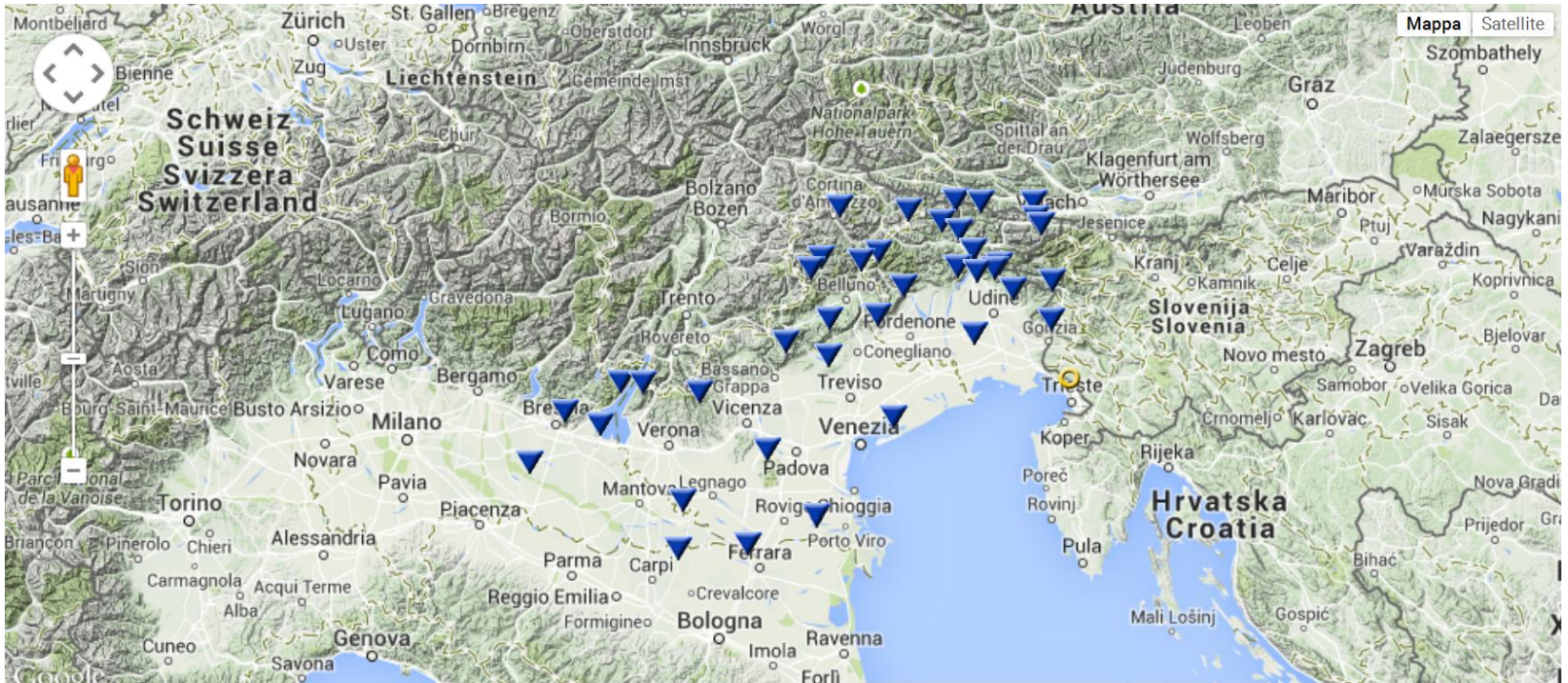




# Antelope RT @ OGS 2015

Damiano Pesaresi  
dpesaresi@inogs.it  
AUG Udine March 2015

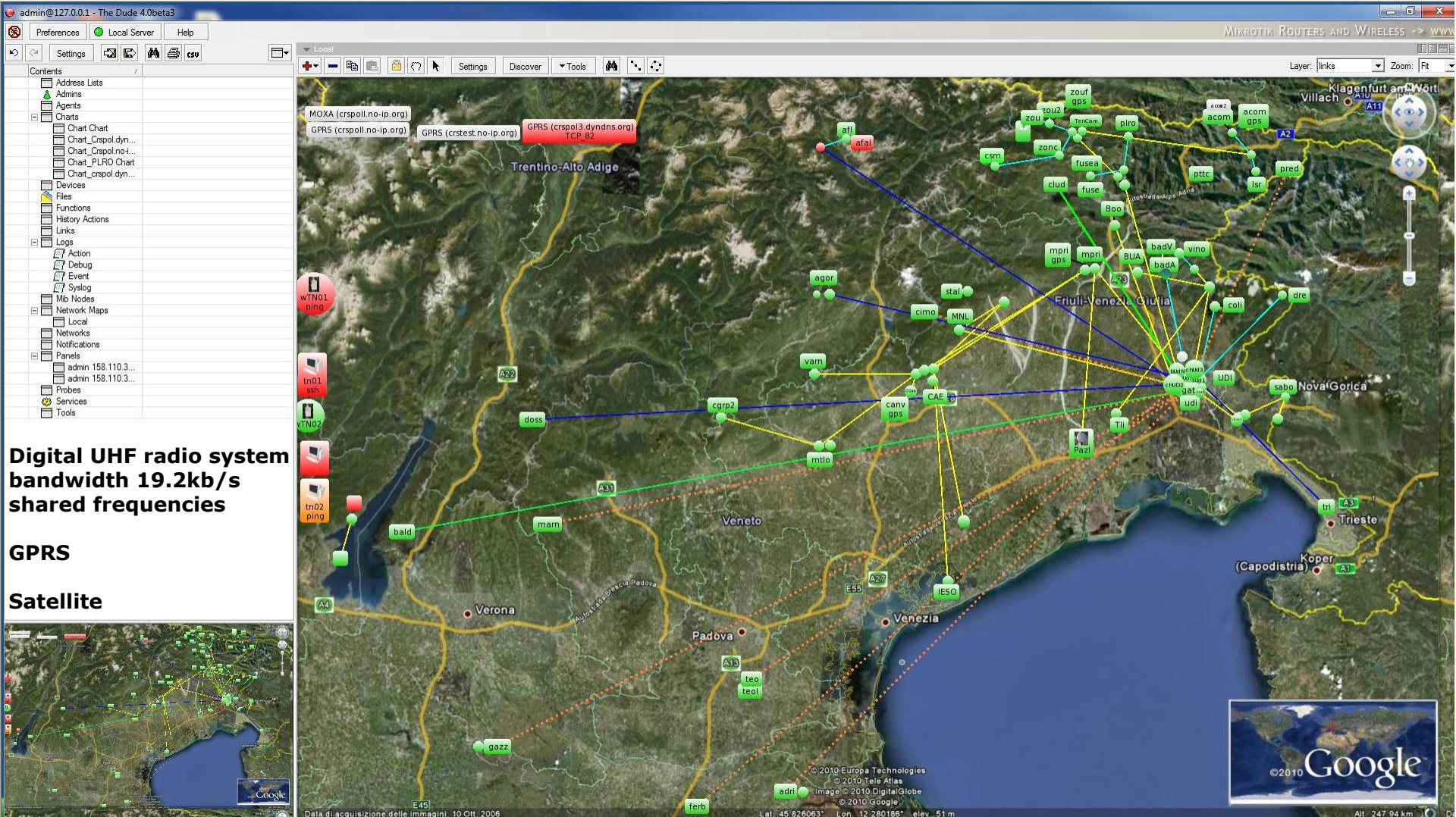
# NE Italy Seismic Network - OGS



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



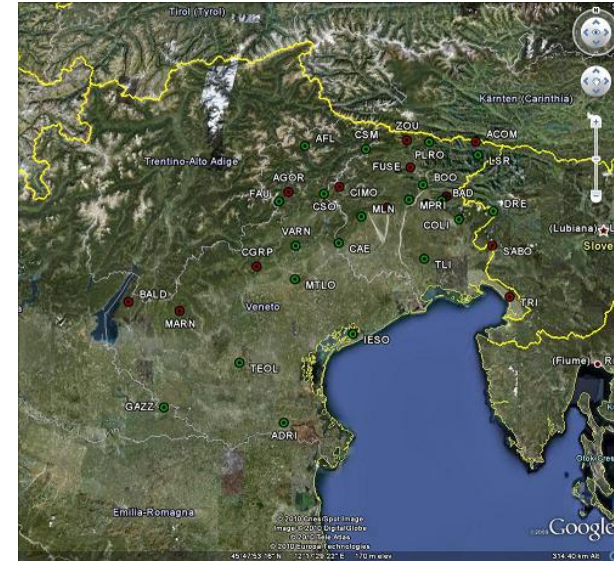
# How is data transmitted?





