



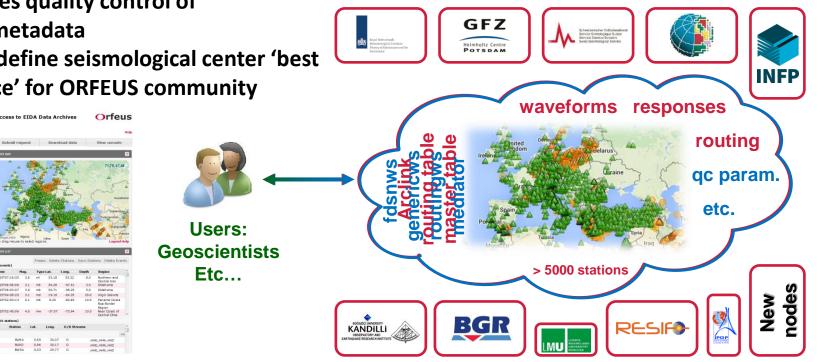
# **ORFEUS** data infrastructure, services and products

### EIDA => EIDA-Next Generation

More than just data and federated archive

- Coordination of data holdings and software/strategic developments
- Provides quality control of data/metadata
- Helps define seismological center 'best practice' for ORFEUS community

http://www.orfeus-eu.org/eida/eida.html







# ORFEUS data infrastructure, services and products NERA key products: Station Inventory, RRSM and ESM NERA

**Station inventory:** up-to-date station information ("Station Book") for strong motion and broad-band stations operational in Europe (station metadata, site characterization). <u>www.orfeus-eu.org/stationbook</u>

**Rapid Raw Strong Motion database (RRSM):** a high-quality, automatically and rapidly filled database build on state-of-the-art data collection and processing software to provide near real-time (web) access to open (unrestricted) strong motion data after a significant earthquake in Europe.

http://www.orfeus-eu.org/rrsm

**Engineering Strong Motion database (ESM):** a single, high quality database with historical and present time strong motion waveforms and carefully reviewed metadata, dynamically updated with manually processed data when significant new events occur. <u>http://www.orfeus-eu.org/esm</u>





# **ORFEUS data infrastructure, services and products**

## NERA key products: Station Inventory, RRSM and ESM

#### NERA

#### RRSM Rapid Response SM

# Collection of accelerometric data from EIDA immediately after an earthquake

- Magnitude threshold: 3.5
- since 2005
- wfs are processed automatically (software scwfparam module of SeisComP3 )
- Station and event metadata are not revised
- Input for SHAKEMAPS provided

#### At 2015-06-15:

- 3700 events
- >50000 waveforms,
- only digital instruments
- raw wf, DS and PSA (5%-dam.) comp. up to 10s
- PGA and PGV, SA @ 0.1s 0.3s and 1s

### ESM Engineering SM

# **Collection of accelerometric data from EIDA and/or offline data**

- Magnitude threshold: 4
- since **1969**
- wfs are processed manually (Paolucci et al. 2011)
- Station and event metadata are periodically revised

#### At 2015-06-15:

- 2345 events
- 2500 stations
- 14800 waveforms including records from analog instruments
- Unpr. acc, vel, DS and PSA (5% damping) PGA, PGV, PGD





#### Observatories and Research Facilities for European Seismology

## **Digital Object Identifiers for seismic networks**

"... to ensure that permanent seismic networks and individua experiments undertaken by small groups or individuals are reliably identified in citations b researchers or monitoring networks that make use of their data ..."

