EIDAW S-Routing	EIDAW S-WFCatalog
ODC	Online 1.1.0	Online 1.1.0	Online 1.1.0	Online 1.0.0
GFZ	Online 1.1.1	Online 1.1.1	Online 1.1.1	Online 1.0.0
RES IF	Online 1.1.0	Online 1.1.0	In development	Online 1.0.0
INGV	Online 1.1.0	Online 1.1.34.9	Timed Out	Online 1.0.0
ETHZ	Online 1.1.0	Online 1.1.0	Online 1.0.3	Online 1.0.0
BGR	Online 1.1.0	Online 1.1.0	Online 1.1.0	Online 1.0.0
NIEP	Online 1.1.0	Online 1.1.0	In development	Online 1.0.0
KOERI	Online 1.1.0	Online 1.1.0	Online 1.0.2	Offline
IPGP	Online 1.1.0	Online 1.1.0	Online 1.0.3	In development
LMU	Online 1.1.0	Online 1.1.0	Online 1.0.3	Online 1.0.0
NOA	Online 1.1.0	Online 1.1.0	Online 1.1.0	Online 1.0.0



Graphical Interface for waveform and metadata access.



APIs for data and metadata access.



Access to the entire EIDA station inventory.



Rapid Raw Strong Motion RRSM

Engineering Strong Motion ESM

Schematic overview of (raw) waveform and metadata services currently up and running.

- EIDA interactive portal
- web services
- Station Book

- EIDA stations map

Derived products and services via:

- RRSM
- ESM

EIDA interactive portal

Explore events

Explore stations

Submit request

Download data

View console

select earthquake catalogue

Events Controls

Event Information

Catalog Services User Supplied

Catalog Service: **USGS**

Date Interval (yyyy-mm-dd):
2017-08-01 - 2017-10-19

Minimum Magnitude: 4

Depth from 0 to 999 km

Coordinates: (Use -ve for S/W; +ve for N/E)

N
44.22

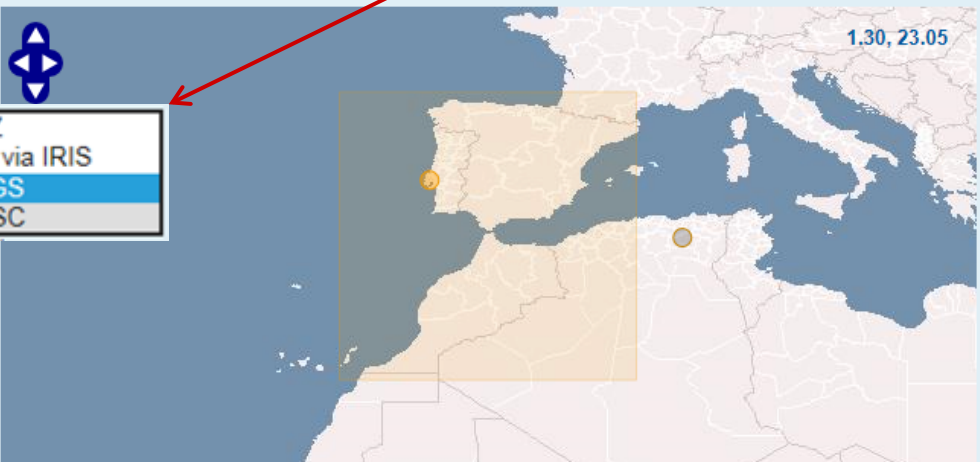
W -14.4 3.09 E

27.27

S

Reset Append

Event and Station Map



1.30, 23.05

Use left SHIFT + drag mouse to select regions.

[Legend](#) [Help](#)

Event and Station List

Request: Freeze Delete Stations Save Stations Delete Events

Events (2 events)

	Origin Time	Mag.	Type	Lat.	Long.	Depth	Region
☒	2017-08-17T06:44:56	4.2	mb	39.03	-9.08	10.0	Portugal
☐	2017-08-15T14:50:43	4.7	mb	35.65	5.80	10.0	Northern Algeria

EIDA interactive portal

Explore events **Explore stations** Submit request Download data View console

[doc Help](#)