# 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

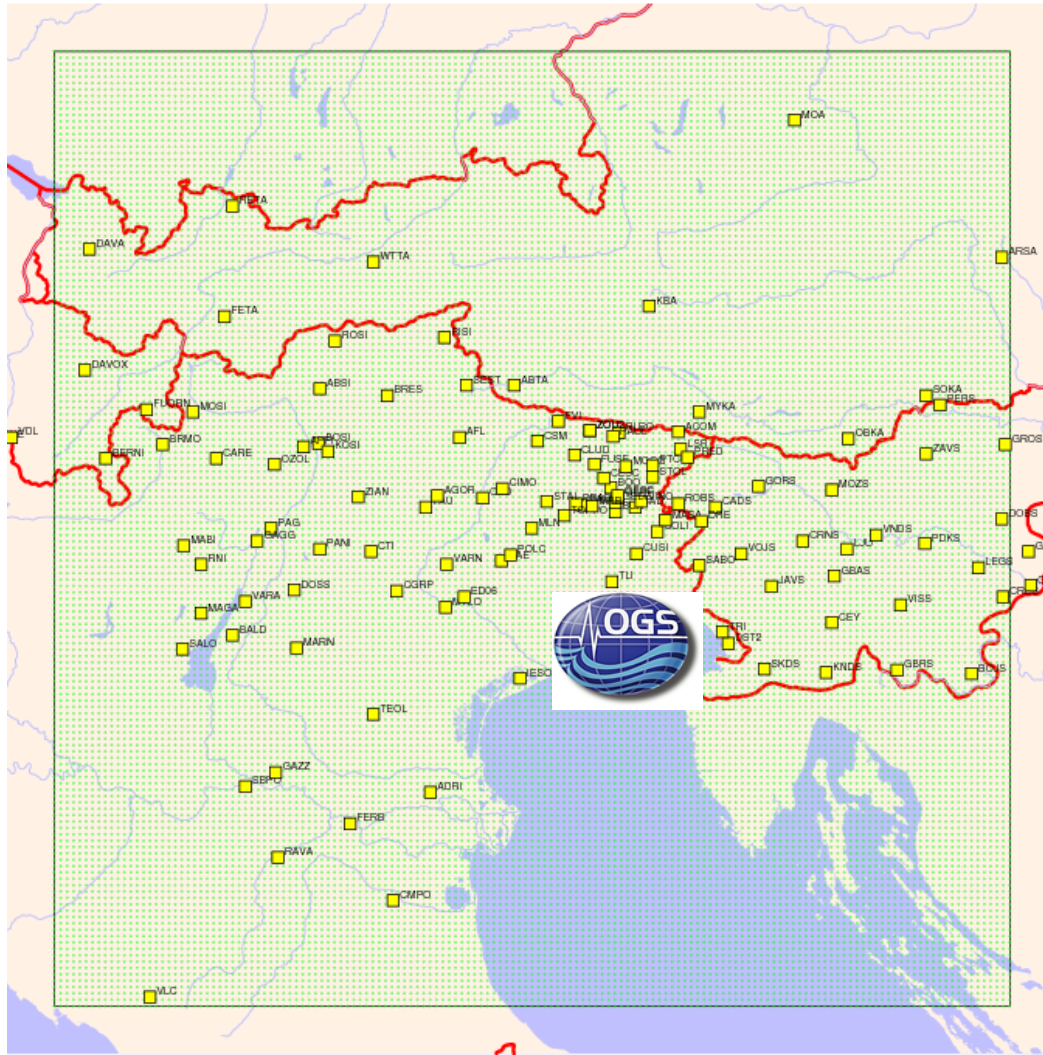
# OGS Virtual Seismic Network (~100 real-time stations)



