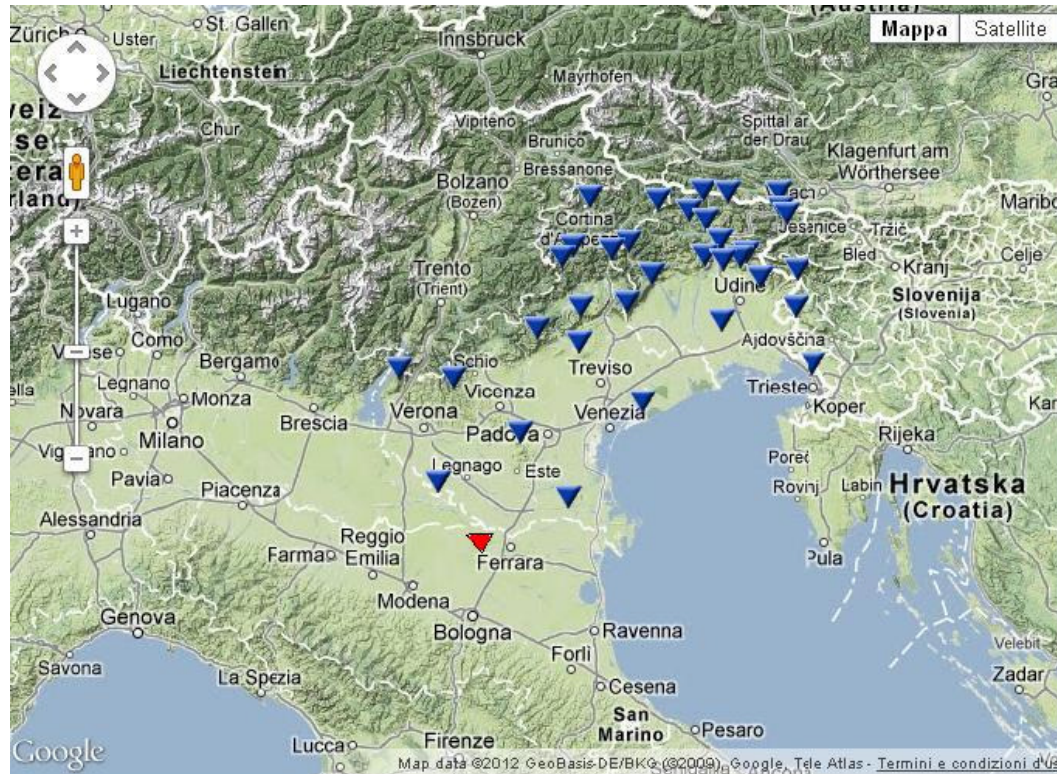




2014 status of the Northeast Italy Seismic Network

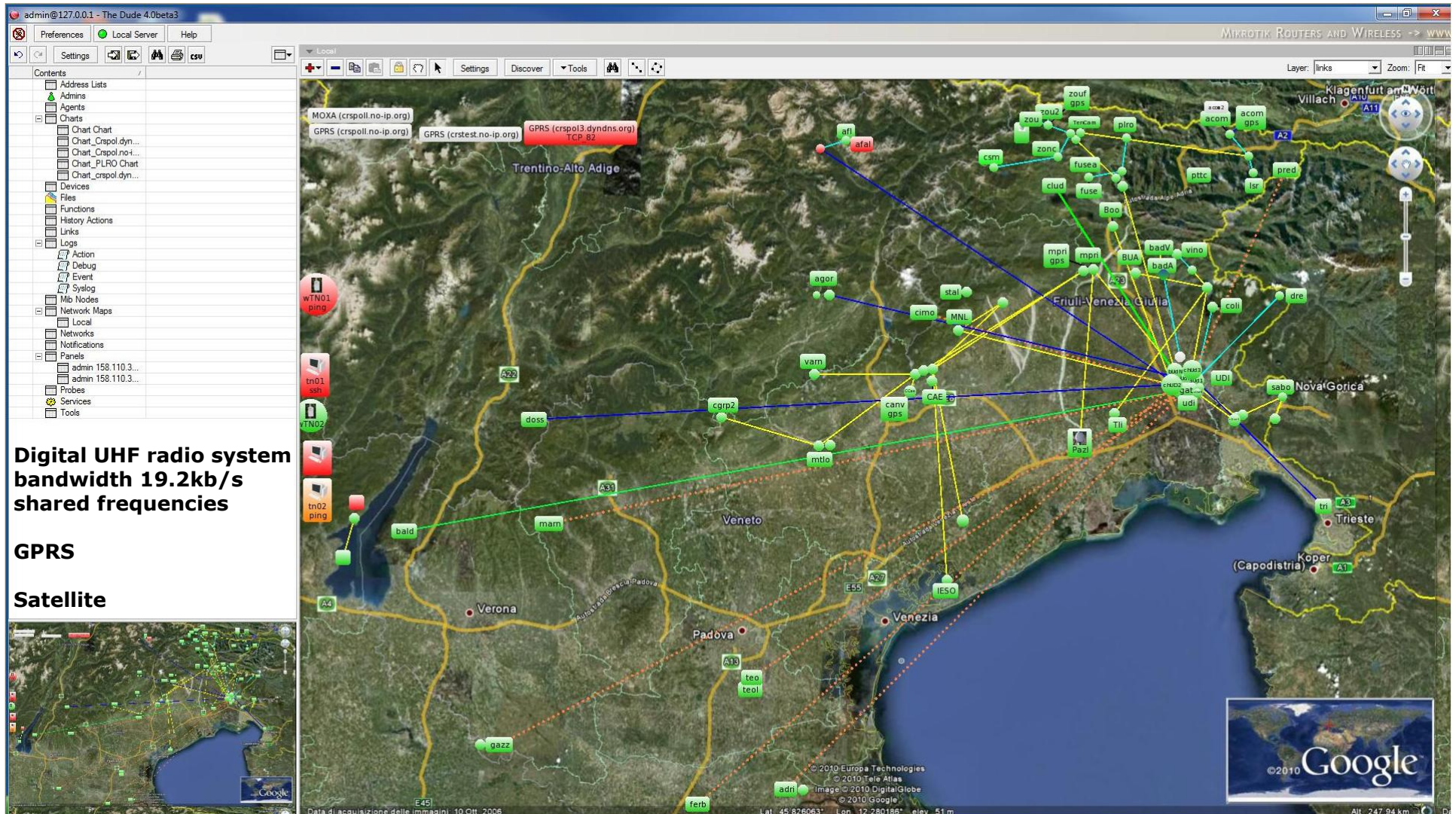
Damiano Pesaresi
dpesaresi@inogs.it
AUG Baku May 2014

