2013 status of the Northeast Italy Seismic Network

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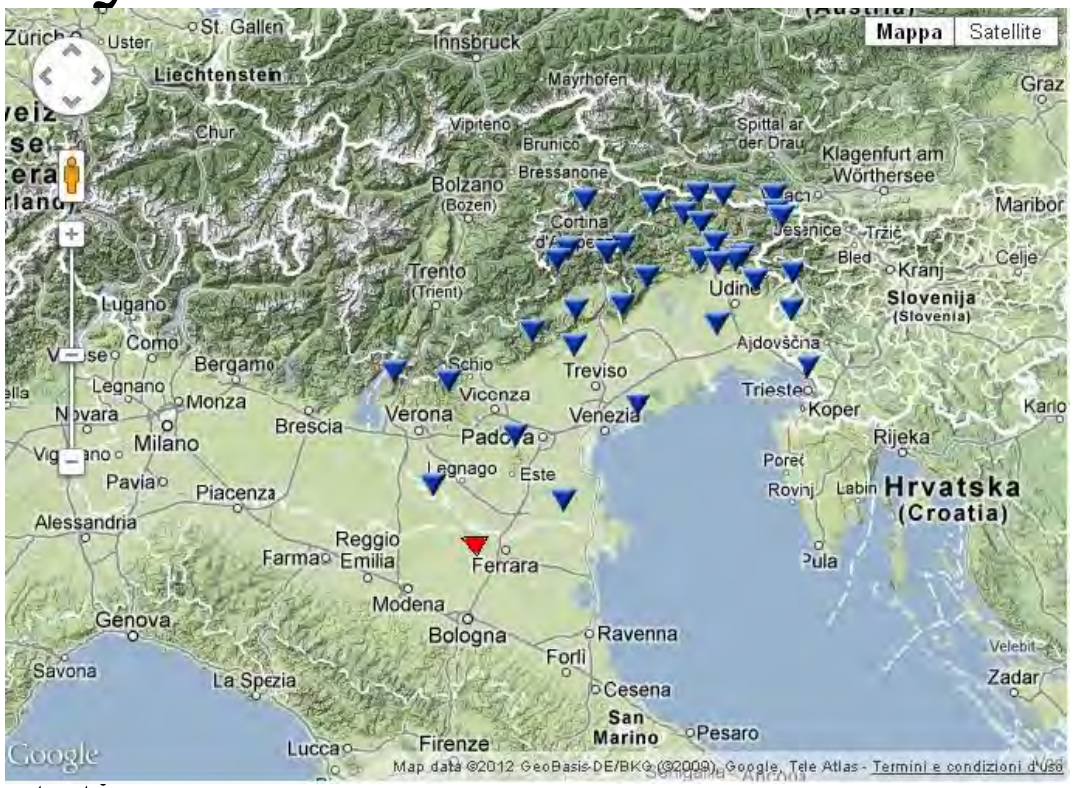
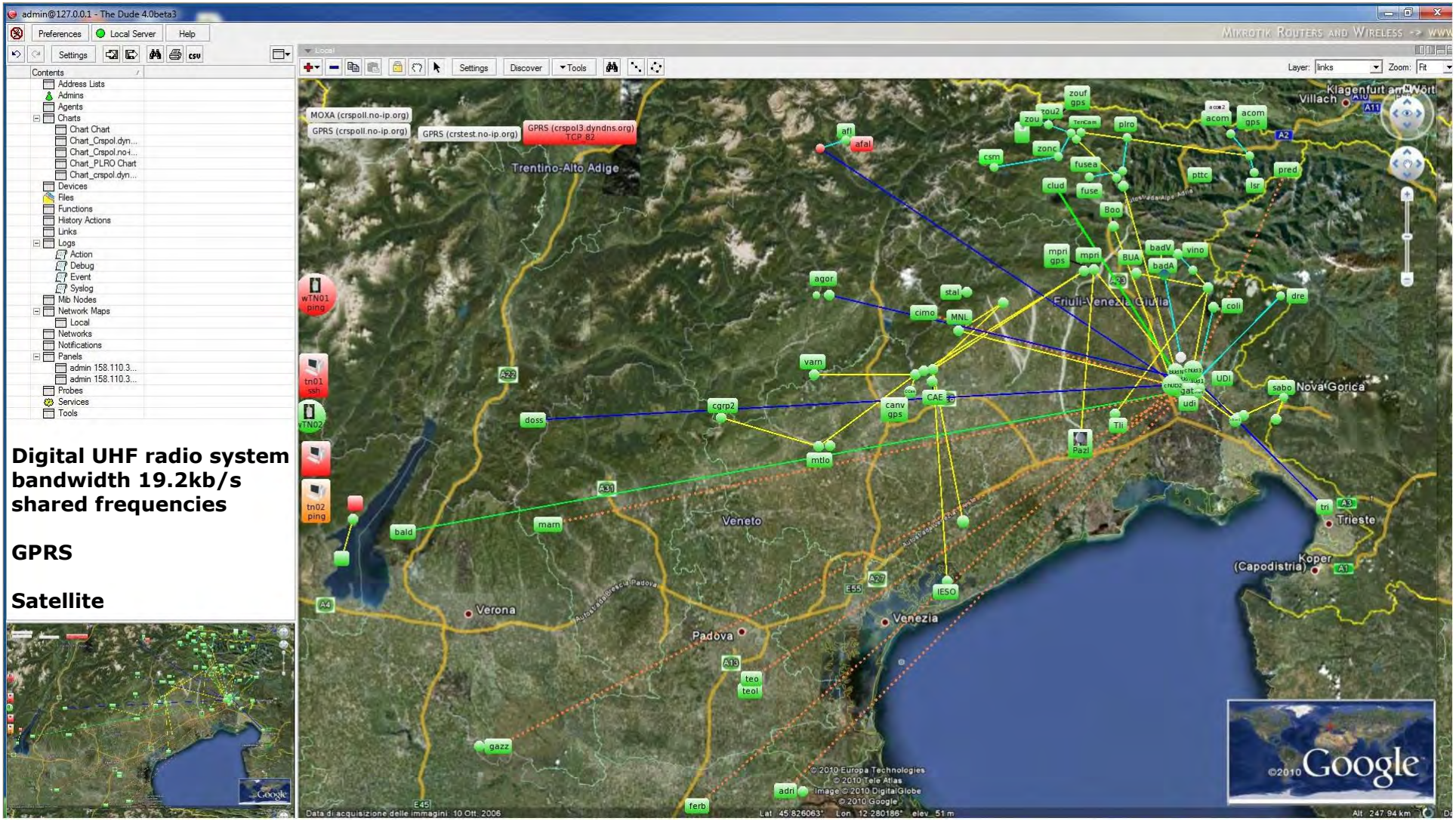
NE Italy Seismic Network - OGS