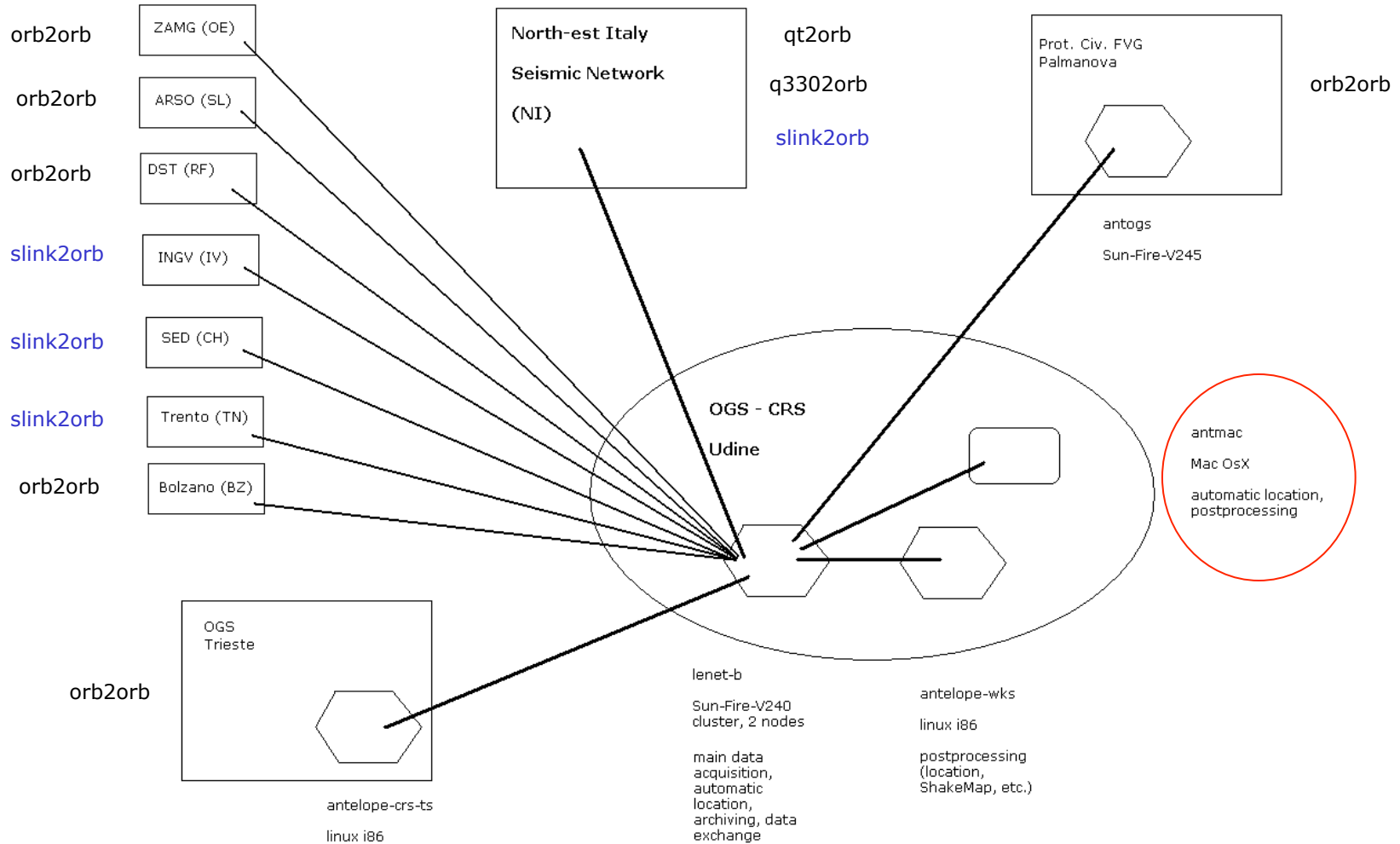
Provincia di Trento



Provincia di Bolzano

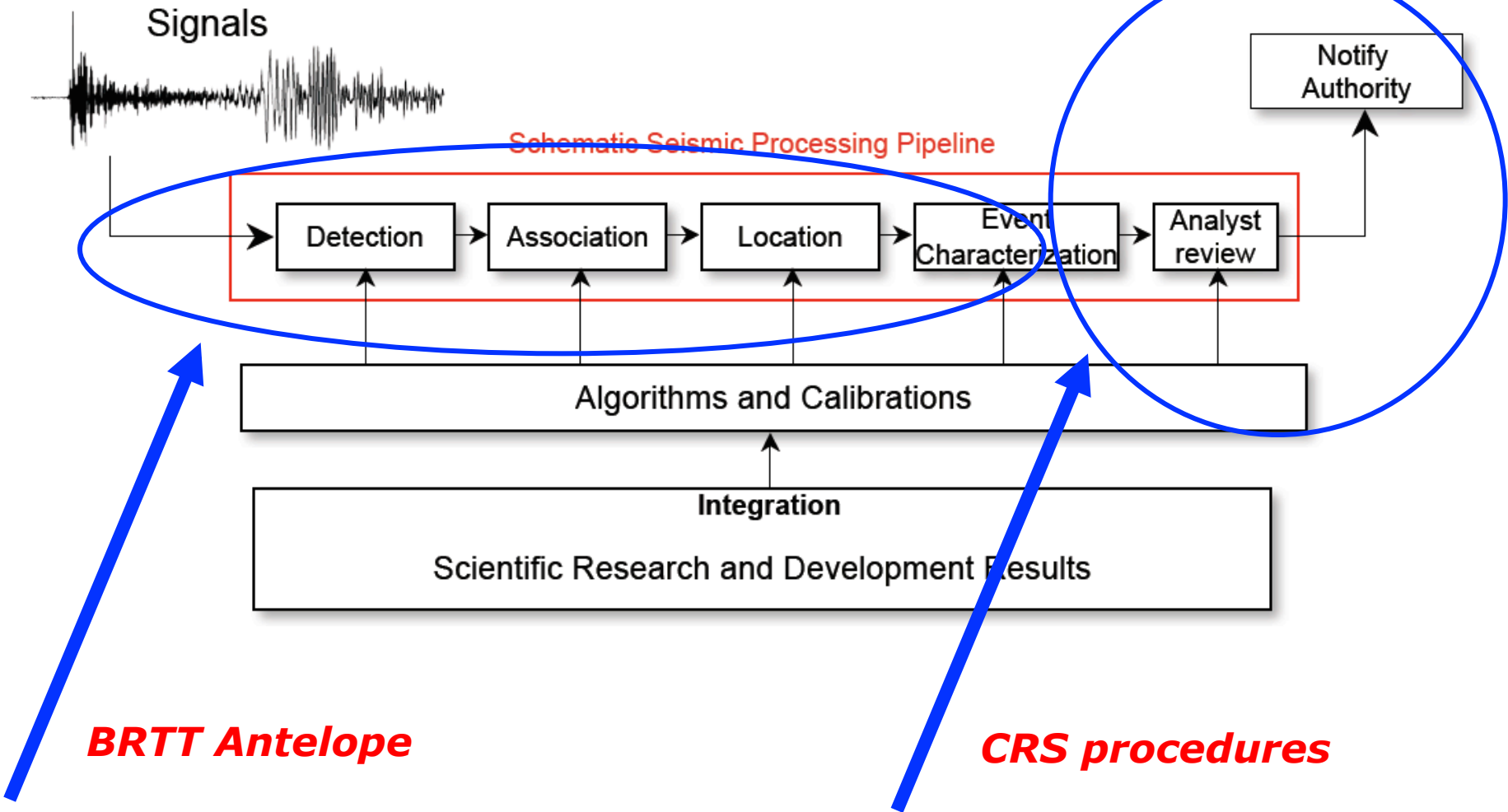


# OGS Antelope configuration



# 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, dlmon, orbstat
  
- *ShakeMap*
- *SeisComP, RingServer (data exchange)*

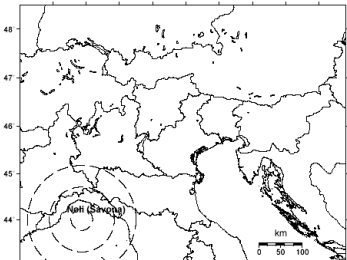


# Alarms

**REGIONE DEL VENETO**  
Centro Funzionale Decentrato Multirischii  
Sala Operativa Tel. 041 2704012 Fax 041 2704019

**SEGNALEZIONE DI TERREMOTO**      Fax n.7681\_1  
Prima Segnalazione

**Evento n. 7681**  
del 01/02/2009 ore 15:52:01

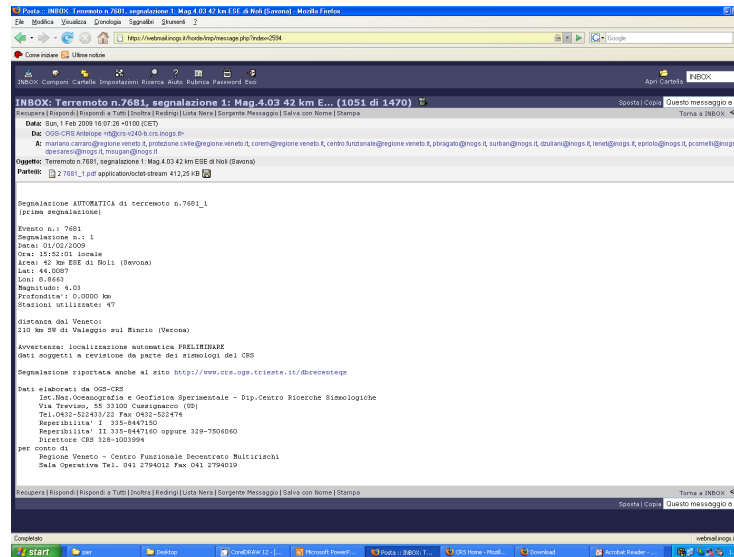


**Data:** 01/02/2009      **Epicentro:** 44.009°lat (44°00'31")  
**Ora:** 15.52:01 locale      **8.866°lon(08°51'58")**  
**Area:** 42km ESE di Noli (Savona)      **Magnitudo:** 4.0 (ML Richter)  
**Profondita':** 0.0 km

**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. 0432-52243/2/22 Fax 0432 522474  
Reperibilità 13358447150 Reperibilità II 3358447180 oppure 3297500600  
Direttore CRS 328 1003994  
Segnalazione pubblicata sul sito <http://www.crs.inogs.it>

fax



**Terremoto n.7681, segnalazione 1: Mag.4.03 42 km E... (1051 di 1470)**

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

**Da:** OGS-CRS Avviso nro=0409 on inogs.it  
**Ricevuto da:** regione.veneto.it, regione.sve.it, regione.vare.it, corem@regione.veneto.it, corem@regione.veneto.it, centro.funzionale@regione.veneto.it, p.lobato@inogs.it, surban@inogs.it, stulani@inogs.it, lenzi@inogs.it, spicini@inogs.it, cornelli@inogs.it, gazzera@inogs.it, mangan@inogs.it

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