NE Italy Seismic Network - OGS



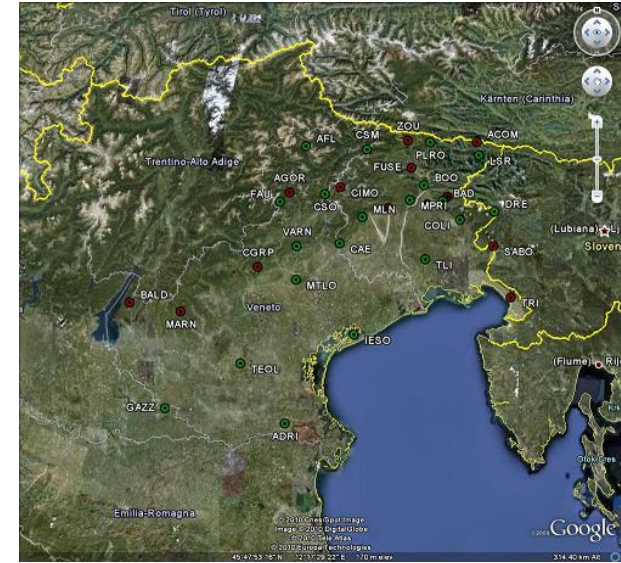
- 19 BB stations
 - Q330 + STS-2/Trillium 40/120s
 - **DM24 + CMG-3TB**
 - real time, continuous
- 20 SP stations
 - Mars88 + Lennartz 1sec
 - real time, on trigger

How is data transmitted?



OGS-CRS: monitoring NE Italy seismicity

- 2 people on call duty H24 for 1 week
 - 1 seismologist + 1 technician
- Intervention in office for events with $M > 3.5$
- OGS staff intervention at Civil Protection headquarters for events with $M > 4.5$

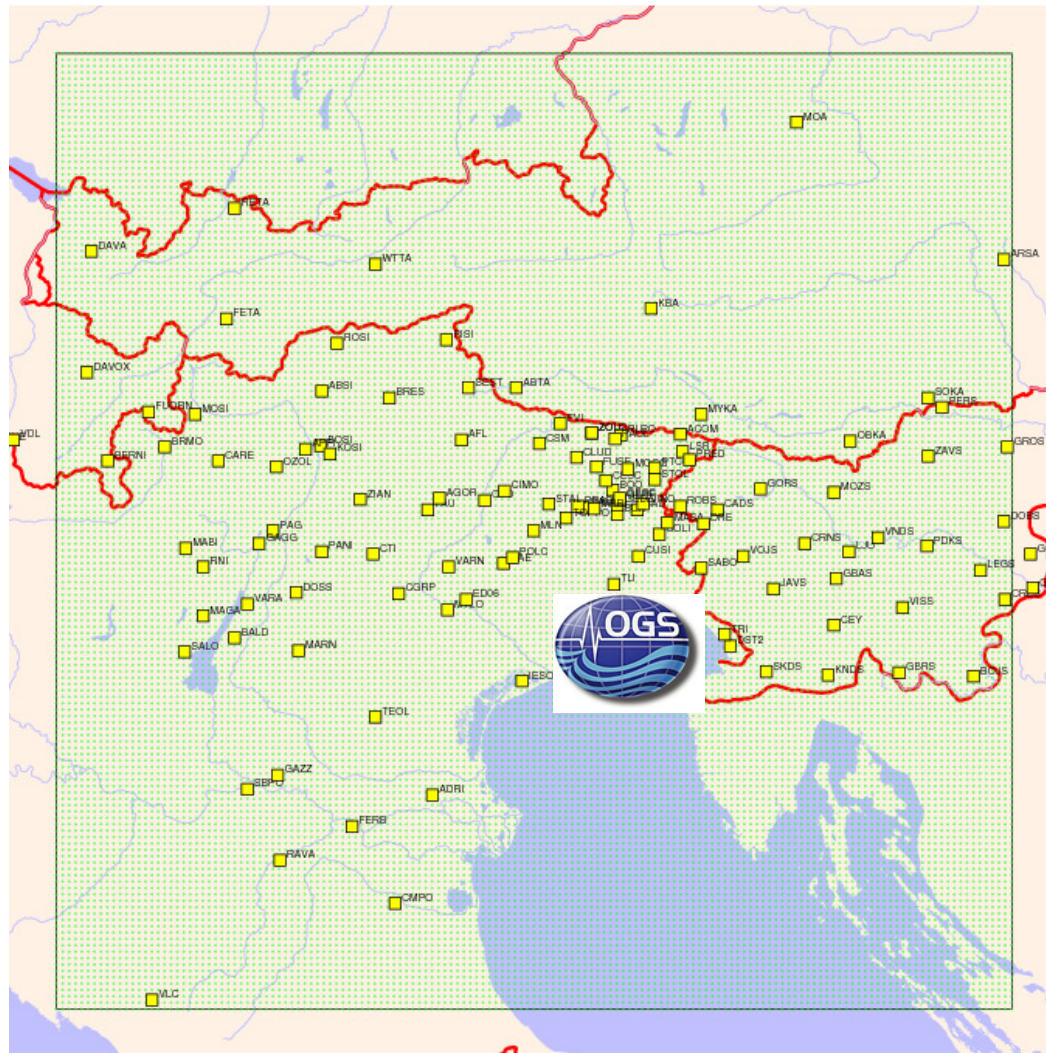


CRS headquarters in Udine (Italy)