- 17 BB stations
  - Q330 + STS-2/Trillium 40/120s
    - DM24 + CMG-3TB
  - real time, continuous

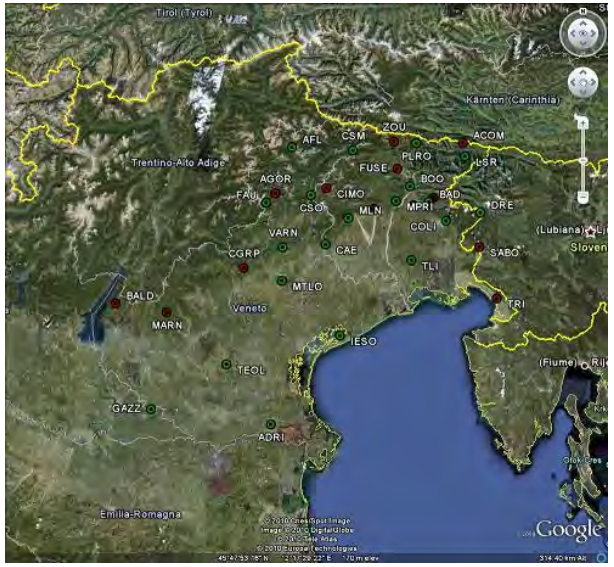
- 19 SP stations
  - Mars88 + Lennartz 1sec
  - real time, on trigger