**Partito:** 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:** 4.03  
**Profondita':** 0.0000 km  
**Reazione allertamento:** 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 riportata anche al sito <http://www.crs-ops.trieste.it/@eventpage>

**Dati elaborati da OGS-CRS**  
Ist.Naz.Oceanografia e Geofisica Sperimentale - Dip.Centro Ricerche Sismologiche  
Via Trivulzio, 35 31100 Cuneigrosso (PD)  
Tel.0432-52243/2/22 Fax 0432-522474  
Reperibilità I 1335-8447150  
Reperibilità II 335-8447180 oppure 329-7500600  
Direttore CRS 328-1003994


per conto di  
Regione Veneto - Centro Funzionale Decentrato Multirischii  
Sala Operativa Tel. 041 2704012 Fax 041 2704019

e-mail

**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**

sms

# OGS PickServer (v. 2)



ISTITUTO NAZIONALE di OCEANOGRAFIA e di GEOFISICA SPERIMENTALE  
Centro di Ricerche Sismologiche  
**Crs PickServer Interface**

Refresh Users Bull.import A.S.W. Settings Help Sign out

**EVENT SELECT**

Antelope antelope\_15min

2015 03 08

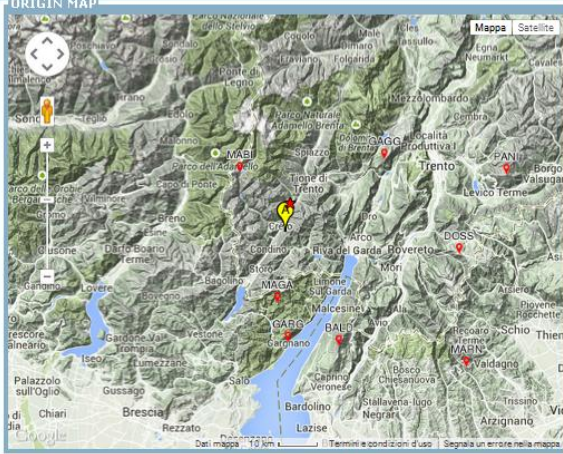
Filter by Label: none

Time(UTC) eventID Md ML Site

09:46:23 #86808\* 3.0 2.79 RONCONE (TRENTINO)

11:14:00 #86833\* 0.8 0.17 BARCIS (FRIULI)

**ORIGIN MAP**



**PICKING SETS/ORIGINS**

Save Delete Copy to my Current Clone to Bulletin Clone to Reper Clone to PS1 .blt .dat .hpl