Stations Controls

Station Information

Browse Inventory User Supplied

Networks

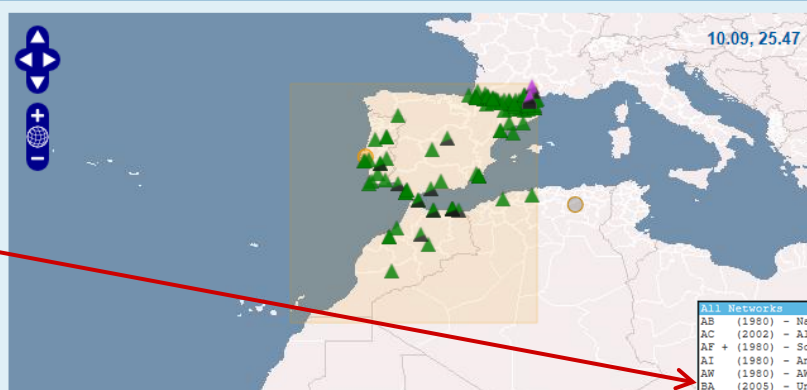
Year from 1980 to 2017:

Network Type:

All permanent nets

Network Code:

Event and Station Map



Use left SHIFT + drag mouse to select regions.

select station(s)

by Code by Region by Events

Filter stations by region:

N 44.22

W -14.4 3.09 E

27.27 Clear

S

Streams

by Code by Sampling

Choose the desired set of channels:
Use SHIFT and CTRL to extend the set.

HH
BH
LH
HN

Event and Station List

Request: Freeze Delete Stations Save Stations

Events (2 events)

	Origin Time	Mag.	Type	Lat.	Long.	Depth
☒	2017-08-17T06:44:56	4.2	mb	39.03	-9.08	10.0
☐	2017-08-15T14:50:43	4.7	mb	35.65	5.80	10.0

Stations (104 stations)

	Network	Station	Lat.	Long.	O/R	Streams
☒	CA	CADI	42.34	1.84	O	.BHE,.BHN,.BHZ
☒	CA	CBRU	42.29	2.18	O	.HHE,.HHN,.HHZ
☒	CA	COBS	40.71	1.36	O	.HHE,.HHN,.HHZ
☒	CA	CSOR	42.38	1.13	O	.BHE,.BHN,.BHZ
☒	CA	CTRE	42.32	0.77	O	.HHE,.HHN,.HHZ
☒	CA	EBR	40.82	0.49	O	.HHE,.HHN,.HHZ

select network(s)

All Networks

AD	(1980)	- National Seismic Network of Azerbaijan [ODC]
AC	(2002)	- Albanian Seismic Network [INGV]
AF +	(1980)	- South Africa National Seismograph Network (SANSN-Net) [GFZ]
AI	(1980)	- Antarctic Seismographic Argentinean Italian N [ODC]
AW	(1980)	- AWI Network Antarctica (AWI-Net) [GFZ]
BA	(2005)	- Universita della Basilicata Seismic Network [INGV]
BE	(1980)	- Belgian Seismic Network [ODC]
BN	(1980)	- UK-Net, Blacknest Array [ODC]
BS	(1980)	- Bulgaria Seismic Network [NIEP]
BW	(1980)	- BayernNetz [LMU]
C4	(2017)	- CERN Seismic Network [SED]
CA	(1980)	- Catalan Seismic Network [ODC]
CH	(1980)	- National Seismic Networks of Switzerland [SED]
CK	(1980)	- CAREMON, Central Asian Cross-border Network (CAREMON) [GFZ]
CL	(2000)	- Corinth Rift Laboratory Network [RESIF]
CH	(1980)	- Canadian National Seismograph Network [GFZ]
CQ	(2013)	- Cyprus Broadband Seismological Network [NOA]
CR	(1980)	- CR network [ODC]
CX	(1980)	- IPOC Seismic Network (Integrated Plate boundary Observatory Chile) [GFZ]
CZ	(1980)	- Czech Regional Seismic Network [GFZ]
DK	(1980)	- Danish National Seismic Network [GFZ]
DZ	(1980)	- Algerian National Seismic Network [ODC]
EB	(1980)	- SINGLE STATION [ODC]
EE	(1980)	- Estonian Seismological Network [GFZ]
EG	(1993)	- EUROSEISTEST Strong Motion Network (SDGEE_AUTH) [NOA]
FI	(1980)	- Irish National Seismic Network, DIAS, Dublin, Ireland [GFZ]
ES	(1980)	- SPANISH DIGITAL SEISMIC NETWORK [ODC]
FN	(1980)	- Northern Finland Seismological Network [GFZ]
FR	(1994)	- RESIF and other Broad-band and accelerometric permanent networks in metropolitan France [RESIF]

EIDA interactive portal

[Explore events](#)
[Explore stations](#)
[Submit request](#)
[Download data](#)
[View console](#)

Make Request

Time Window selection:

Relative Mode

Absolute Mode

Use time windows relative to events, by phase and onset time.