FDSN recommendations for seismic	network DOIs
and related FDSN services	
Adam Clark (1), Peter L. Evans (2), Angelo Strollo (2)	
1. Incorporated Research Institutions for Seismology (IRIS), 1200 New York	Automa MM Tulke 450
Washington, DC 20005, 202-682-2220. adam@iris.washington.edu	Arease any, sere see,
2. Deutsches GeoForschungsZentrum GFZ, Telegrafenberg, 14473 Potsdam, (perann,strollo)@gfz potsdam.de	Germany,
Version 1.0	
21 July 2014	
0. Preamble and overview	
<ol> <li>FDSN recommendations for metadata fields, citation format an 1.1 FDSN Metadata Field Recommendations</li> </ol>	d landing page
Mandatory (Citation) Fields	
Creator	
Title	
Publisher	
Publication Year	
Recommended Fields	
Resource Type	
Description	
Format	
Optional Fields	
Contributor	
Location	
Size	
Date	
Belated Identifier	
1.2 Citation Format	
1.3 Landing Page	
2. DOI services to be offered by FDSN	
2.1 DOI Mapping Service	
1. Single Value Lookup	
2. Temporary Network Listing	
3. Full Data Retrieval	
Virtual Networks	
Data Storage	
Usage 2.2 DOI Generation and Management Service ("FDSN-minted DO	1-71
2.2 DOI Generation and Management Service (1+DSN-minted DO DOI Naming Convention	12.1