Picks	Origin time (UTC)	Site	M <sub>p</sub>	M <sub>L</sub> σ	Lat Lon	Depth (km)	ΔN-S (km)	ΔE-W (km)	Hor. Err	Gap	RMS	Qual.	Owner	Label	Last change (UTC)	Agent	Pin	Sct
67	2015-03-08 09:46:23.68	RONCONE (TRENTINO)	3.03		45.9273 10.6502	3.2 ±2	0	0	0.8	195	0.29	B/B/B	Pick Server1	-	2015-03-09 07-16-02	HF1	A	○
67	2015-03-08 09:46:23.68	RONCONE (TRENTINO)	3.03	2.79 ±0.29	45.9273 10.6502	3.2 ±2	0	0	0.8	195	0.29	B/B/B	surban (archived)	Allarme Preliminare	2015-03-09 07-16-10	HF1	A	●
67	2015-03-08 09:46:23.68	RONCONE (TRENTINO)	3.03	2.79 ±0.3	45.9273 10.6502	3.2 ±2	0	0	0.8	195	0.29	B/B/B	surban (current)	-	2015-03-09 07-17-41	HF1	A	○
27	2015-03-08 09:46:23.68000			2.79	45.9273 10.6502	0	0	0					antelope old#86836	antelope preferred	2015-03-09 07-16-10	-by orx	A	○

Show all Antelope origs Send prelim. ALARM Send Final ALARM set Label no label

**PICK & LOCATE**

SAC download SG2K Hypa71

Net	Sta	Loc	Ch	Z	N	E	DE-FIR	P	ie	P time	P Res	P Err.	H71 wgt	W2	Auth	S	ie	S time	S Res	S Err.	H71 W2	W2	Auth	S-P	C	Coda time	Auth	Md	M <sub>L</sub>	Dist km
MABI	-	HH						<input checked="" type="checkbox"/>		09:46:27.418	3.00	0.0025	0	1	sub	<input checked="" type="checkbox"/>		09:46:27.590	2.97	0.0104	0	0	sub	2.34	<input checked="" type="checkbox"/>	09:48:27.824	sub	3.2	2.6	18
MAGA	-	HH						<input checked="" type="checkbox"/>		09:46:27.818	3.01	0.0032	0	1	sub	<input checked="" type="checkbox"/>		09:46:28.631	2.93	0.0235	0	0	sub	2.88	<input checked="" type="checkbox"/>	09:48:15.369	sub	3.3	3.4	17
GARG	-	HH						<input checked="" type="checkbox"/>		09:46:27.990	-0.48	0.0108	1	1	sub	<input checked="" type="checkbox"/>		09:46:31.720	2.44	0.0108	0	0	sub	3.75	<input checked="" type="checkbox"/>	09:48:21.789	sub	3.1	2.6	26
BALD	-	HH						<input checked="" type="checkbox"/>		09:46:28.852	-0.10	0.0071	0	1	sub	<input checked="" type="checkbox"/>		09:46:31.900	2.93	0.0048	0	0	sub	4.31	<input checked="" type="checkbox"/>	09:47:45.706	sub	2.8	2.9	30
GAGG	-	HH						<input checked="" type="checkbox"/>		09:46:28.967	3.07	0.0074	0	1	sub	<input checked="" type="checkbox"/>		09:46:31.993	3.11	0.0118	0	0	sub	4.32	<input checked="" type="checkbox"/>	09:48:05.085	sub	2.9	2.7	25
DOSS	-	HH						<input checked="" type="checkbox"/>		09:46:31.952	3.22	0.0082	0	1	sub	<input checked="" type="checkbox"/>		09:46:36.990	4.10	0.0040	0	0	sub	5.31	<input checked="" type="checkbox"/>	09:48:17.947	sub	3.0	2.8	42

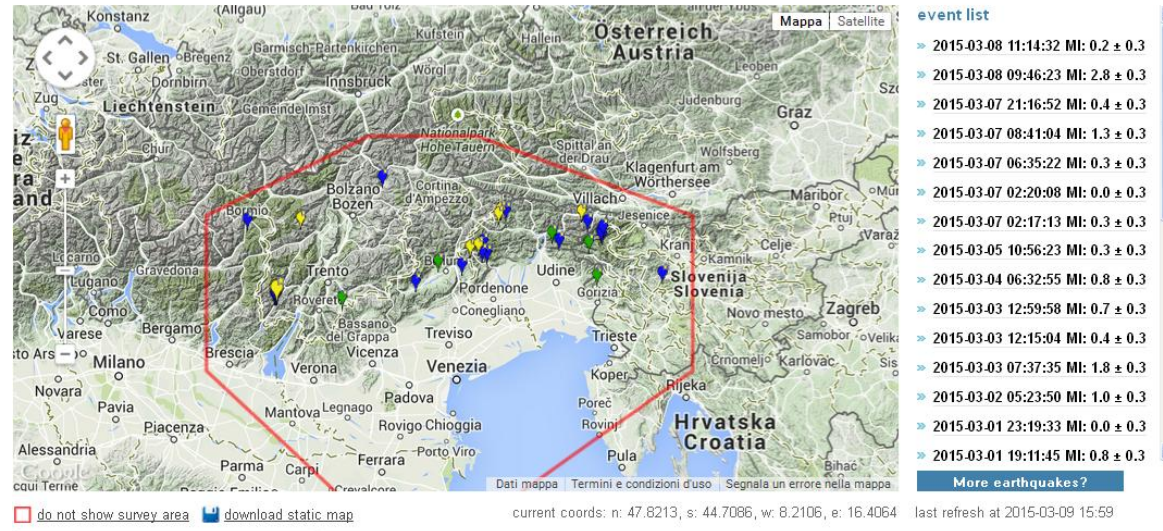
# OGS Real Time Seismology:

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

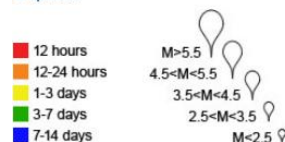


## Seismicity of NE Italy

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



## 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 di GEOFISICA Sperimentale

The OGS Archive System of Instrumental Seismology

Ministero dell'Istruzione, dell'Università e della Ricerca  
PRIN - Progetto 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

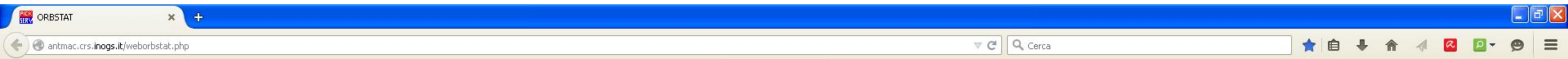
Housing: -- Any value --

Morphology: -- Any value --

Number of Recordings: >=

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 weborbstat



Last update: 2015.03.09 16:47:29 CEST

Current ORB: antMac

next refresh in 118s

Auto: 3' Refresh

**CRS Collalto (EV)**

Station	DL	Chan	Latency	kB
ED06	Orsbp	-	0:05"	2402.2

**CRS Short Period (FV)**

Station	DC	AC	DL	Chan	Latency	kB
ADRI	AMS	-	0:53"	-	1744.2	
AFL	AMS	-	4:09"	-	1892.0	
BAD	AMS	-	0:07"	-	1039.4	13.8
BOO	AMS	-	0:07"	-	2206.6	
BUA	AMS	-	0:07"	-	1778.4	13.1
COLI	AMS	-	0:17"	-	1281.3	13
CSM	AMS	-	0:15"	-	1115.6	13.5
CSO	AMS	-	0:07"	-	1156.7	13
FAU	AMS	-	0:40"	-	1479.6	
GAZZ	AMS	-	-	-	-	13.86
IESO	AMS	-	7h:06:31"	-	397.7	13.17
LSR	AMS	-	0:15"	-	1087.8	
MLN	AMS	-	0:07"	-	1162.5	13.4
MTLO	AMS	-	0:07"	-	1781.0	12.7
PLRO	AMS	-	0:07"	-	1776.8	14.3
TEOL	AMS	-	0:07"	-	1243.5	13.43
TLI	AMS	-	0:08"	-	1219.3	12.77
ZOU	AMS	-	-	-	-	

**CRS Broadband (NI)**

Station	DC	AC	DL	Chan	Latency	kB
ACOM	Q330	-	0:502"	-	986.4	13.6
AGOR	Q330	-	0:07"	-	1200.9	13.7
BALD	Q330	-	0:16"	-	1309.5	13.91
BOO	Q330	-	0:02"	-	1115.0	13.31
CAE	Q330	-	0:02"	-	1093.3	13.3
CGRP	Q330	-	0:02"	-	1030.5	14.39
CIMO	Q4120	-	0:13"	-	691.2	
CLUD	Q330	-	0:04"	-	1000.1	13.3
DRE	Q330	-	0:02"	-	1216.2	13.4
DST2	Q330	-	0:02"	-	1332.7	
IERO	Orsbp	-	0:09"	-	1200.9	
FUSE	Q330	-	0:02"	-	1147.6	13.6
GARG	Q330	-	0:10"	-	1200.3	
MARN	Q330	-	0:48"	-	1211.3	
MPRI	Q330	-	0:02"	-	1239.7	13.8
POLC	Q330	-	0:02"	-	1103.4	
PRED	Q330	-	1:04"	-	1237.1	
PURA	Q330	-	0:04"	-	1395.4	
SABO	Q330	-	0:02"	-	1023.6	13.91
VARN	Q330	-	0:02"	-	1190.8	13.55
VINO	Q4120	-	0:10"	-	1060.9	
ZOU2	Q330	-	0:02"	-	934.9	13.6

**ZAMG-AUSTRIA (OE)**

Station	DL	Chan	Latency	kB
ABTA	Q330	-	0:03"	1057.3
ARSA	Q330	-	0:12"	529.0
DAVA	Q330	-	0:11"	610.8
FETA	Q330	-	0:04"	936.8
KBA	Q330	-	0:11"	520.3
MOA	Q330	-	0:17"	551.3
MYKA	Q330	-	0:04"	971.8
RETA	Q330	-	0:03"	995.8
SOKA	Q330	-	1h:31:41"	412.9
WTTA	Q330	-	0:03"	959.7

**ARSO-SLOVENIA (SL)**

Station	DL	Chan	Latency	kB
CADS	Q230	-	0:06"	1609.9
CEY	Q230	-	0:05"	1969.4
GBAS	Q230	-	0:04"	1431.2
GORS	Q230	-	0:08"	1288.9
JAVS	Q230	-	0:07"	1531.4
KNDS	Q230	-	0:05"	1441.8
LJU	Q230	-	0:04"	2543.9
MOZS	Q230	-	0:07"	1375.5
ROBS	Q230	-	0:04"	1998.0
SKDS	Q230	-	0:08"	1524.1
VNDS	Q230	-	0:06"	1425.4
VOJS	Q230	-	0:06"	1523.1