Start (minutes before)

P/Pdiff

-

2

End (minutes after)

P/Pdiff

+

10

Request Information:

ArcLink request type:

☒ Waveform (Mini-SEED)
 ☐ Waveform (Full SEED)
 ☐ Metadata (Dataless SEED)
 ☐ Metadata (Inventory XML)

Use compression?

☐ Yes
 ☒ No

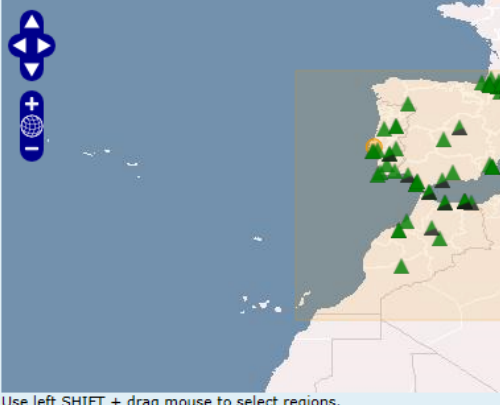
Authentication:

Your e-mail address:

☐ Remember me?

Reset

Event and Station Map



Use left SHIFT + drag mouse to select regions.

Event and Station List

Request:

Freeze

Delete

Events (2 events)

	Origin Time	Mag.	Type	Lat.	Long.
☒	2017-08-17T06:44:56	4.2	mb	39.03	
☐	2017-08-15T14:50:43	4.7	mb	35.65	

Stations (104 stations)

	Network	Station	Lat.	Long.	O/R
☒	CA	CADI	42.34	1.84	0
☒	CA	CBRU	42.29	2.18	0
☒	CA	COBS	40.71	1.36	0
☒	CA	CSOR	42.38	1.13	0

Package 1508414723292

Reroute

Retr

INGV (Italian Seismic)

Request ID: 16044073, Type: WAVEFORM, Encrypted: No, Args: format=MSEED

Description: Package 1508414723292

Status: READY, Size: 0, Info:

Volume ID: INGV, Status: NODATA, Encrypted: No, Size: 0, Info:

[+] 12 lines in this volume

RESIF Data center

Request ID: 290240, Type: WAVEFORM, Encrypted: No, Args: format=MSEED

Description: Package 1508414723292

Status: PROCESSING, Size: 0, Info:

Volume ID: RESIF, Status: PROCESSING, Encrypted: No, Size: 0, Info:

[+] 108 lines in this volume

Volume ID: UNSET, Status: UNSET, Encrypted: No, Size: 0, Info:

[+] 111 lines in this volume

GEOFON Data center

Request ID: 111118707, Type: WAVEFORM, Encrypted: No, Args: format=MSEED

Description: Package 1508414723292

Status: PROCESSING, Size: 0, Info:

Volume ID: GFZ, Status: PROCESSING, Encrypted: No, Size: 0, Info:

[+] 55 lines in this volume

Volume ID: UNSET, Status: UNSET, Encrypted: No, Size: 0, Info:

[+] 227 lines in this volume

KNMI/ODC (Orfeus Data Center)

Request ID: 459594, Type: WAVEFORM, Encrypted: No, Args: format=MSEED

Description: Package 1508414723292

Status: READY, Size: 3323904, Info:

Download Volume

Volume ID: ODC, Status: OK, Encrypted: No, Size: 3323904, Info:

[+] 111 lines in this volume

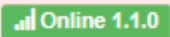
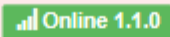
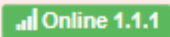
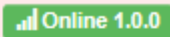
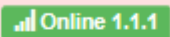
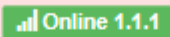
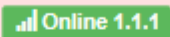
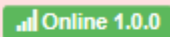
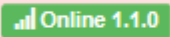
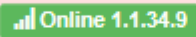
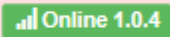
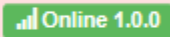
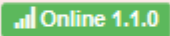
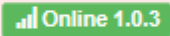
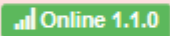
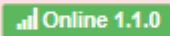
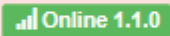
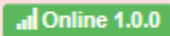
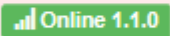
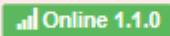
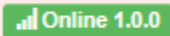
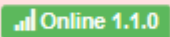
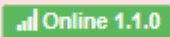
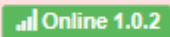
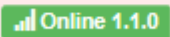
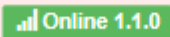
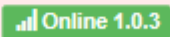
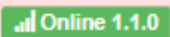
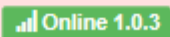
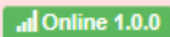
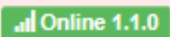
download your requested data from different EIDA nodes