http://www.fdsn.org/services/doi/

	ories and Research Facilities for Euro	pean seismoto	CETURE LINKS				Helmholtz-	Zentrum			GEOF	ON Progra	am			
ROME	DAZIA EXATTI QUANE S VICATION	GROUPS SO	KOPTINHIE LINKS	ORGAN ZACION			Pots	DAM								G
ORFEUS EI	DA permanent and tempo	ary networ	ork list				Mission	Earthquak	te Info	Waveform Ad	cess		Sol	ftware	Contrib	ute
Tables generated b	by ODC at 2015-06-25 12:15:02.							Basic Netw	ork Info	rmation						
Permanent	EIDA Stations (83)							Network code	e: CE	-	vpe: Permanent		Identif	Ser doi:1	0.14470/TR5	NON ON
Search:								Restricted	d: No	Archive	d at: GFZ		North		tion informat	
FOSN Network No	ietwork Description	Number of O	Organization	Region	Archive	I den tifter		Network KML file		in Google Earth)			DataCite metada Seismic metada			
	lational Seismic Network of Azerbaijan	3 R	RSSC-ANAS	Azerbaijan	ODC			Time Range Institution(s		tners			Seismic metada	ata: Stath	ON XINL	
AI AI	intarctic Seismographic Argentinean Ialian Network	s o	OGS, IAA	Antarctica	ODC			Creator(s	): GEOFC	N Data Centre						
	WI Network Antarctica (AWI-Net)	18 A	AWI	Antarctica	GFZ						Potsdam, German ngsNetz) is the gl					
BA U	iniversita della Basilicata	1			INGV			Abstrac			(GFZ). The GEOF					
	lelgian Seismic Network		ROB	Belgium	ODC				pillars o	f the GEOFON p	ogram dedicated t	to Ernst von	Rebeur-Paschi	witz, prop	ooser of a glo	ibal ean
	K-Net, Blacknest Array Julgaria Seismic Network	5 A	AWE Blacknest	United Kingdo	Im ODC						ecorded the first te					
	ayernNetz	62			LMU						ated to provide hig ogical community.					
	atalan Seismic Network		105C	Catalonia	ODC				distribu	tion while keeping	the high quality b	road-band d	ata in focus. To	day the r	network plays	a lead
он о	H - Swiss Seismological Network		Swiss Seismological Service	Switzerland	SED						ogy providing valua					
	AREMON, Central Asian Cross-border	- K	Kyrgyz Institute of	Central Asian	GEZ .	-					rojects at GFZ an than 50 internatio					
N	letwork (CAREMON) Iorinth Rift Laboratory (FRANCE)	/ 5 17	Seimology	Curtie Asien	RESIT	411	)		contine	ts, but concentra	ted in Europe and	the Mediterr	anean region a	s well as	in the Indian	Ocean
	anadian National Seismograph Network		GLISN	Canada	GFZ						med by local partr					
GR 0	zoatian Seismograph Network	1 U	Univ. Zagreb	Croatia	ODC						ced technically whi rerally STS-2) that					
~ 19	POC Seismic Network (Integrated Plate	20 G	GFZ/IPGP	Northern Chile	GFZ	doi					hquakes to the larg	gest global e	arthquakes. De	sta from a	all stations a	re freely
	aundary Observatory Ohle) Zech Regional Seismic Network Internation	14 1	GF2/IPGP IGCAS/IPEMU	Czech Rep.	GFZ	dai	)	For instructions	high-fre redistrit at the G Modulai * Descrip	quency local earl uted in real-time EOFON data cer Earth Science Ir tion is taken from	hquakes to the larg for earthquake mo tre via wired or sat frastructure (MES) seismic metadata, and metadata for	nitoring and tellite links. I) housed at and may not	tsunami warnir Archived data i: GFZ. match the pref	ng center s also av ferred title	rs immediate allable. GEC e for citations	ly after FON is
	aundary Observatory Ohle) Zech Regional Seismic Network Internation	14 1	IGCAS/IPEMU	Czech Rep.	GFZ	dos	)	For instructions of GE Network State	high-fre redistril at the G Modular * Descrip on retrievin	quency local earl uted in real-time EOFON data cer Earth Science Ir tion is taken from	for earthquake mo tre via wired or sat frastructure (MES) seismic metadata,	nitoring and tellite links. I) housed at and may not	tsunami warnir Archived data i: GFZ. match the pref	ng center s also av ferred title	rs immediate allable. GEC e for citations	ly after a FON is
CX B CZ CA Fore Nets Network	eundary Otel Zech Regional Seemic Nations Internation works Codes	14 II	iccus/iPew	Crech Rep. Se ismograph	Grz	doi	)		high-fre redistril at the G Modular * Descrip on retrievin	quency local earl uted in real-time EOFON data cer Earth Science Ir tion is taken from	for earthquake mo tre via wired or sat frastructure (MES) seismic metadata,	nitoring and tellite links. I) housed at and may not	tsunami warnir Archived data i: GFZ. match the pref	ng center s also av ferred title	rs immediate allable. GEC e for citations	ly after a FON is