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

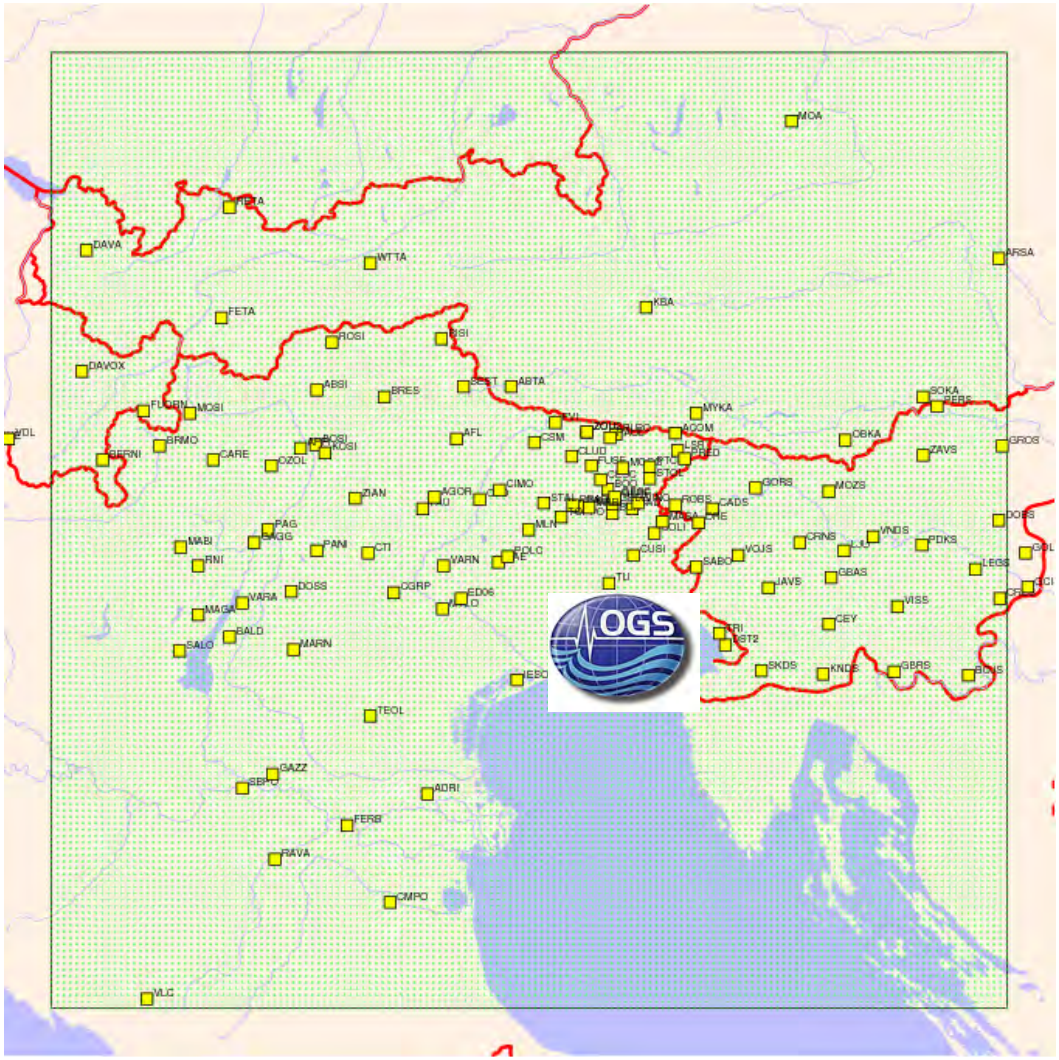


CRS headquarters in Udine (Italy)

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)