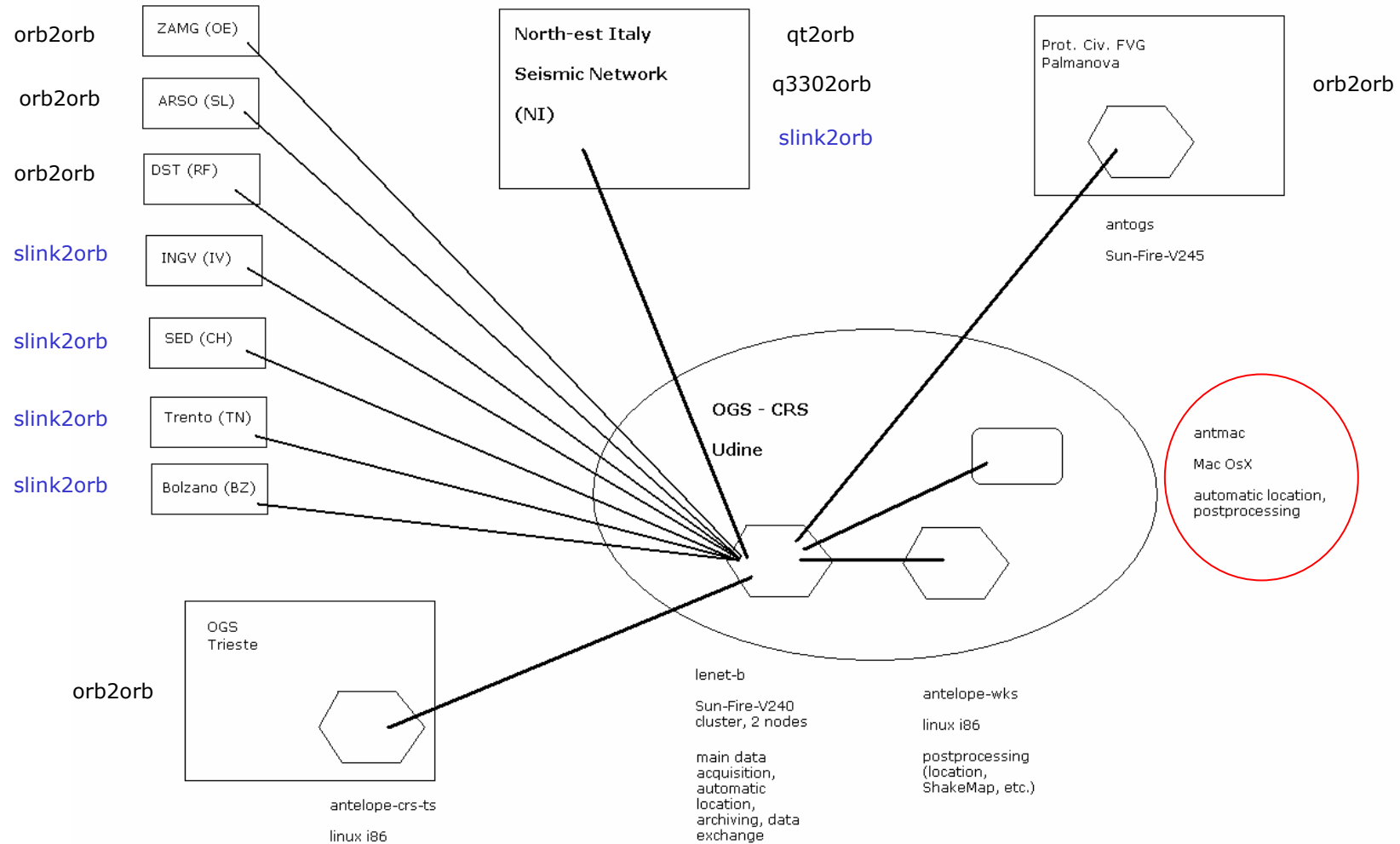
Intervention at CRS headquarters for:

- operations checking
- review / confirmation of the location with magnitude (picking of S waves)
- control over any replicas of earthquake
- maintain the link with the structures of the regional Civil Protections

OGS Virtual Seismic Network (~100 real-time stations)