CX S	avadary Observatory Obiel Zech Regional Steamic Network SNA works Codes twork codes are assigned by the FDSN ar	14 II	iccus/iPew	Crech Rep. Se ismograph	Grz	doi	)		high-fre redistril at the G Modular * Descrip on retrievin	quency local earl uted in real-time EOFON data cer Earth Science Ir tion is taken from	for earthquake mo tre via wired or sat frastructure (MES) seismic metadata,	nitoring and tellite links. , I) housed at and may not this and othe	tsunami warnin Archived data ii GFZ. match the pref r seismic netw	ng center s also av ferred title	rs immediate allable. GEC e for citations	ly after a FON is
CX S	eundary Otel Zech Regional Seemic Nations Internation works Codes	14 II	iccus/iPew	Crech Rep. Se ismograph	Grz	doi	)		high-fre redistril at the G Modular * Descrip on retrievin	quency local earl uted in real-time EOFON data cer Earth Science Ir tion is taken from	for earthquake mo tre via wired or sat frastructure (MES) seismic metadata,	nitoring and tellite links. , I) housed at and may not this and othe	tsunami warnir Archived data i: GFZ. match the pref	ng center s also av ferred title	rs immediate allable. GEC e for citations	y after a
Home Network	Anothery Observatory Onlea Seach Regional Seamic Network SNO Works Codess Nords codes are analgred by the FDSN are tetroshic codes (Other available formats) Nords (Codess) Nords (Cod	14 II	iccus/iPew	Crech Rep. Se ismograph	Grz	desi	)		high-fre redistrik at the G Modulai * Descrip on retrievit tion Map	quency local eart uted in real-time EDFON data cer Earth Science in tion is taken from g waveform data	for earthquake mo tre via wired or sat frastructure (MES) seismic metadata,	nitoring and tellite links. , I) housed at and may not this and othe	tsunami warnin Archived data ii GFZ. match the pref r seismic netw	ng center s also av ferred title orks, see	rs immediate allable. GEC e for citations	ly after a FON is
Home Network Request a new or Show network	anders Oberantizy Obe Sach Regional Searce Service. International services ECodes Ecodes Ecodes Anternative Profile of a extensive code   Obera analizie formas: Krysma Mar Remarkst. Remains/ work codes (code grafie)	14 II	IGCAS/TPEMU	Ceech Rep.	Grz	desi	)		high-fre redistrik at the G Modulai * Descrip on retrievin tion Map	quency local eart uted in real-time EDFON data cer Earth Science in tion is taken from g waveform data	for earthquake mo tre via wired or sat frastructure (MES) seismic metadata,	nitoring and tellite links. , I) housed at and may not this and othe	tsunami warnin Archived data ii GFZ. match the pref r seismic netw	ng center s also av ferred title orks, see	rs immediate. ailable. GEC e for citations e here.	ly after a FON is
Home Nets	Analysis Call and Angele Angel	14 II	IGCAS/TPEMU	Ceech Rep.	Grz		)		high-fre redistrik at the G Modulai * Descrip on retrievit tion Map	quency local eart uted in real-time EDFON data cer Earth Science in tion is taken from g waveform data	for earthquake mo the via wired or sal frastructure (MES) seismic metadata, and metadata for	nitoring and tellite links. , I) housed at and may not this and othe	tsunami warnin Archived data ii GFZ. match the pref r seismic netw	ng center s also av ferred title orks, see	rs immediate. ailable. GEC e for citations e here.	ly after a FON is
Home Nets	anders Oberantizy Obe Sach Regional Searce Service. International services ECodes Ecodes Ecodes Anternative Profile of a extensive code   Obera analizie formas: Krysma Mar Remarkst. Remains/ work codes (code grafie)	14 II al Federation	IGCAS/TPEMU	Ceech Rep.	Grz		)	GE Network Stat	high-fre redistril at the G Modulau * Descrip on retrievit tion Map	quency local eart uted in real-time EDFON data cer Earth Science in tion is taken from g waveform data	for earthquake mo tre via wired or sat frastructure (MES) seismic metadata,	nitoring and tellite links. , I) housed at and may not this and othe	tsunami warnin Archived data ii GFZ. match the pref r seismic netw	ng center s also av ferred title orks, see	rs immediate. ailable. GEC e for citations e here.	ly after a FON is