SED

Provincia di Trento

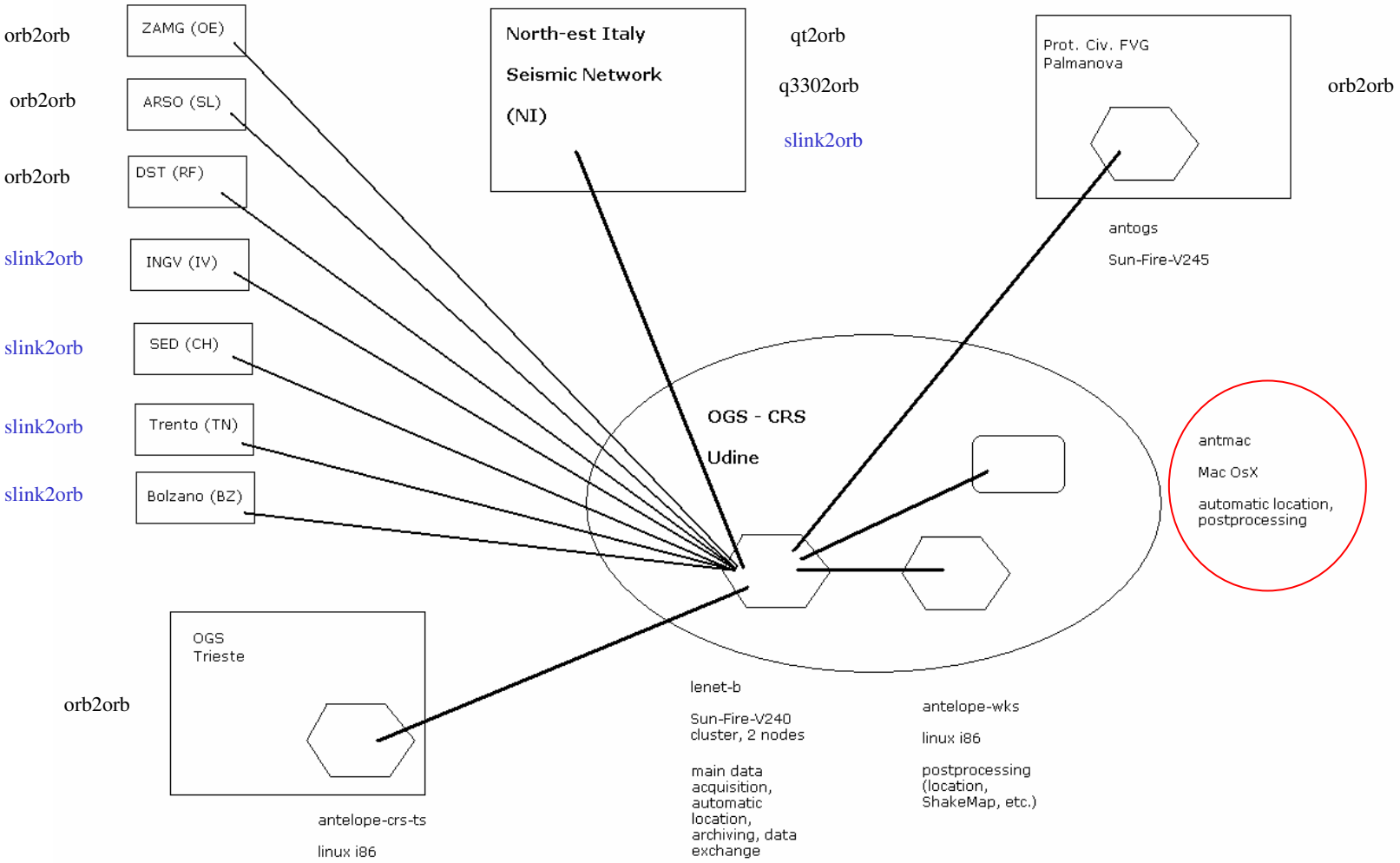
Provincia di Bolzano

INGV

ZAMG

Dipartimento di Geoscienze

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 -onlypicks -out $ORB $ORB $DB
orbassoc            orbassoc -v -select /db/detection $ORB $ORB dbmaster/ttgrid
orbevproc           orbevproc  -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_towebpcfvg               orbptrigger -background -select "/pf/orbmag" -state state/orbptrigger_towebpcfvg $ORB /database/towebpcfvg/towebpcfvg.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

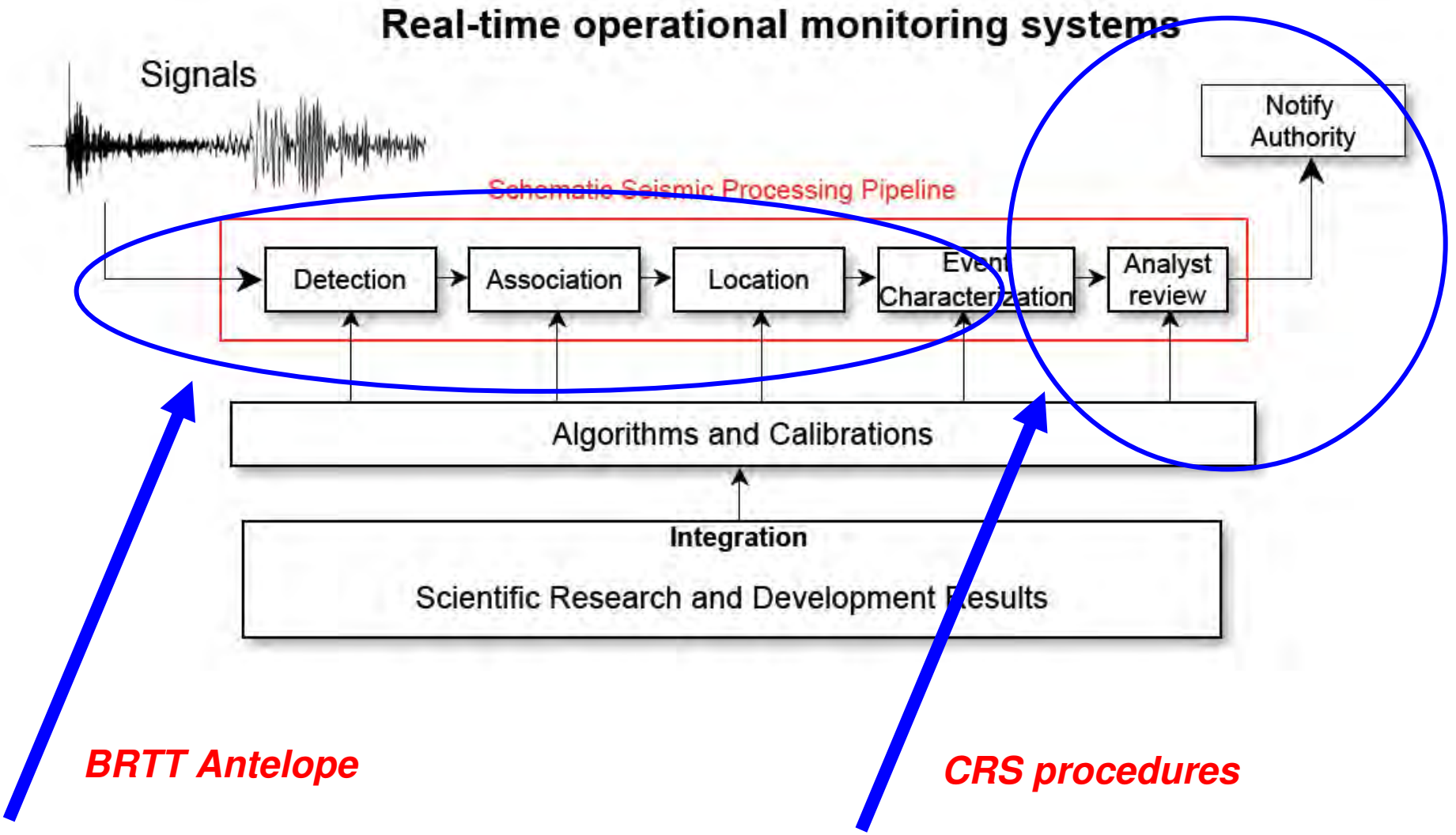
PID	USERNAME	LWP	PRI	NICE	SIZE	RES	STATE	TIME	CPU	COMMAND
4856	rt	91	41	0	1048M	625M	cpu/1	113.5H	8.04%	orbserver
5384	rt	1	59	0	191M	17M	sleep	17.0H	1.32%	orbdetect
5042	rt	59	59	0	41M	17M	run	673:29	0.96%	q3302orb
26989	rt	1	59	0	44M	26M	sleep	272:40	0.86%	cdorb2db
4868	rt	12	59	0	110M	78M	sleep	377:26	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