OGS Antelope configuration



main rtexec processes table

```
Processes &Tbl{
orbserver      orbserver -p $ORB orbserver
orbexport      orbserver -p $ORBEXPORT orbexport
orbinIV        orbserver -p $ORBINIV orbinIV
qt2orb         qt2orb -dataorb $ORB -cmdorb $ORB -calib_db $DB
q3302orb       q3302orb -calib_db $DB -S state/q3302orb -v OGS dataorb $ORB
TN2orb         slink2orb -v -dc $DB -dm $DB -S state/TN2orb -pf pf/TN2orb.pf $TNSEISCOMP $ORB
TNsecond2orb   slink2orb -v -dc $DB -dm $DB -S state/TNsecond2orb -pf pf/TNsecond2orb.pf $TNSEISCOMP2 $ORB
MN2orb         slink2orb -v -dc $DB -dm $DB -S state/MN2orb -pf pf/MN2orb.pf discovery.rm.ingv.it:39962 $ORB
IV_TEOL2orbinIV slink2orb -v -dc dbmaster/dbINGV -dm dbmaster/dbINGV -S state/IV_TEOL2orb -pf pf/IV_TEOL2orb.pf discovery.rm.ingv.it:39962 $ORBINIV
orbinIV2orb    orb2orb -S state/orbinIV2orb -m '(IV_TEOL|EV_ED06)_H.*' -X pf/X.pf $ORBINIV@ $ORB@
DST2orb        orb2orb -m '(RF_(CESC|GEDE|GEPF|GESC|MASA|MOGG|PAUL|PRAD|STOL|TARC)|MN_TRI|NI_(DST2|PALA|POLC|PURA))_(H|E|S)(H|L|G|N)(Z|N|E).*'
-r 'RF_MORT.*' -S state/DST2orb $DSTORB@ $ORB@
ARSO2orb       orb2orb -m 'SL_(CADS|CEY|GBAS|GORS|JAVS|KNDS|LJU|MOZS|ROBS|SKDS|VNDS|VOJS).*_ (H|E|S)(H|L|G|N)(Z|N|E).*' -S state/ARSO2orb
$ARSOORB@ $ORB@
ZAMG2orb       orb2orb -m 'OE_(ABTA|ARSA|DAVA|FETA|KBA|MOA|MYKA|RETA|SOKA|WTTA)_(H|E|S)(H|L|G|N)(Z|N|E).*' -S state/ZAMG2orb $ZAMGORB@ $ORB@
SI2orb         orb2orb -S state/SI2orb -m 'SI_.*_(H|E|S)(H|L|G|N)(Z|N|E).*' $SIORB@ $ORB@
orb2export     orb2orb -m
'FV_.*|MN_TRI_H.*|NI_VINO/log|NI_(AGOR|ACOM|BALD|CGRP|CLUD|CIMO|DRE|FUSE|PRED|SABO|VARN|VINO|ZOU2)_(H|E|S)(H|L|G|N)(Z|N|E).*' -S
state/orb2export -r '/.*|*/pf.*' $ORB $ORBEXPORT
orbinIV_FERB2orb orb2orb -S state/orbinIV_FERB2orb -m 'NI_FERB_.*' -X pf/Y.pf $ORBINIV $ORB
CH2orb         slink2orb -v -dc $DB -dm $DB -S state/CH2orb -pf pf/CH2orb.pf seedlink.ethz.ch:18000 $ORB
Collalto2orbinIV slink2orb -v -dc dbmaster/EV/dbEvin -dm dbmaster/EV/dbEvin -S state/Collalto2orbinIV -pf pf/Collalto2orbinIV.pf 158.110.30.171:18000 $ORBINIV
FERB2orbinIV   slink2orb -v -dc dbmaster/NI/FERB -dm dbmaster/NI/FERB -S state/FERB2orbinIV -pf pf/FERB2orbinIV.pf crs-fe01.dyndns.org:18000 $ORBINIV
cdorb2db       cdorb2db -v -S state/cdorb2db -r 'FV_.*' $ORB $DB
orb2dbt        orb2dbt -v -state state/orb2dbt -overwrite $ORB $DB
orbdetect      orbdetect -onypicks -out $ORB $ORB $DB
orbassoc       orbassoc -v -select /db/detection $ORB $ORB dbmaster/ttgrid
orbvproc       orbvproc -v -state state/orbevproc $ORB@ $ORB@ $DB
orb_quake_email orb_quake_email $ORB
orb_alert_friuli orbptrigger -background -select "/pf/orbmag" -state state/orbptrigger_friuli $ORB /database/AlertFriuli/alert_friuli @origin.evid@ @origin.orid@
@origin.ml@
orb_alert_veneto orbptrigger -background -select "/pf/orbmag" -state state/orbptrigger_veneto $ORB /database/AlertVeneto/alert_veneto @origin.evid@ @origin.orid@
@origin.ml@
orb_alert_TN    orbptrigger -background -select "/pf/orbmag" -state state/orbptrigger_TN $ORB /database/AlertTrentino/alert_trentino @origin.evid@ @origin.orid@
@origin.ml@
orb_alert_CRS   orbptrigger -background -select "/pf/orbmag" -state state/orbptrigger_CRS $ORB /database/AlertCRS/alert_CRS @origin.evid@ @origin.orid@
@origin.ml@
orbtrigger_topkserver orbptrigger -background -select "/pf/orbmag" -state state/orbptrigger_topkserver $ORB /database/topkserver/orbtrigger_topkserver
@origin.evid@ @origin.orid@ @origin.time@ @origin.lat@ @origin.lon@ @origin.depth@ @origin.ml@ @origin.lddate@ @origin.auth@
orbtrigger_orb2db_evid orbptrigger -background -select "/db/origin" -state state/orbptrigger_orb2db_evid $ORB /database/evdb/orb2db_evid @origin.evid@
orbtrigger_towebpcfv orbptrigger -background -select "/pf/orbmag" -state state/orbptrigger_towebpcfv $ORB /database/towebpcfv/towebpcfv.pl
@origin.evid@ @origin.orid@
orbtrigger_toShakeMap orbptrigger -background -select "/pf/orbmag" -state state/orbptrigger_toShakeMap $ORB
/database/toShakeMap/orbtrigger_toShakeMap @origin.evid@ @origin.orid@ @origin.ml@
}
```

main OGS Antelope load averages

load averages: 1.36, 1.57, 1.60; up 167+12:31:32
17:29:41

104 processes: 101 sleeping, 1 running, 2 on cpu

CPU states: 85.9% idle, 8.9% user, 5.3% kernel, 0.0% iowait, 0.0% swap

Memory: 4096M phys mem, 64M free mem, 20G total swap, 14G free swap

PID	USERNAME	LWP	PRI	NICE	SIZE	RES	STATE	TIME	CPU	COMMAND
4856	rt	91	41	0	1048M	625M	cpu/1	113.5H	8.04%	orbserver
5384	rt	1	59	0	191M	17M	sleep	17.0H	1.32%	orbdetect
5042	rt	59	59	0	41M	17M	run	673:29	0.96%	q3302orb
26989	rt	1	59	0	44M	26M	sleep	272:40	0.86%	cdorb2db
4868	rt	12	59	0	110M	78M	sleep	377:26	0.58%	orbserver
5398	rt	1	59	0	6216K	1744K	sleep	145:14	0.22%	orb2orb
21764	rt	1	59	0	3056K	1992K	cpu/0	0:00	0.15%	top
5277	rt	1	59	0	6232K	2104K	sleep	50:44	0.08%	orb2orb
5261	rt	1	59	0	6256K	2616K	sleep	54:47	0.07%	orb2orb
4843	rt	1	59	0	23M	11M	sleep	46:55	0.06%	perl
5251	rt	1	59	0	6248K	2032K	sleep	54:11	0.06%	orb2orb
13509	rt	1	59	0	76M	7128K	sleep	30:36	0.06%	slink2orb
5271	rt	1	59	0	6232K	1960K	sleep	47:37	0.05%	orb2orb
5040	rt	13	59	0	26M	4040K	sleep	63:03	0.05%	qt2orb
5214	rt	1	59	0	208M	34M	sleep	25:25	0.04%	slink2orb

main OGS orb sources & clients

orbserver 2/27/2013 (058) 16:32:26.699

Version 'Release 5.1-64 SunOS 5.10 2011-04-28 '