ORFEUS Annual Workshop & Open EPOS Seismology meeting

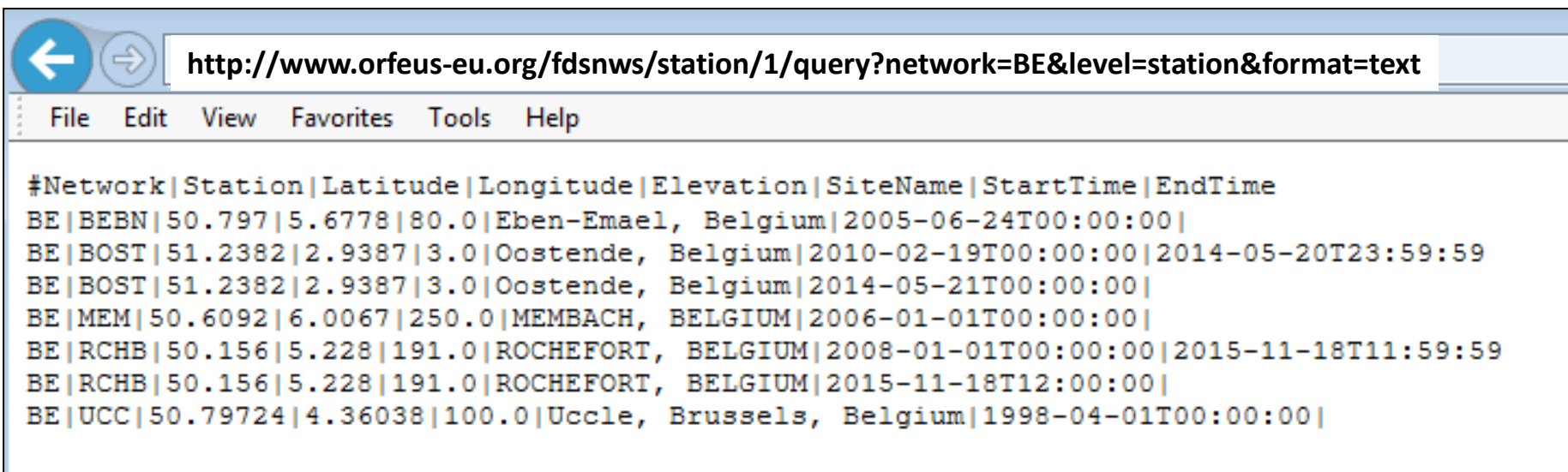
25-27 October, Lisbon, Portugal

EIDA webservices

fdsnws-datasetselect		FDSN standardized webservice for mini-SEED waveform data.
fdsnws-station		FDSN standardized webservice for station metadata.
eidaws-routing		EIDA standardized webservice for routing between EIDA services.
eidaws-wfcatalog		EIDA standardized webservice for waveform metadata.

EIDA Node	FDSNWS-Datasetselect	FDSNWS-Station	EIDAWS-Routing	EIDAWS-WFCatalog
ODC	 Online 1.1.0	 Online 1.1.0	 Online 1.1.1	 Online 1.0.0
GFZ	 Online 1.1.1	 Online 1.1.1	 Online 1.1.1	 Online 1.0.0
RESIF	 Online 1.1.0	 Online 1.1.0	 In development	 Online 1.0.0
INGV	 Online 1.1.0	 Online 1.1.34.9	 Online 1.0.4	 Online 1.0.0
ETHZ	 Online 1.1.0	 Online 1.1.0	 Online 1.0.3	 Online 1.0.0
BGR	 Online 1.1.0	 Online 1.1.0	 Online 1.1.0	 Online 1.0.0
NIEP	 Online 1.1.0	 Online 1.1.0	 In development	 Online 1.0.0
KOERI	 Online 1.1.0	 Online 1.1.0	 Online 1.0.2	 Offline
IPGP	 Online 1.1.0	 Online 1.1.0	 Online 1.0.3	 In development
LMU	 Online 1.1.0	 Online 1.1.0	 Online 1.0.3	 Online 1.0.0
NOA	 Online 1.1.0	 Online 1.1.0	 Online 1.1.1	 Online 1.0.0

EIDA webservices: example fdsnws-station



The screenshot shows a web browser window with the address bar containing the URL: <http://www.orfeus-eu.org/fdsnws/station/1/query?network=BE&level=station&format=text>. The browser's menu bar includes File, Edit, View, Favorites, Tools, and Help. The main content area displays a text-based table of station data for the network 'BE'.