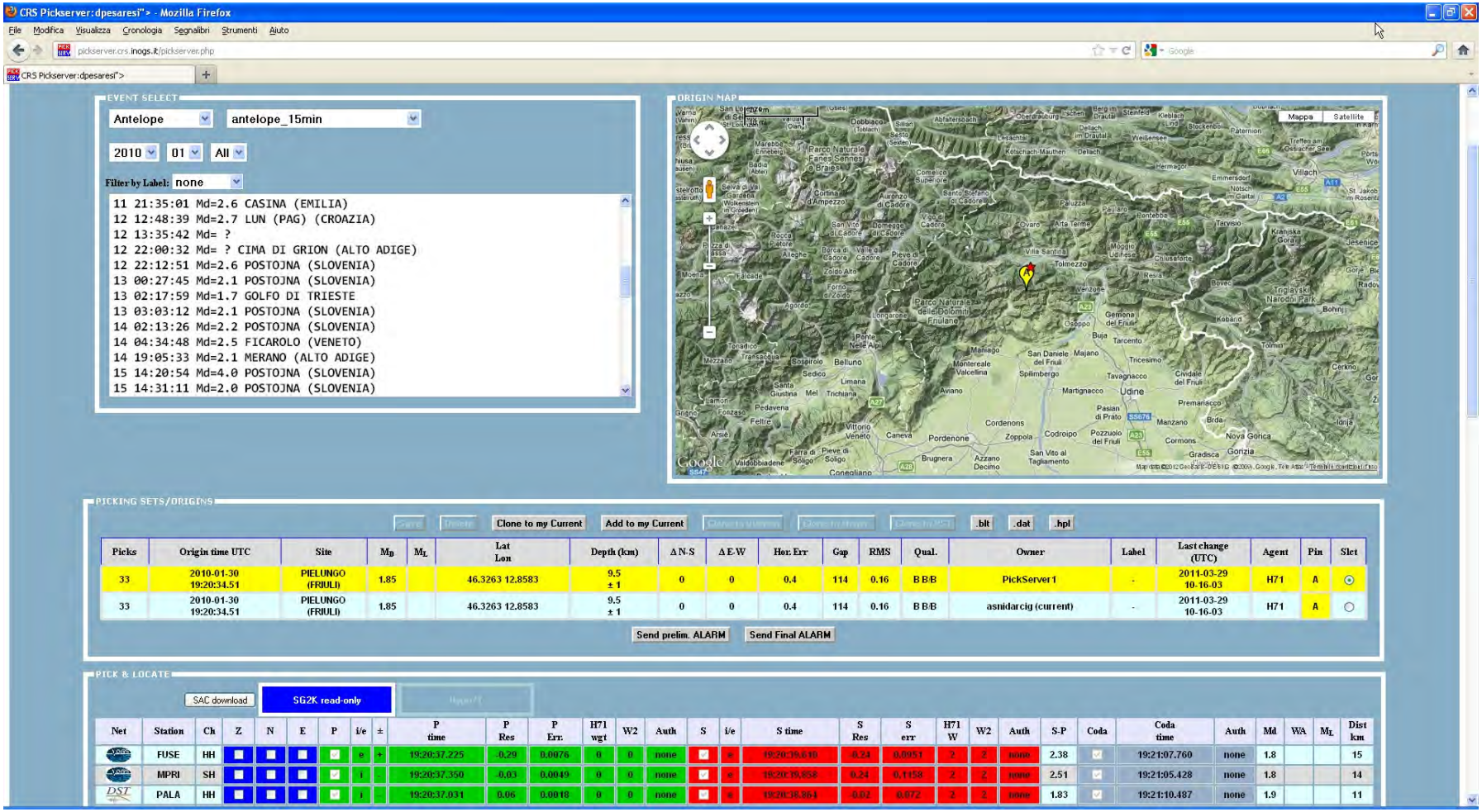


OGS adds-on for Antelope

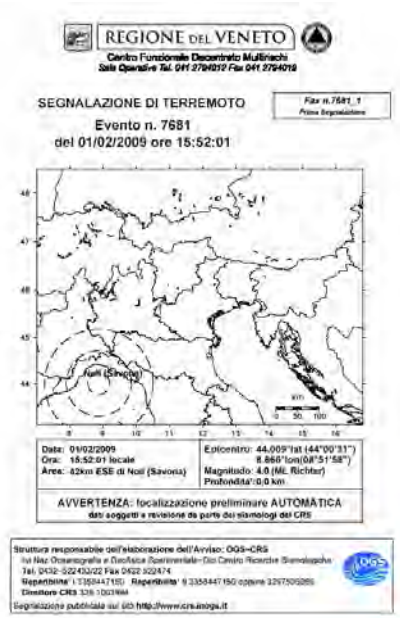
- PickServer (using Lomax viewer)
- Comprehensive Alarm routines with re-location control
  - Output: email, fax, SMS, web
- M882orb and ORION2orb plugins
- Data archive (OASIS)
- Drumplot