Home Nets	Analysis Call and Angele Angel	14 II	IGCAS/TPEMU	Ceech Rep.	Grz		)	GE Network Stat	high-fre redistril at the G Modulau * Descrip on retrievit tion Map	quency local eart uted in real-time EDFON data cer Earth Science in tion is taken from g waveform data	for earthquake mo for earthquake mo trastructure (MES) seismic metadata, and metadata for	nitoring and tellite links. , I) housed at and may not this and othe	tsunami warnin Archived data ii GFZ. match the pref r seismic netw	ng center s also av ferred title orks, see	rs immediate. ailable. GEC e for citations e here.	ly after a FON is
Home Nets	Analysis Call and Angele Angel	14 II al Federation	IGCAS/TPEMU	Canh Res. Se is mograph ess to selsmological w   x   y   2	GFZ		)	GE Network Stat	high-fre redistril at the G Modulau * Descrip on retrievit tion Map	quency local eart uted in real-time EDFON data cer Earth Science in tion is taken from g waveform data	for earthquake mo the via wired or sal frastructure (MES) seismic metadata, and metadata for	nitoring and tellite links. , I) housed at and may not this and othe	tsunami warnin Archived data ii GFZ. match the pref r seismic netw	ng center s also av ferred title orks, see	rs immediate. ailable. GEC e for citations e here.	ly after a FON is
Home Nets	Analysis Call and Angele Angel	14 II al Federation	IGOLS (PERU	Crech Rep.	Grz		)	GE Network Stat	high-fre redistrit at the G Modulai * Descrip on retrievit tion Map	quency local eart uted in real-time EDFON data cer Earth Science in tion is taken from g waveform data	for earthquake mo for earthquake mo trastructure (MES) seismic metadata, and metadata for	nitoring and tellite links. , I) housed at and may not this and othe	Isunami varnin china data i crichived data i SFZ. match the pref r seismic network of the set of	ng center s also av ferred title orks, see	rs immediate. ailable. GEC e for citations e here.	ly after a FON is
Hone Network The following net Regrets an evo Show network Show only net Show only net Show only network Show only network Show only network	maning the angular determines that a second se	14 II al Federation thive (IRIS DMC) (L M N O P Search network of	IGOLS (PERU	Cench Res.	GFZ		)	GE Network Stat	high-fre redistrit at the G Modulai * Descrip on retrievit tion Map	uency local earlied	for earthqueke mo for earthqueke mo fastructure (MES session enteddata) and metadota for the session enteddata metadota f	nitoring and tellite links. , I) housed at and may not this and othe	tsunami warnin Archived data ii GFZ. match the pref r seismic netw	ng center s also av ferred title orks, see	rs immediate. ailable. GEC e for citations e here.	ly after a FON is
C Terrer Nets Regress a new or Stow retwork Stow only net 12 24 49 Search for retwork networkcode	Analysis and a second sec	14     11       al Federation       chive (IRIS DMC)       Search       search       Instruction       Instruction       Instruction       New Mexit	Council (1999)     Council	Cench Res.	GFZ		)	GE Network Stat	high-fre redistrit at the G Modulai * Descrip on retrievit tion Map No Atta Oct	uency local earl ued in real-ime EOFON data cer Earlh Science in Earlh Science in gu aveform data in taken from gu aveform data	for earthqueke mo for earthqueke mo frastructure (MES seismic metadata, and metadata for reme to the seismic metadata per to the seismic metad	nitoring and tellite links. , I) housed at and may not this and othe	Isunami vernin tsunami vernin	ng center s also av ferred title orks, see	rs immediate. GEC eilable. GEC e for citations e here.	ly after a FON is
