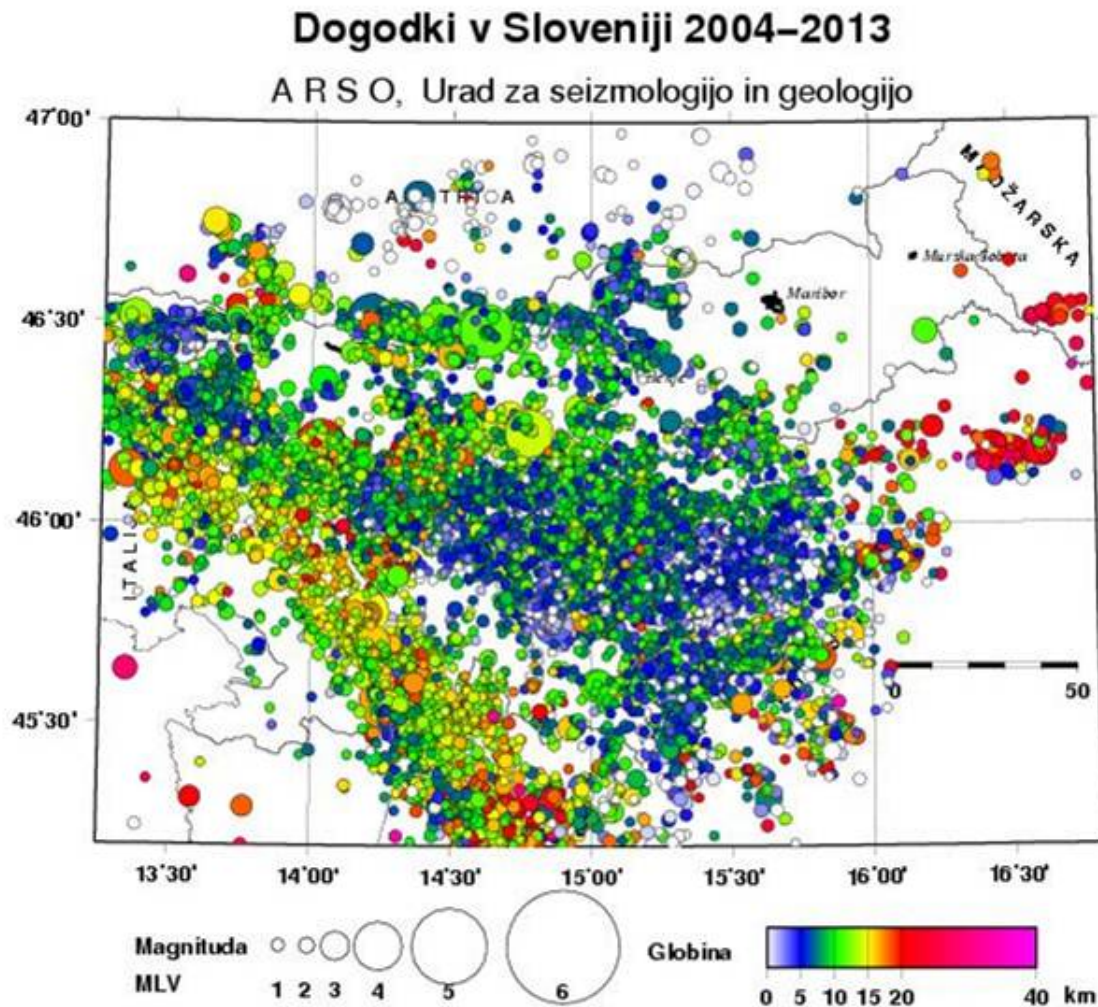

Seismology @ ARSO, Slovenia

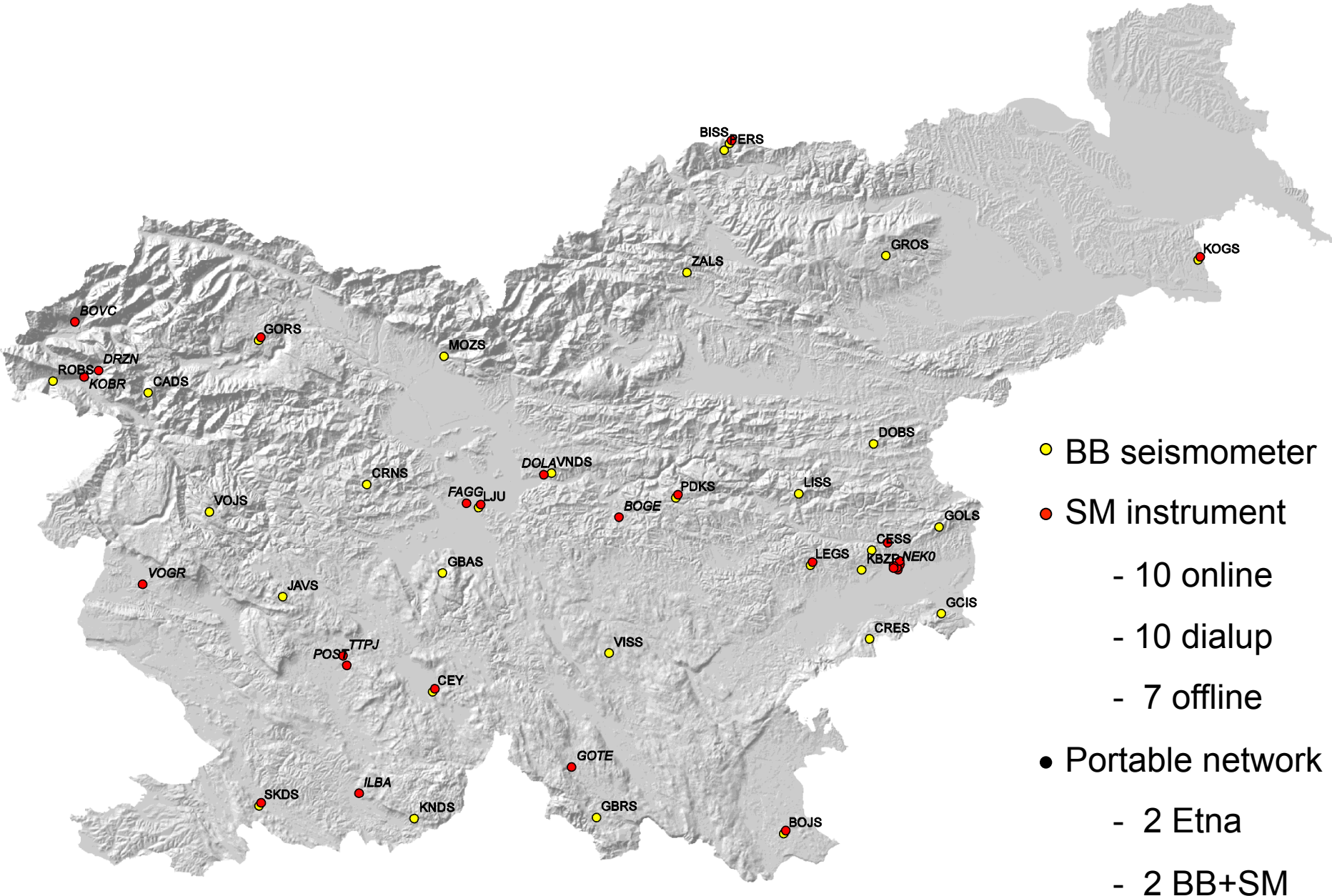