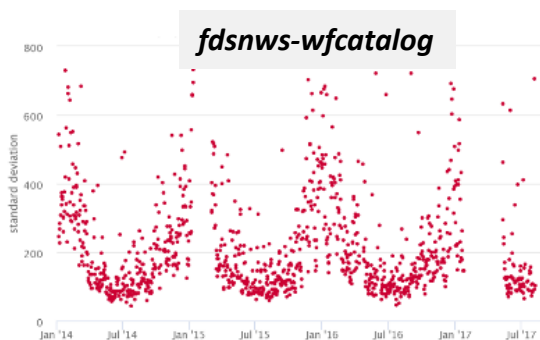
#	Network	Station	Latitude	Longitude	Elevation	SiteName	StartTime	EndTime
1	BE	BEBN	50.797	5.6778	80.0	Eben-Emael, Belgium	2005-06-24T00:00:00	
2	BE	BOST	51.2382	2.9387	3.0	Oostende, Belgium	2010-02-19T00:00:00	2014-05-20T23:59:59
3	BE	BOST	51.2382	2.9387	3.0	Oostende, Belgium	2014-05-21T00:00:00	
4	BE	MEM	50.6092	6.0067	250.0	MEMBACH, BELGIUM	2006-01-01T00:00:00	
5	BE	RCHB	50.156	5.228	191.0	ROCHEFORT, BELGIUM	2008-01-01T00:00:00	2015-11-18T11:59:59
6	BE	RCHB	50.156	5.228	191.0	ROCHEFORT, BELGIUM	2015-11-18T12:00:00	
7	BE	UCC	50.79724	4.36038	100.0	Uccle, Brussels, Belgium	1998-04-01T00:00:00	

EIDA webservice in development

- | | |
|-------------------------------|--|
| eida federator | webservice to provide catalog of data and services at one EIDA node |
| eida mediator | webservice for advanced selection of data across EIDA based on user criteria |
| authentication service | webservice for managing user attributes (e.g. authentication) |

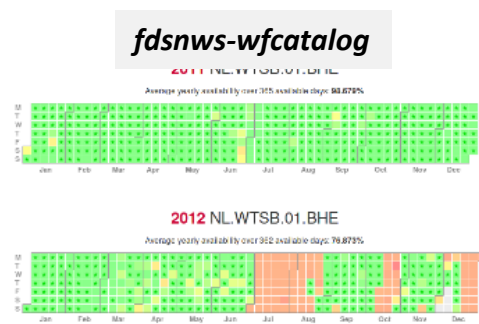
EIDA webservices – example clients

<http://www.orfeus-eu.org/data/odc/quality>



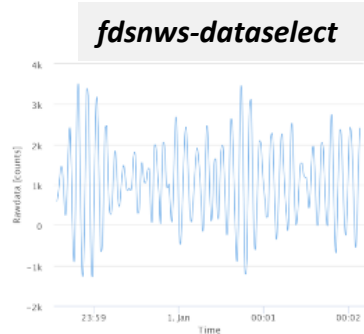
Data Metrics

Graphical interface showing daily waveform metrics.



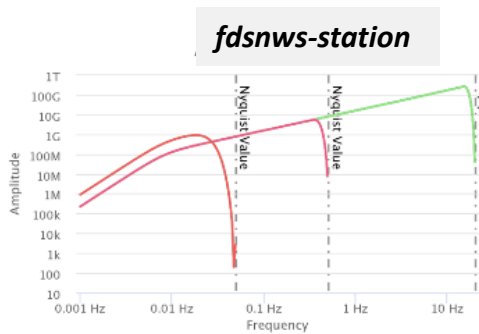
Data Availability

Graphical interface showing daily data availability.



Waveform Viewer

Graphical interface showing for viewing waveform data.