C C C C C C C C C C C C C C C C C C C	Analysis and a second sec	14     11       all Federation       thive BRIS DMCD       thive BRIS DMCD       Search       search       instruction       instruction       instruction       Mining 62       NMLUSAP	don of Digital don don don don don don don don don don	Czech Rep. Setermograph ess to selsmological w x y z z u FR: france EUS United Soates 1	orz Network data streams. deployment country (region france		)	GE Network Stat	high-fre redistrik at the G Modulai • Descrip on retrievit tion Map No Atla Occ	uency local earliers tued in real-time EXPON data cer Expr Science in Earliers is taken from up waveform data in the from up waveform data in the from up waveform data in the from up waveform data is taken from up wav	for earthqueke mo for earthqueke mo frastructure (MES seismic metadata, and metadata for reme to the seismic metadata per to the seismic metad	nitoring and tellite links. , I) housed at and may not this and othe	Isunami vernin tsunami vernin	ng center s also av ferred title orks, see	rs immediate. GEC eilable. GEC e for citations e here.	vous new Guera
The fullowing set	maniner Observe Week     manual      manual      manual     m	14     11       all Federation       chive URIS DMC)       Search       search       Instruction       Instruction       NMU USA       Rhive URIS DMC	don of Digital don don don don don don don don don don	Const Rep. Se Brings aph ess to selunological w x v z constay est Tre France 1 Sociel 1 S	GPZ			GE letwork Stat	high-fre redistrik at the G Modulai * Descrip on retrievit tion Map No Atta Occ Bazel Bazel Work Info	uency local earliers tued in real-time EXPON data cer Expr Science in Earliers is taken from up waveform data in the from up waveform data in the from up waveform data in the from up waveform data is taken from up wav	for earthquee mo for earthquee mo fastructure (MES) session metadata, and metadata for the session metadata for the sessi	nitoring and tellite links. , I) housed at and may not this and othe	Isunami vernin tsunami vernin	ng center s also av ferred title orks, see	rs immediate. GEC eilable. GEC e for citations e here.	vous new Guera
Reme         Net           Home         Net           Home         Net           Second remove         Net           Second remove         Net           Second remove         Net           Second remove         Net           Net         Net           Second remove         Net           Network code         Net (2009-2002)           Net (2003-2012)         Net (2004-2015)	maniner Observe Week     manual      manual      manual     m	14     11       all Federation       chive URIS DMC)       Search       search       Instruction       Instruction       NMU USA       Rhive URIS DMC	IDENCYPERU IDEN OF DIGITAL DEPROVE UNQUERU OF PROVE UNDU OF PROVE	Const Rep. Se Brings aph ess to selunological w x v z constay est Tre France 1 Sociel 1 S	deta streams. deta streams. depkyment country/region France United States Cermany			GE Inetwork Stat	high-frei redistriite Modulaatie	uency local earlied BUD and a set of the set of the set of the BUD and the set of the set of the set of the BUD and the set of the set of the set of the and set of the set of the set of the set of the Set of the set of the set of the set of the Set of the set of the set of the set of the Set of the set of the set of the set of the Set of the set of the set of the set of the Set of the set of the set of the set of the Set of the set of the set of the set of the Set of the set of the set of the set of the Set of the set of the set of the set of the Set of the set of the set of the set of the Set of the set of the set of the set of the set of the Set of the set of the Set of the set of the Set of the set of the Set of the set of the Set of the set of t	for earthquike mo for earthquike mo fastructure (MES) seismic metadata, and metadata for the seismic metadata for the sei	intering and intering and intering and intering and tellile links.	Isunami vernin tsunami vernin	ng center s also av ferred title orks, see	rs immediate. GEC eilable. GEC e for citations e here.	vous new Guera