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

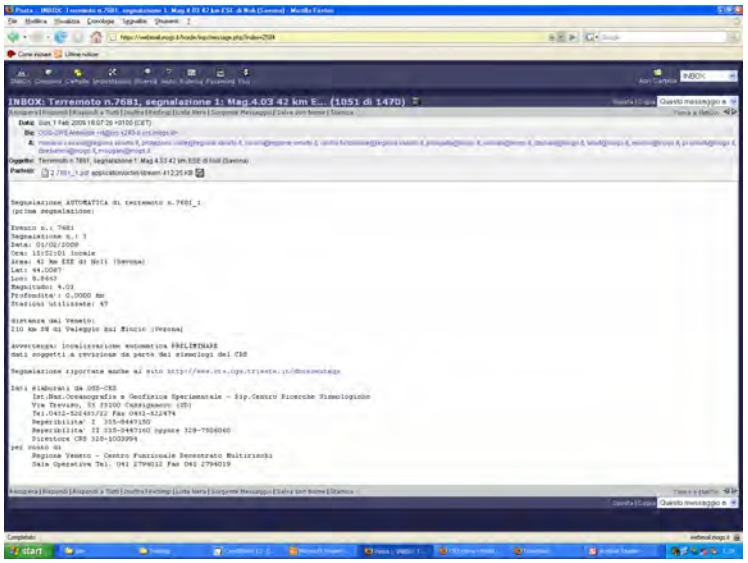
OGS PickServer (v. 2)