Instrument Response

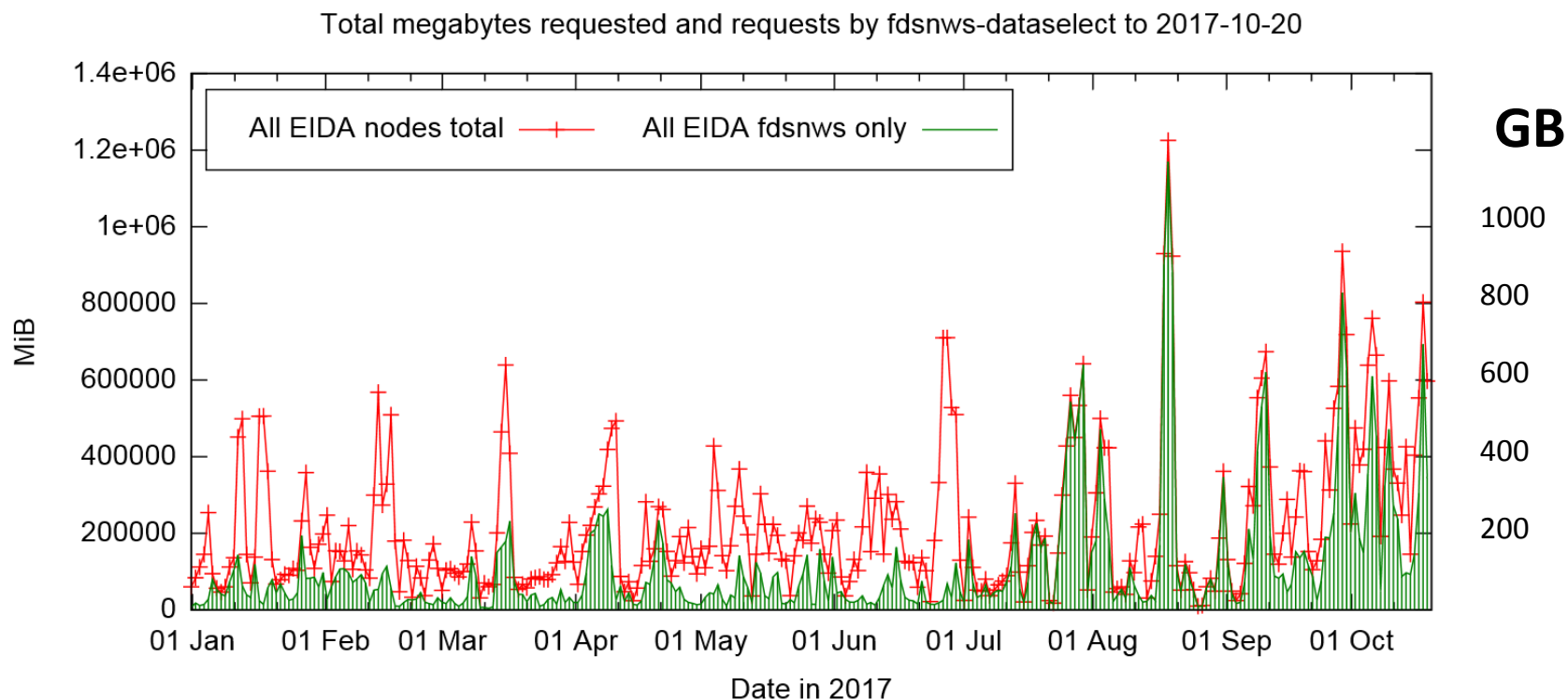
Interface showing instrument response characteristics.

EIDA webservices – example clients

`fdsnws_fetch` - distributed data request tool

- Uses FDSN web services and EIDA routing service
- Supports tokens released by EIDA Authentication Service.
- Client included in ObsPy (next release).
- Provides citation support for each data request (FDSN DOI).