Related Reference(s): 1. Hanka, W.; Kind, R.: The GEOFON Program. Annals of Geophysics v. 37, n. 5, Nov. 1994. ISSN 2037-416X. doi:10.4401/ag-4196 [+]

#### Network Station List (Network Code: GE)

#	Station Code	Station description	Begin	End	Loc	Channels	
<<	return to ne	twork list					
1	APE	GEOFON Station Apirathos, Naxos	2000-200	2008-122	H	HE BHN BHZ HHE HHN HZ LHE LHN LHZ SHE HN SHZ VHE VHN VHZ	

#### FDSN plenary session, Prague, June 26. 2015

UC Sente Cruz

HELIS: United

US: Uniter

B (2014-2014) Sweetwater Array

Seismic Characterization of Menenga

Whillans/UCSC

1C (2009-2010) Urban Seisr

D (2014-2014) MSH Node Array





## **Digital Object Identifiers for seismic networks**

ResearchGate		GFZ	GEOFON			
		Helmholtz-Zentrum	GEOFON Program		GEOF	DEUTSCHE ForschungsZentru
Article		Mission   Earthquake Info	Waveform Access	Software	Contribute   C	ontact   Hor
Development and Operation of a Regional Moment Tensor Analysis System in the Philippines: Contributions to the Understanding of Recent Damaging Earthquakes		Basic Network In Network code: GE Restricted: No Network KUIL file: % (X)	Type: Permanent Archived at: GFZ	Identifier: doi:10.1 (Citation ite metadata: [HTML]	information)	
😰 Punongbayan 📃 Hiroyuki Kumagai 🧮 Nelson Pulido		Time Range: 1993 Institution(s): GFZ/		nic metadata: Station )	KML	
Dun Bonita Assanu Nakano Z Tadashi Yamashina [more]		Creator(s): GEO Description*: GEO		el broed-bend networ	r onersted by the Ge	in the second
O 10015: ABSTRACT A network of 10 satellite-telemetered broadband sta-6ons was establahed under a cooperative project be-tween. Japan and the Philippines, and a source analysis system based on waveform inversion of regional seamegra: [more]		GeoF pillar monit seism stand	iorschungsZentrum (GFZ). The GEOFON seismic netw softhe GEOFON program dedicated to Ernst von Rebe oring systam, who recorded the first teleseismic seism nic network were created to provide high quality broad- bards in the seismological community. The network has t ution while keening the high quality broad-band data in	ork came into being i ur-Paschwitz, propos ogram in Potsdam in 1 and data for scientific evolved towards real-t	n 1993 as one of the i er of a global earthqu 889. The program an use and foster comm ime data acquisition	three uake nd its mon and
Full-text	Download full-text	globa	I real-time seismology providing valuable data for almo- nological research projects at GFZ and the wider seism	st all fundamental and	applied global/regio	onal
Available from: Nelson Pulido, Feb 03, 2015		opera	ted jointly with more than 50 international partners and i	n 2014 consists of ab	out 80 active stations	s on all
		opera netwo	nents, but concentrated in Europe and the Mediterraneau tion is mostly performed by local partners with GFZ gui rk to be well-advanced technically while still extremely i-band sensors (generally STS-2) that allow resolution o	dance and logistic su cost-effective. All stat	oport, allowing the glo ions are equipped wi	lobal ith
REFERENCES (23) CITED IN (0) So	orted by Appearance in publication +		frequency local earthquakes to the largest global earthq tributed in real-time for earthquake monitoring and tsun			uisition
Article: Estimation of the magnitudes and epicenters of Philippine historical earthquake Maria Leonia P Bachta, Kasso Olike	ies.	at the Modu	GEOFON data centre via wired or satellite links. Archin lar Earth Science Infrastructure (MESI) housed at GFZ. ription is taken from seismic metadata, and may not matc	ved data is also availa	ible. GEOFON is pai	rt of the
[Show abstract] Technophysics 02(2000; 317:137-160, DOI:10.1016/S0040-1951(99)00272-3 - 2.87 Impact Factor		For instructions on retrie	ving waveform data and metadata for this and other seis	smic networks, see he	re.	
Performance of Broadband Selsmic Network of the Philippines. AA Melosantos, K.V.C.Soriano, P.C.M.Alcones, J.U.Pantig, J.D.Bont Innov. Journal of Dip-aster Research 19 2015.	ta, I C Narag H Kumagal, H		lorth	n Mongola Chas	Jupan	đ
GEOFON Seismic Network. Gedin Data, Centre . 1993. Deutsches GeoForschungsZentum GFZ, OtweiSteismic Network. Article: Waveform Inversion in the frequency domain for the simultaneous determination mechanism and moment function. M Assans, H, Numagie, H, Noos (phow assang) Geow assang) Geow assang)	on of earthquake source		Janie Genn Marti	nda Theland	north Kores Depus New Cuinea Australia	
Article: Real-time earthquake monitoring for tsunami warning in the Indian Ocean and b	beyond	[Re-center]	Atlantic Ocean South Africa	¥	Terms of U	lse
Hanka W, Saul J, Weber B, Becker J, Harjadi P, Fauzi, GITEWS Seismology Group (thew ebstract)		Extended Network In	formation for network GE			
National Instantia and earth system sciences 01/0010; 10(12): 00110.5114/bitess-10-2011 - 5423 Impact Pactor		Title	work Information. GEOFON Date Centre GEOFON Seismic Network Deutsches GeoForschungsZentrum GFZ			
Article: Discrete wave number representation of elastic wave fields in three-space dim Michel Bourbon	nensions		doi:10.14470/TR560404 GEOFON Data Centre (1993); GEOFON Seismic Networ	k. Deutsches GeoFor	schungsZentrum GFZ	Ζ.
[Deven shafted] Journal of Geophysical Research Atmospheres 011579; 84:3063-3014 DOI 10.1029/30504857p23009 - 3.44 Impact Factor		Related Reference(s)	Other/Seismic Network. doi:10.14470/TR560404.           1. Hanka, W.; Kind, R., The GEOFON Program. Anna 2037-416X. doi:10.4401/ag-4196           [+]	als of Geophysics v. 3	7, n. 5, Nov. 1994. ISI	SN
The authors of this publication are on ResearchGate and have made the full-text available on their profiles. Life full-text	free account to access tt version from them.	× Network Station List # Station Code Station		End Loc	Channels	
Article: Development and Operation of a Regional Moment Tensor Analysis Job System is the Palipower Contributions to the Understanding of Recent Damaging Enthquakes Available three Telator Palas	sin for free	<< return to network list		08-122 - BHE BH HHZ LF	1	