Pid 4856 @ crs-v240-b:/database (158.110.30.133), port #7000

Started Mon 2013-035 Feb 04 16:30:10 by rt, running 23 days

ring buffer last initialized Thu 2012-257 Sep 13 4:01:28

Maximum 1000.0 Mbytes packet data

Maximum 2500010 packets

Maximum 1000 sources

56 clients

519 sources

511551 opens 511495 closes 0 errors 7 rejections

Total Output rate = 2070.524 kbps

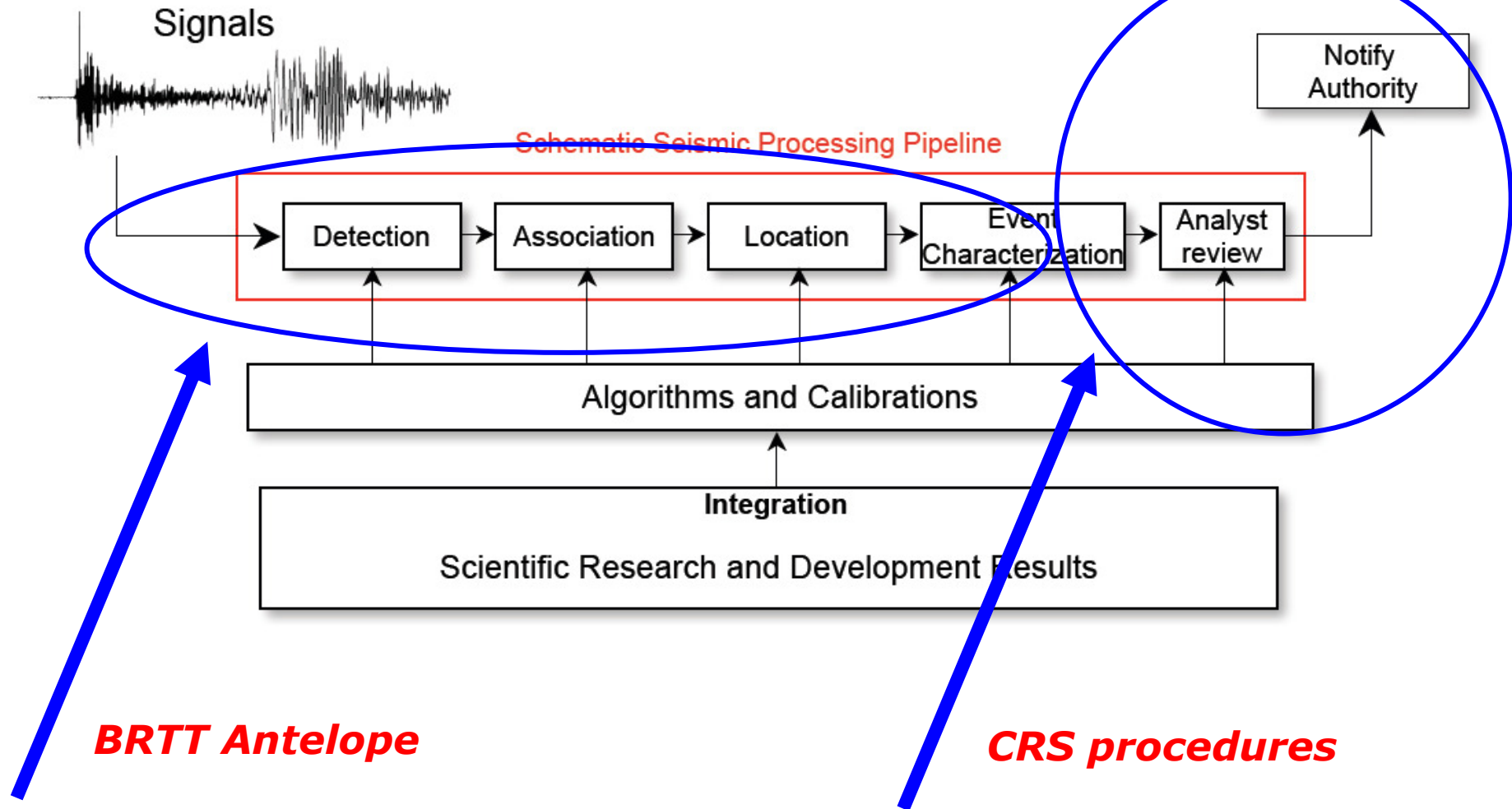
Total Input rate = 121.852 kbps

Total Output packet rate = 1263.238 pkts/s

Total Input packet rate = 203.656 pkts/s

Earthquake detection and notification

Real-time operational monitoring systems



OGS adds-on for Antelope

- PickServer (using Lomax viewer)
- Comprehensive Alarm routines with re-location control
 - Output: email, fax, SMS, web
- M882orb and ORION2orb plugins
- Data archive (OASIS)
- Web Drumplot

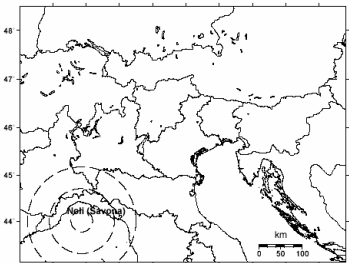
- *ShakeMap*
- *SeisComP, RingServer (data exchange)*

Alarms

REGIONE DEL VENETO
Centro Funzionale Decentrato Multirischi
 Sede Operativa Tel. 041 2794012 Fax 041 2794019

SEGNALAZIONE DI TERREMOTO
 Evento n. 7681
 del 01/02/2009 ore 15:52:01

Fax n.7681_1
 Prima Segnalazione

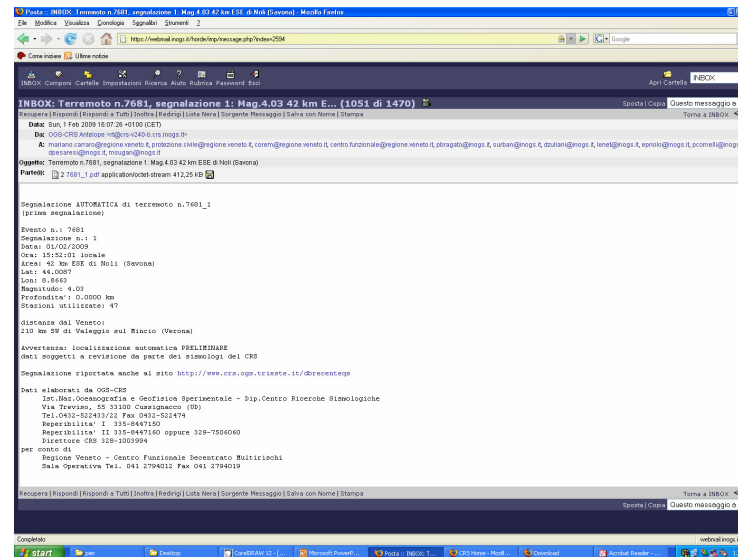


Data: 01/02/2009	Epicentro: 44.009°lat (44°00'31")
Ora: 15:52:01 locale	8.866°lon(08°51'58")
Area: 42km ESE di Noli (Savona)	Magnitudo: 4.0 (ML Richter)
	Profondità: 0.0 km