Alarms



fax



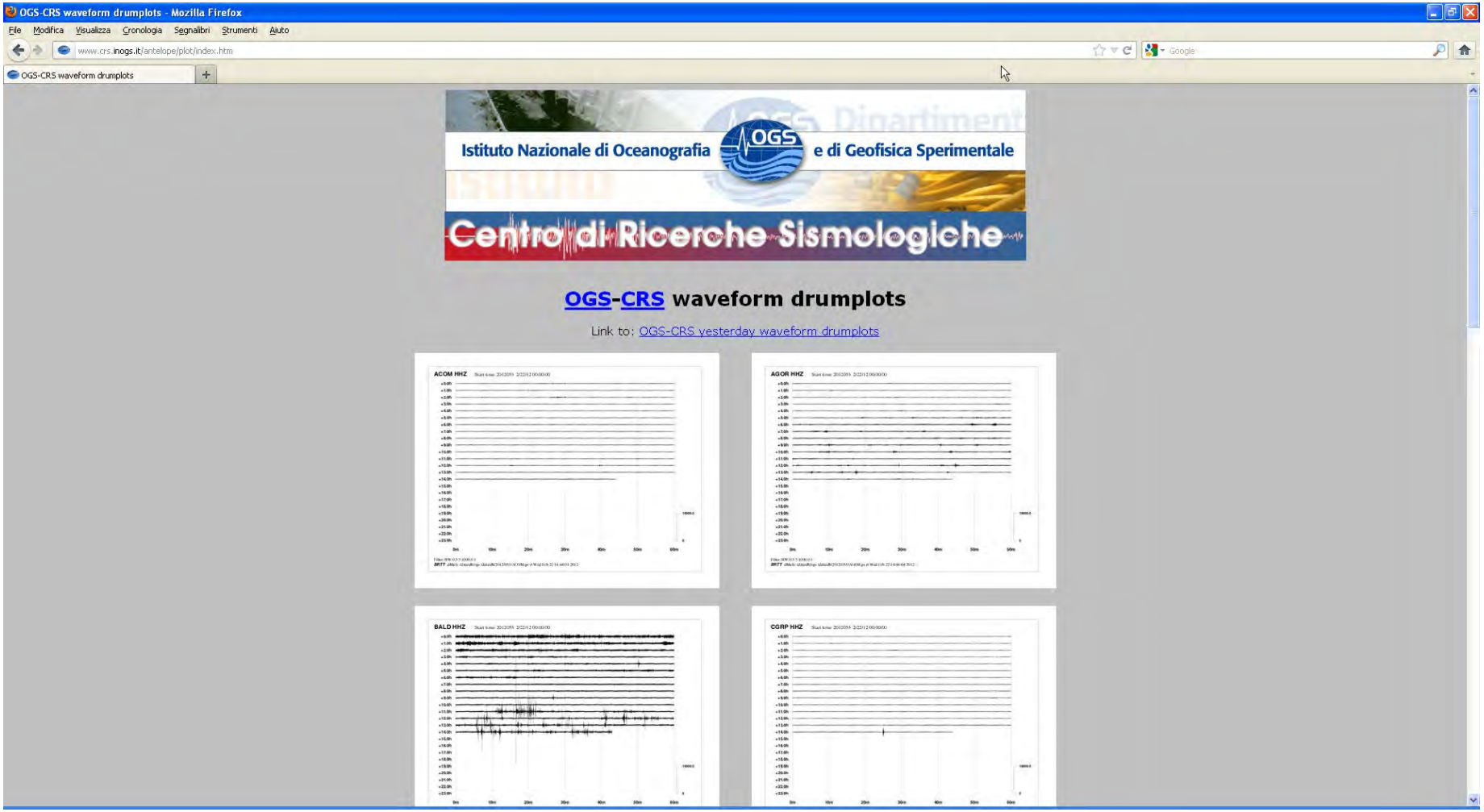
e-mail

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

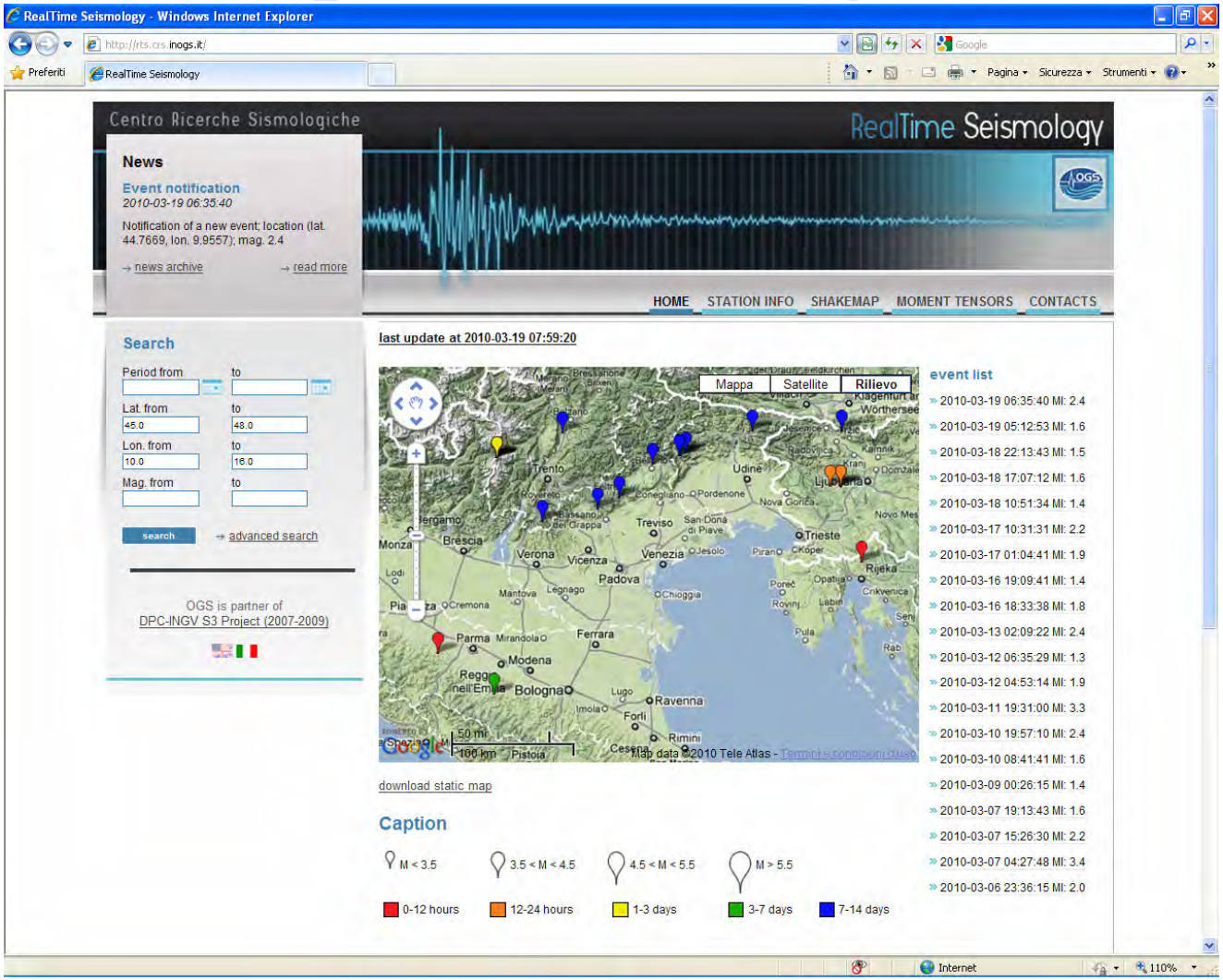
web

OGS dbheli


OGS-CRS waveform drumplots - Mozilla Firefox
File Modifica Visualizza Cronologia Segnalibri Strumenti Aiuto
www.crs.inogs.it/antelope/plot/index.htm
OGS-CRS waveform drumplots
Istituto Nazionale di Oceanografia
OGS
e di Geofisica Sperimentale
Centro di Ricerche Sismologiche
OGS-CRS waveform drumplots
Link to: OGS-CRS yesterday waveform drumplots
ACOM HHZ
AGOR HHZ
BALD HHZ
CGRP HHZ