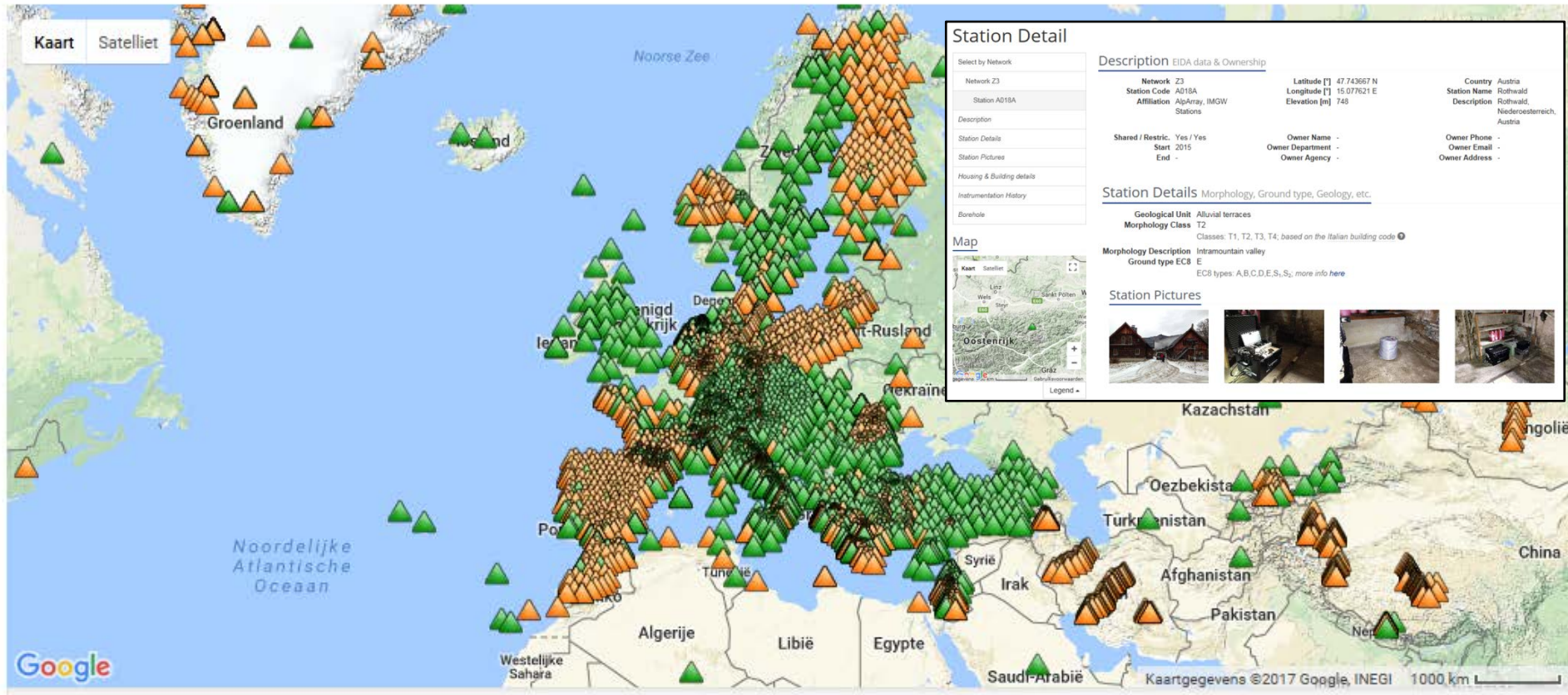
EIDA dissemination tool



European Station Book

www.orfeus-eu.org/stationbook

All stations by time frame



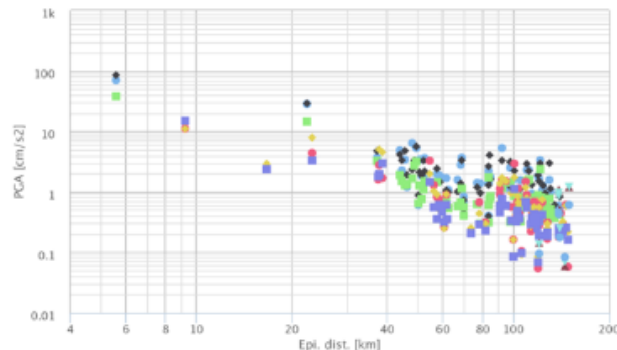
Common network and station metadata: collected automatically from EIDA.
Station and site characteristics: added/edited by network operators.

Strong Motion Data Portals

The Rapid Raw Strong Motion (RRSM) is an entirely automated system that uses open data from **EIDA**. It provides earthquake information and strong motion parameters including PGA and PGV within minutes of any event.