**INGV (IV)**

Station	DL	Chan	Latency	kB
APPI	Q330	-	0:07"	1236.6
BRMO	Q330	-	0:07"	1201.4
CTI	Q330	-	0:09"	1212.4
FVI	Q330	-	0:08"	1201.9
MABI	?	-	0:09"	1104.6
MAGA	?	-	0:09"	1200.9
PTCC	?	-	0:08"	1201.4
RAVA	?	-	0:05"	2071.9
STAL	?	-	-	-
TEOL	Q330	-	-	-

**Rete Trentino (ST)**

Station	DL	Chan	Latency	kB
CARE	Q330	-	0:02"	851.9
DOSS	Q330	-	0:02"	1108.2
GAGG	Q330	-	0:02"	1108.0
OZOL	Q330	-	0:09"	960.0
PANI	Q330	-	0:09"	938.9
RONC	Q330	-	0:02"	906.1
VARA	Q330	-	0:06"	979.4
ZIAN	Q330	-	0:02"	993.5

**FVG Acc. Netw. RAF (RF)**

Station	DL	Chan	Latency	kB
GEFF	Q330	-	-	-

**CRS Repeaters**

Station	DC	AC	Site
IOAN	AMS	-	MRJohannaz
NAML	AMS	-	MRNamen
Piz1	AMS	-	MRPiz1
STRA	AMS	-	MRStranet
TEN	AMS	-	MRTenite
ZoNC	AMS	-	MRZocetan

**CRS GPS**

Station	DC	AC	Site
VARM	AMS	-	Orsbp
CAEG	AMS	-	Orsbp

**Bozen-Südtirol (SI)**

Station	DL	Chan	Latency	kB
ABSI	Q330	-	0:03"	967.9
BOSI	Q330	-	0:03"	1990.6
KOSI	Q330	-	132208h:14:59"	899.0
LUSI	?	-	0:03"	1052.1
MOSI	Q330	-	0:04"	1131.1
RISI	Q330	-	0:03"	1003.5
ROSI	Q330	-	0:04"	1102.8

**ETH Zürich (CH)**

Station	DL	Chan	Latency	kB
BERNI	trident	-	0:24"	354.0
DAVOX	trident	-	0:21"	326.1
FUORNI	trident	-	-	-
MUGIO	trident	-	0:28"	375.0
TORNY	trident	-	0:18"	453.9
VDL	trident	-	0:28"	364.5

**MEDNET (MN)**

Station	DL	Chan	Latency	kB
AQU	Q230	-	0:10"	2023.5
BNI	Q230	-	0:08"	1200.9
TRI	Q230	-	-	-
TUE	Q230	-	0:08"	1200.9
VLC	Q230	-	0:11"	1200.3

Status area

```
no entry for sta_net:QUIN_NI; no entry for
sta_net:TRES_NI;
15:46:42: snmpget SYS_DESCR failed:Piz1_REP;
15:46:52: XML query failed for GARG_NI;
```

# Already done (☺):

- orbdetect tuning
  - BB continuous, SP trigger, Local/teleaseismic bandwidth, S phases
- Antelope migration to 5.2-64
- orbassoc tuning (grid, windows, station weighting and grouping, etc.)



# Still work in progress (☹):

- Migration core Antelope (SUN cluster) from 5.1-64 to 5.2-64 (need OS patch) – SUN cluster to be abandoned?
- Migration from cdorb2db + db2msd to orbwf
- Antelope migration to 5.4
- Implement orbxchange between Antelope backups (Palmanova/Udine)
- Implement orbxchange with neighbors -> **SeismoSAT!!**



# European Geosciences Union General Assembly 2015

Vienna | Austria | 12 - 17 April 2015



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## SM1.2/GI1.5

### Improving seismic networks performances: from site selection to data integration (co-organized)

Convener: Damiano Pesaresi

Co-Conveners: H.A. Pedersen , Yuri Starovoit

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- B331 EGU2015-7985 **Comparative Noise Performance of Portable Broadband Sensor Emplacements**  
J. Sweet, E. Arias-Dotson, B. Beaudoin, and K. Anderson
- B332 EGU2015-9164 **Sources of high frequency seismic noise: insights from a dense network of ~250 stations in northern Alsace (France)**  
J. Vergne, A. Blachet, M. Lehujeur and the EstOF Team
- B333 EGU2015-9965 **AlpArray Austria - Illuminating the subsurface of Austria and understanding of Alpine geodynamics**  
F. Fuchs, G. Bokelmann, I. Bianchi, M.-T. Apoloner, and AlpArray Working Group
- B336 EGU2015-11525 **Introduction of digital object identifiers (DOI) for seismic networks**  
P. Evans, A. Strollo, A. Clark, T. Ahern, R. Newman, J. Clinton, C. Pequegnat, and H. Pedersen
- B342 EGU2015-14387 **Impact of sensor installation techniques on seismic network performance**  
G. Bainbridge, M. Laporte, D. Baturan, and W. Greig

# THANKS!

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Mucciarelli, Angela Saraò, Paolo Di Bartolomeo,  
Giorgio Durì, Paolo Bernardi, Michele Bertoni, Elvio  
Del Negro, Luca Moratto  
and all the **OGS-CRS** team!