OGS Real Time Seismology:

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



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/teleseismic bandwidth, S phases
- Antelope migration to 5.2-64

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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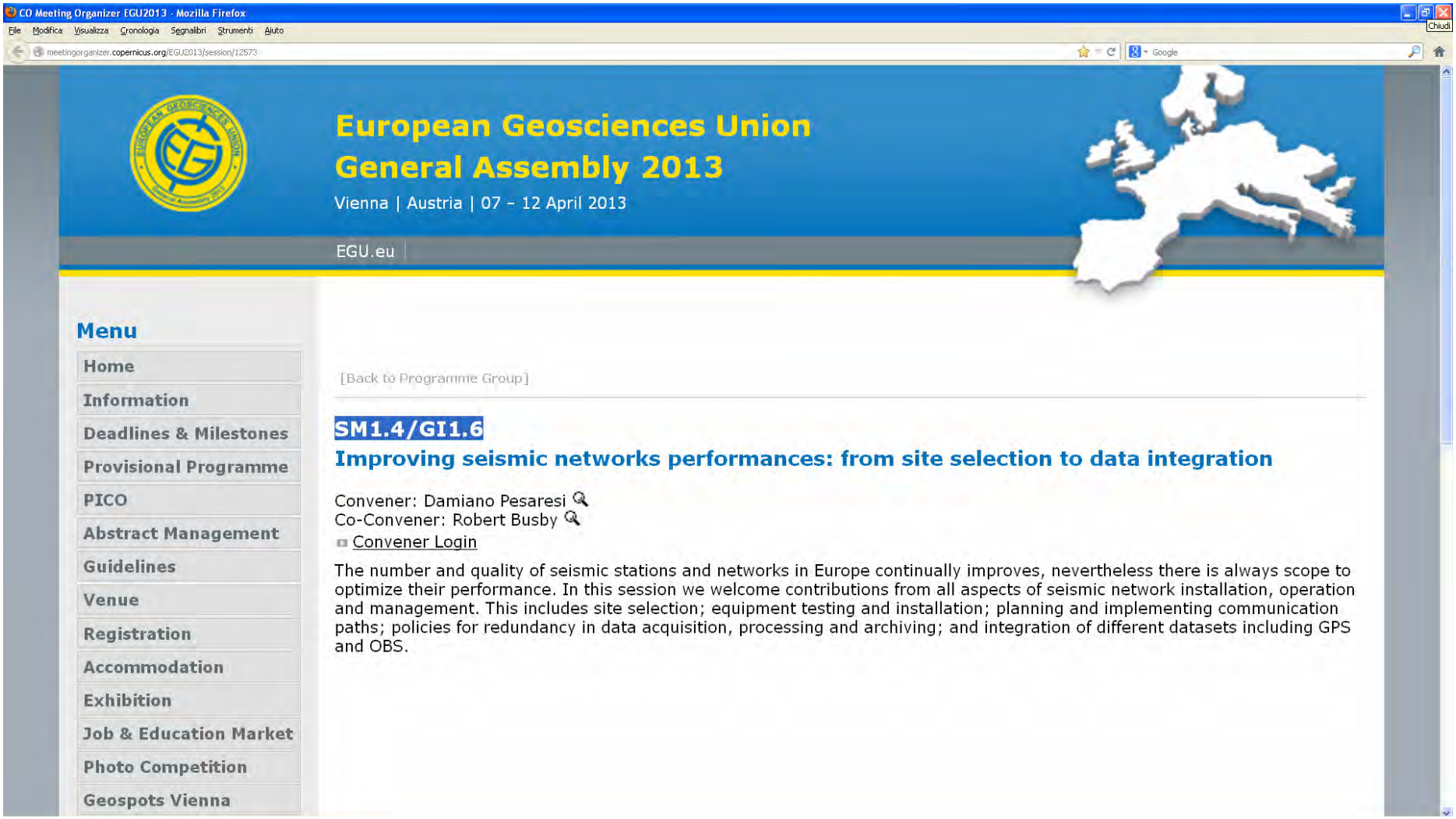
EGU2013 SM1.4/GI1.6

Improving seismic networks performances: from site selection to data integration



THANKS!

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Damiano Pesaresi, Pier Luigi Bragato, Marco Mucciarelli, Angela Saraò, Paolo Di Bartolomeo, Giorgio Durì, Paolo Bernardi, Michele Bertoni, Elvio Del Negro, Denis Sandron, Luca Moratto and all the **OGS-CRS** team!