AVVERTENZA: localizzazione preliminare AUTOMATICA
 dati soggetti a revisione da parte dei sismologi del CRS

Struttura responsabile dell'elaborazione dell'Avviso: OGS-CRS
 Ist.Naz.Oceanografia e Geofisica Sperimentale-Dip.Centro Ricerche Sismologiche
 Tel. 0432-52433/22 Fax 0432 524274
 Reperibilità I 335-8447150 Reperibilità II 335-8447160 oppure 3297506090
 Direttore CRS 328-1003994
 Segnalazione pubblicata sul sito <http://www.crs.inogs.it>

fax



INBOX: Terremoto n.7681, segnalazione n.1: Mag.4.03 42 km ESE di Noli (1051 di 1470)

Recupera | Rispondi | Rispondi a Tutti | Inoltra | Redirigi | Lista Inviati | Sorgente Messaggio | Salva con Nome | Stampa

Data: Sun, 1 Feb 2009 16:07:26 +0100 (CET)

Mit: OGS-CRS (mailto:ingegner@inogs.it)

A: mutiano.carato@regione.veneto.it, protezione.città@regione.veneto.it, centro.funzionale@regione.veneto.it, pirapato@ingv.it, surban@ingv.it, duciani@ingv.it, lenzi@ingv.it, sorio@ingv.it, comelli@ingv.it, spezzano@ingv.it, truggiani@ingv.it

Oggetto: Terremoto n.7681, segnalazione n.1: Mag.4.03 42 km ESE di Noli (Savona)

PathID: 27681_1.pdf;application/octet-stream;412,25 KB

Segnalazione AUTOMATICA di terremoto n.7681_1
 (prima segnalazione)

Evento n. 7681
 Segnalazione n. 1
 Data: 01/02/2009
 Ora: 15:52:01 locale
 Area: 42 Km ESE di Noli (Savona)
 Lat: 44.009
 Lon: 8.866
 Magnitudo: 4.0
 Profondità: 0.0000 km
 Reperibilità: 47

Distanza dal Veneto:
 210 Km SW di Valdagno sul Rincio (Verona)

Avvertenza: localizzazione automatica PRELIMINARE
 dati soggetti a revisione da parte dei sismologi del CRS

Segnalazione reperibile anche al sito <http://www.crs.inogs.it/centrali/terremoti/>

Dati e contatti del CRS:
 Ist.Naz.Oceanografia e Geofisica Sperimentale - Dip.Centro Ricerche Sismologiche
 Via Treviso, 55 31100 Cuneo Veneto (TV)
 Tel.0432-52433/22 Fax 0432-524274
 Reperibilità I 335-8447150
 Reperibilità II 335-8447160 oppure 329-7506090
 Direttore CRS 328-1003994

per conto di:
 Regione Veneto - Centro Funzionale Decentrato Multirischi
 Sede Operativa Tel. 041 2794012 Fax 041 2794019

e-mail

sms

**OGS-CRS Terremoto n.7681
 segnalazione n.1
 Mag4.03 H15:52:01
 del 01/02/2009
 42km ESE di Noli(Savona)
 lat44.0087 lon8.8663
 rep 3358447150**



Centro di Ricerche Sismologiche
OGS

Istituto Nazionale di Oceanografia
 e di Geofisica Sperimentale

Earthquake: NORTHERN ITALY



web

OGS PickServer (v. 2)

CRS Pickserver: dpesaresi - Mozilla Firefox

pickserver.crs.inogs.it/pickserver.php

EVENT SELECT

Antelope antelope_15min

2010 01 All

Filter by Label: none

- 11 21:35:01 Md=2.6 CASINA (EMILIA)
- 12 12:48:39 Md=2.7 LUN (PAG) (CROAZIA)
- 12 13:35:42 Md= ?
- 12 22:00:32 Md= ? CIMA DI GRION (ALTO ADIGE)
- 12 22:12:51 Md=2.6 POSTOJNA (SLOVENIA)
- 13 00:27:45 Md=2.1 POSTOJNA (SLOVENIA)
- 13 02:17:59 Md=1.7 GOLFO DI TRIESTE
- 13 03:03:12 Md=2.1 POSTOJNA (SLOVENIA)
- 14 02:13:26 Md=2.2 POSTOJNA (SLOVENIA)
- 14 04:34:48 Md=2.5 FICAROLO (VENETO)
- 14 19:05:33 Md=2.1 MERANO (ALTO ADIGE)
- 15 14:20:54 Md=4.0 POSTOJNA (SLOVENIA)
- 15 14:31:11 Md=2.0 POSTOJNA (SLOVENIA)

ORIGIN MAP

PICKING SETS/ORIGINS

Save Delete Clone to my Current Add to my Current Clone to Bulletin Clone to Report Clone to PSI .bit .dat .hpl

Picks	Origin time UTC	Site	Mp	Ml	Lat Lon	Depth (km)	Δ N-S	Δ E-W	Hor. Err	Gap	RMS	Qual.	Owner	Label	Last change (UTC)	Agent	Pin	Slot
33	2010-01-30 19:20:34.51	PIELUNGO (FRIULI)	1.85		46.3263 12.8583	9.5 ± 1	0	0	0.4	114	0.16	B B B	PickServer 1	-	2011-03-29 10-16-03	H71	A	<input checked="" type="radio"/>
33	2010-01-30 19:20:34.51	PIELUNGO (FRIULI)	1.85		46.3263 12.8583	9.5 ± 1	0	0	0.4	114	0.16	B B B	asnidarcj (current)	-	2011-03-29 10-16-03	H71	A	<input type="radio"/>