The Engineering Strong-Motion database (ESM) is a reviewed archive of accelerometric waveforms from events with magnitudes above 4.0 recorded in Europe and the middle-East since 1969. It provides unprocessed acceleration time-series, manually processed acceleration, velocity, and displacement waveforms, acceleration and displacement response spectra, and other relevant engineering parameters.

www.orfeus-eu.org/rrsm

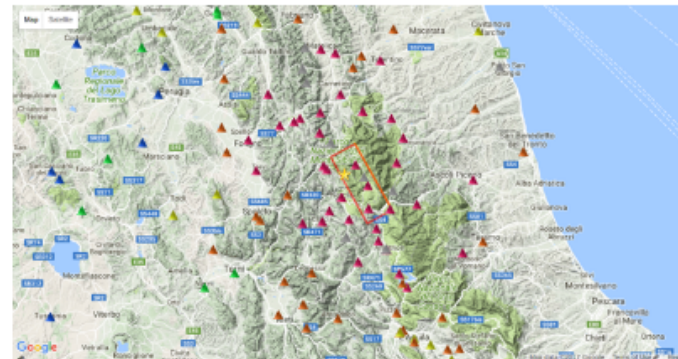


Rapid Raw Strong Motion RRSM

The RRSM portal exposes earthquake information, peak ground motion parameters, and response spectral amplitudes. Waveform data can be downloaded within minutes after an event exceeding magnitude 3.5 in the European-Mediterranean region.

Introducing the European Rapid Raw Strong-Motion Database. C. Cauzzi et al., 2016, Seismol. Res. Lett. 87, 4, doi: 10.1785/0220150271

www.orfeus-eu.org/esm



Engineering Strong Motion ESM

ESM allows users to query earthquake and station information and download earthquake waveforms and response spectra for events with magnitudes above 4.0 recorded in the European-Mediterranean and the middle-East regions.

The Engineering Strong-Motion Database: A Platform to Access Pan-European Accelerometric Data. L. Luzi et al., 2016, Seismol. Res. Lett. 87, 4, doi: 10.1785/0220150278

- The EIDA Management Board, under the ORFEUS and EPOS-S coordination is working on updating formal agreements with NRIs to transparently link their national contributions to EPOS through the various ORFEUS/EIDA nodes.
- Preliminary EIDA Service monitoring is under development (@ ETHZ) to monitor performance of the EIDA overall system:
<http://quake.ethz.ch/eidanodeperformance/>.
- Ongoing effort to obtain better statistics related to data usage (e.g. what data is exported when, and by what clients).

EIDA: Data acknowledgement (Network assigned DOI's)

The FDSN is currently introducing data acknowledgements through DOI's
For each network. Example (see statement in the EIDA web pages:

Some of the data sets distributed by EIDA have **DOI's** (**Digital Object Identifier**) associated with their seismic network according to a standard procedure recently proposed to FDSN. Where this is the case, this will be shown on the **ORFEUS EIDA network list** page for that network. Please use the DOI indicated in your acknowledgments or citations as appropriate, if one is available.

Here the typical citation format recommended by FDSN:
Creator (Year): Title. Publisher. ResourceType. DOIName

Example for the GE (GEOFON) seismic network:
GEOFON Data Centre (1993): GEOFON Seismic Network. Deutsches
GeoForschungsZentrum GFZ. Other/Seismic Network. doi:10.14470/TR560404.

Benefits of joining EIDA:

- Increased visibility (national level, European, Global)
- Increased usage of data
- Joint technical developments
- Distributed technical knowledge
- Up-to-date and homogenized usage of standardized services
- ...

What data should an EIDA node offer?

All EIDA nodes must offer access to:

- *Waveform data*: through Dataselect and Arclink,
- *Inventory*: through Station-WS and Arclink,
- *Routing Information*: for the Routing Service(s) @ODC, GFZ, etc,
- *Quality metrics of the data*: through WFCatalog.

Which services should an EIDA node run?

Mandatory services are:

- Arclink
- FDSN-WS
 - Dataselect
 - Station-WS
- WFCatalog
- Webreqlog (daily report for statistics)
- Extension to Dataselect for AAI (“auth” method)

Which services should an EIDA node run?

Optional services are:

- Routing Service
- WebDC3 interface
- FDSN Event-WS
- WFCatalog frontend (availability and other metrics)

Technical requirements

- High data quality for archives:
 - Waveforms (miniSEED format),
 - Inventory (any of StationXML, datalessSEED, InventoryXML).
- Service availability: 95% (minimum was 97% in 2013).
- Contact person for technical issues and maintenance.
- Reaction time for problems in less than 48 hs.
- At least one backup copy of all data.
- Infrastructure should be able to serve all EIDA inventory.

Monitoring before integration

- Arclink server reachable for the machine monitoring it. Availability, up- and response time will be monitored for some weeks (ca. 4-6).
- Declare a list of networks from which the new node is the main responsible.
- Send a list of streams, already distributed by other node and how the routing table should look like (priority 1 or 2, etc.).
- Send a list of new streams.
- Waveform requests will be made regularly to measure the performance of the service (Arclink and WS).