Send prelim. ALARM Send Final ALARM

PICK & LOCATE

SAC download SG2K read-only Hypo71

Net	Station	Ch	Z	N	E	P	i/e	±	P time	P Res	P Err.	H71 wgt	W2	Auth	S	i/e	S time	S Res	S err	H71 W	W2	Auth	S-P	Coda	Coda time	Auth	Md	WA	Ml	Dist km
SG2K	FUSE	HH	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	e	+	19:20:37.225	-0.29	0.0076	0	0	none	<input checked="" type="checkbox"/>	e	19:20:39.610	-0.24	0.0951	2	2	none	2.38	<input checked="" type="checkbox"/>	19:21:07.760	none	1.8			15
SG2K	MPRI	SH	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	i	-	19:20:37.350	-0.03	0.0049	0	0	none	<input checked="" type="checkbox"/>	e	19:20:39.858	-0.24	0.1158	2	2	none	2.51	<input checked="" type="checkbox"/>	19:21:05.428	none	1.8			14
DST	PALA	HH	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	i	-	19:20:37.031	0.06	0.0019	0	0	none	<input checked="" type="checkbox"/>	e	19:20:38.964	-0.02	0.072	2	2	none	1.83	<input checked="" type="checkbox"/>	19:21:10.487	none	1.9			11

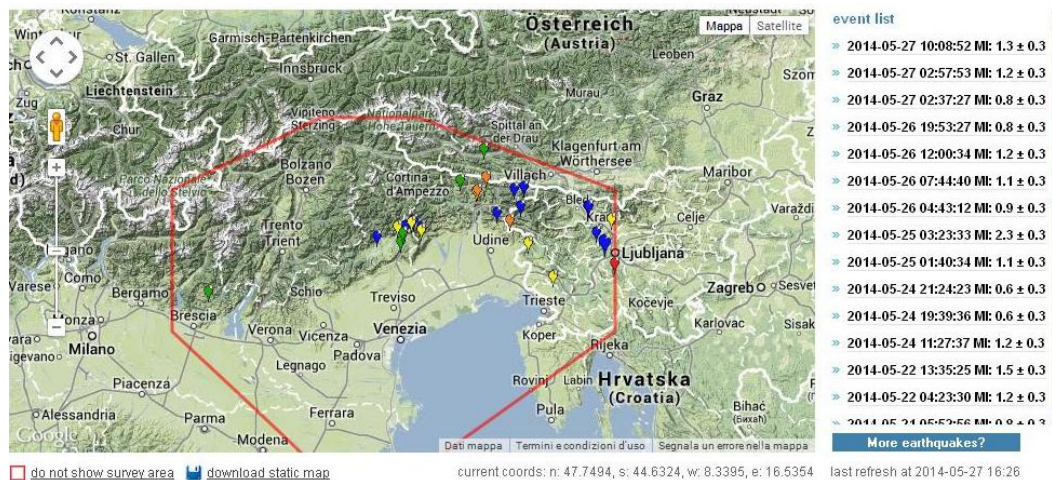
OGS Real Time Seismology:

<http://rts.crs.inogs.it/>



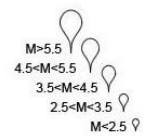
Seismicity of NE Italy

We monitor the seismicity occurring in North-East Italy and its surroundings (red polygon on the map) as recorded by the network run by OGS. The automatic locations (in grey) and related analysis can be inaccurate and are updated (in bold) as soon as new data are available. The magnitude is provided with the associated measurement error.



Caption

- 12 hours
- 12-24 hours
- 1-3 days
- 3-7 days
- 7-14 days



Links

- ### Latest earthquakes
- Italy (INGV)
 - Europe (CSEM)
 - Worldwide (USGS)
 - Seismic monitor (GFZ)

- ### About earthquakes
- If an earthquake occurs
 - Seismic risk in Italy
 - Io non rischio
 - Edurisk

- ### Civil Defense Agencies
- Friuli Venezia Giulia
 - Veneto
 - Trentino
 - DPC Italian

OASIS OGS Archive System of Instrumental Seismology

Progetto OASIS

oasis.crs.inogs.it/oasis/CadmoDriver?_action_prepare_find=1&_page=ACC_Stations_R_progressive&_rock=INVALID&_state=find_progressive&_tabber=1&_token=NULLNULLNULLNULL

ISTITUTO NAZIONALE di OCEANOGRAFIA e GEOPHISICA Sperimentale

The OGS Archive System of Instrumental Seismology

Ministero dell'Istruzione, dell'Università e della Ricerca PRIN - Progetti di Ricerca di Interesse Nazionale

Homepage Sites Event Waveforms Continuous Waveforms Jump to Gallery... Log-in to oasis Version 2.0 (December 2013)

Stations search

Network Type:

Network Code: -- select network --

Station Code: contains

Station Name: contains

Latitude (e.g. 45.27): from [≥]: to [<]:

Longitude (e.g. 12.7): from [≥]: to [<]:

Region: contains

Province: contains

EC8: - Any value -

Sensor: contains - Any value -

Housing: - Any value -

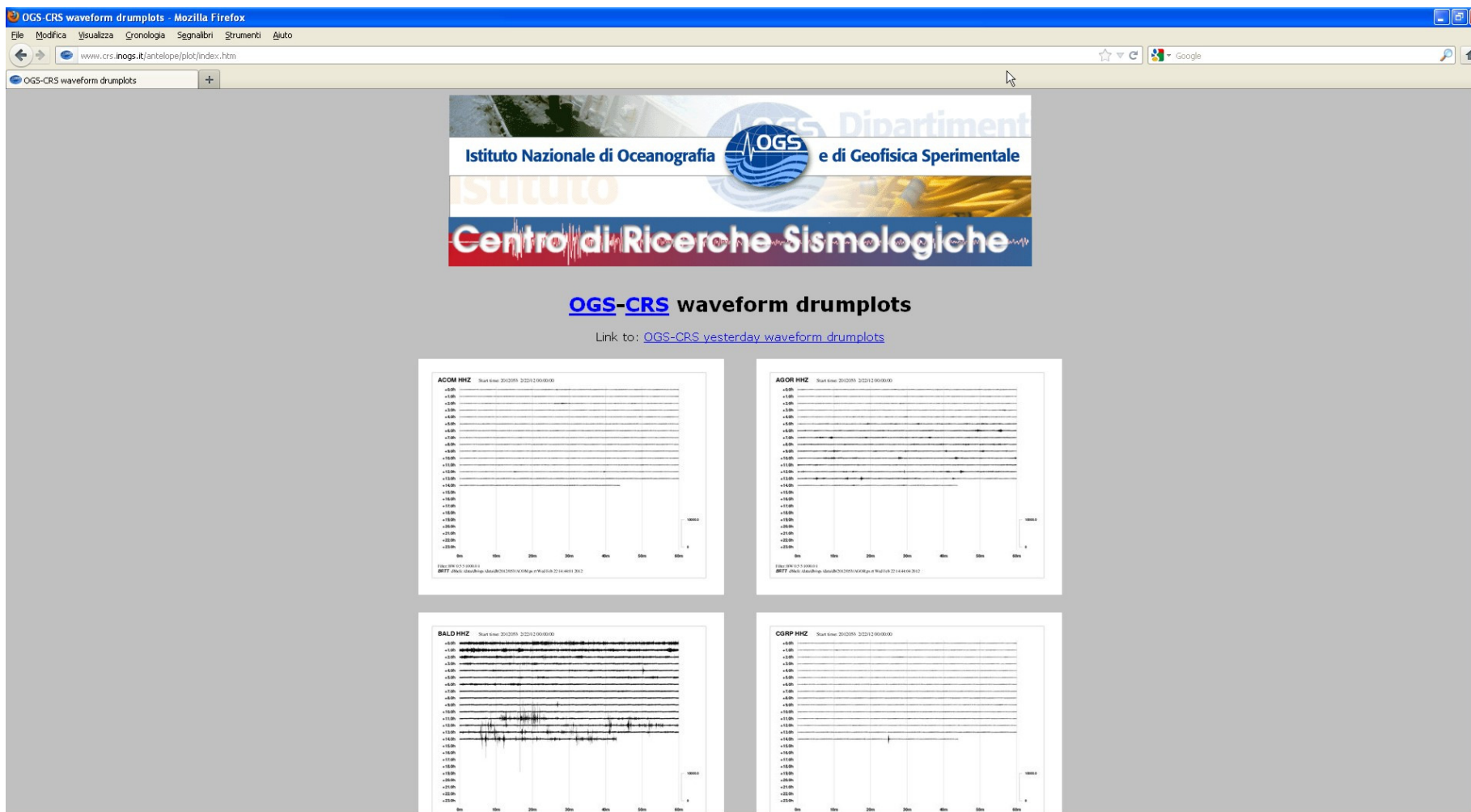
Morphology: - Any value -

Number of Recordings: >=

Search

Network Code	Stat. Code	Station Name	Latitude	Longitude	Elev [m.a.s.l.]	Municipality	EC8	Sensors (*)=out of service	Housing	# of records	Station recordings
ZR (Temp)	OG001	CONA - Ospedale Nuovo	44.800311	11.695581	7	VOGHIERA	C	SP(*)	Building	11	
ZR (Temp)	OG002	FERRARA - Comune	44.852490	11.598470	7	FERRARA	C	SP(*)	Building	0	
ZR (Temp)	OG003	S. Agostino	44.786163	11.383370	16	SANT'AGOSTINO	C	SM(*)	Free Field	0	
ZR (Temp)	OG004	Ficarolo	44.952037	11.433883	4	FICAROLO	C	SP(*)	Free Field	12	
ZR (Temp)	OG005	Poggio Renatico	44.766983	11.484940	9	POGGIO RENATICO	C	SP(*)	Free Field	6	
ZR (Temp)	OG006	Vigarano Pieve	44.862407	11.514919	6	VIGARANO MAINARDA	C	SP(*)	Building	9	
ZR (Temp)	OG007	Aguscello	44.806519	11.663715	7	FERRARA	C	SP(*)	Building	12	
ZR (Temp)	OG008	MIRABELLO	44.812673	11.431863	9	MIRABELLO	C	SP(*)	Building	11	
ZR (Temp)	OG009	SAN CARLO - Chiesa	44.804401	11.408932	17	SANT'AGOSTINO	C	SM(*)	Building	0	
ZR (Temp)	OG010	Casaglia Superficie	44.901443	11.540011	6	FERRARA	C	BB,SP(*)	Free Field	0	
ZR (Temp)	OG012	FERRARA - Comune	44.853161	11.598961	5	FERRARA	C	SP(*)	Free Field	0	
NI (Perm)	ACOM	ACOMIZZA	46.548794	13.514900	1715	MALBORGHETTO VALBRUNA	A	BB(*),SM(*)	Bunker	0	
NI (Perm)	AGOR	AGORDO	46.282900	12.047200	631	AGORDO	A	BB(*),SM(*)	Gallery	0	

OGS dbheli



Already done (☺):

- Split event determination and graphics on PowerMAC from main acquisition on SUN cluster
 - Reliability (2 machines)
- Migration from orbampmag to orbevproc
- Migration from orb2db to cdorb2db + db2msd
- orbdetect tuning
 - BB continuous, SP trigger, Local/teleaseismic bandwidth, S phases
- Antelope migration to 5.2-64

Still work in progress (☹):

- orbassoc tuning (grid, windows, station weighting and grouping, etc.)
- Migration core Antelope (SUN cluster) from 5.1-64 to 5.2-64 (need OS patch)
- Migration from cdorb2db + db2msd to orbwf
- Implement orbxchange with neighbors

The OGS Antelope Real-Time Team



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CRS Director
mmucciarelli@inogs.it



Pier Luigi Bragato
"I-do-everything"
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The OGS Antelope Real-Time Team



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Paolo Di Bartolomeo
PickServer,
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The OGS Antelope Real-Time Team



*(Denis Sandron
Magnitudo,
Catalogue
dsandron@inogs.it)*



Luca Moratto
ShakeMaps,
RT configuration
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34th GENERAL ASSEMBLY OF THE EUROPEAN SEISMOLOGICAL COMMISSION

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**Session N. 1:
“Improving
seismic
networks
performances:
from site
selection to
data
integration “**

The number and quality of seismic stations and networks in Europe continually improves, nevertheless there is always scope to optimize their performance. In this session we welcome contributions from all aspects of seismic network installation, operation and management. This includes site selection; equipment testing and installation; planning and implementing communication paths; policies for redundancy in data acquisition, processing and archiving; and integration of different datasets including GPS and OBS.

THANKS!

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