an overview

Jurij Pahor
March 2015♪

Seismicity in Slovenia

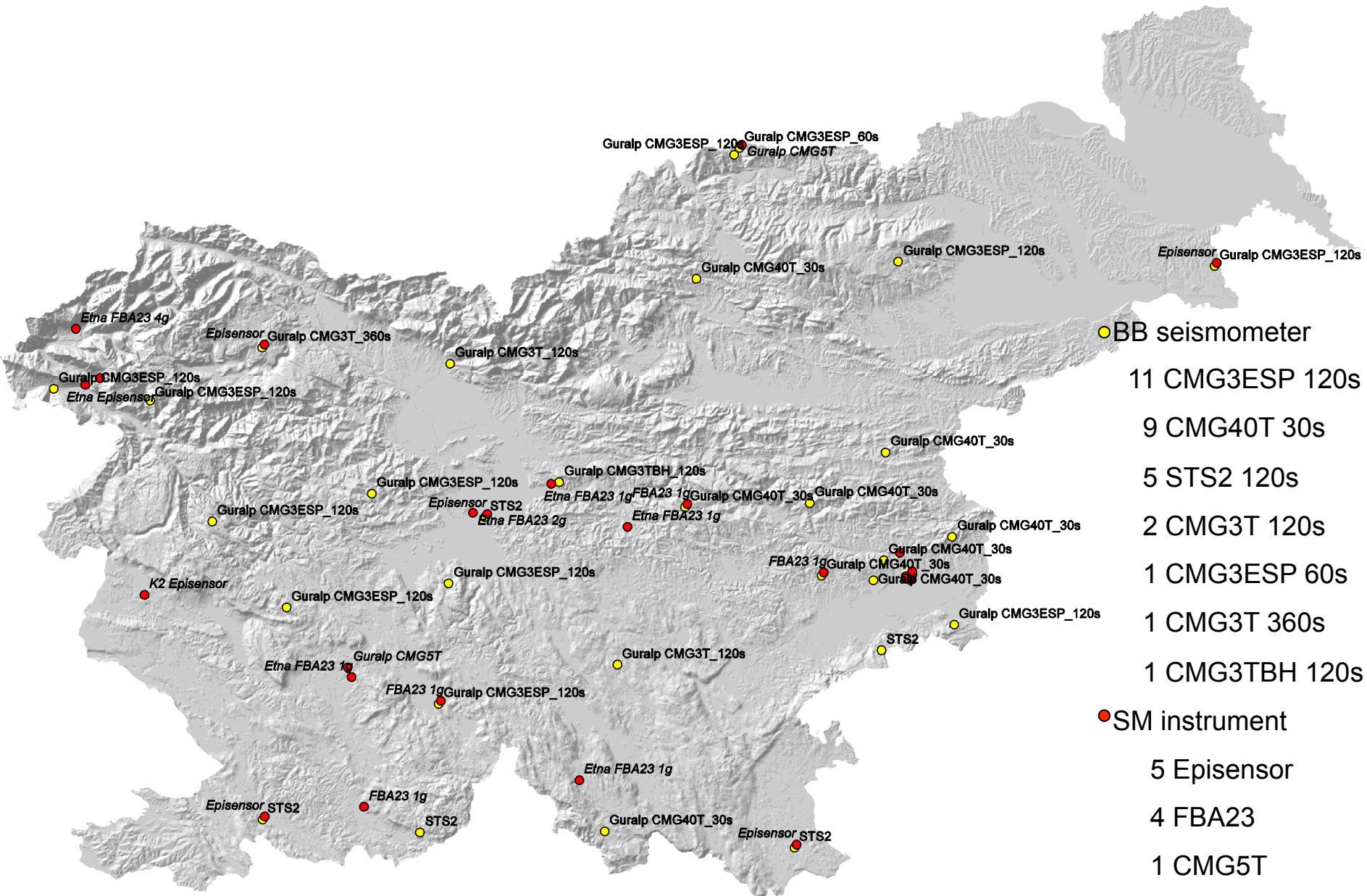


Station layout



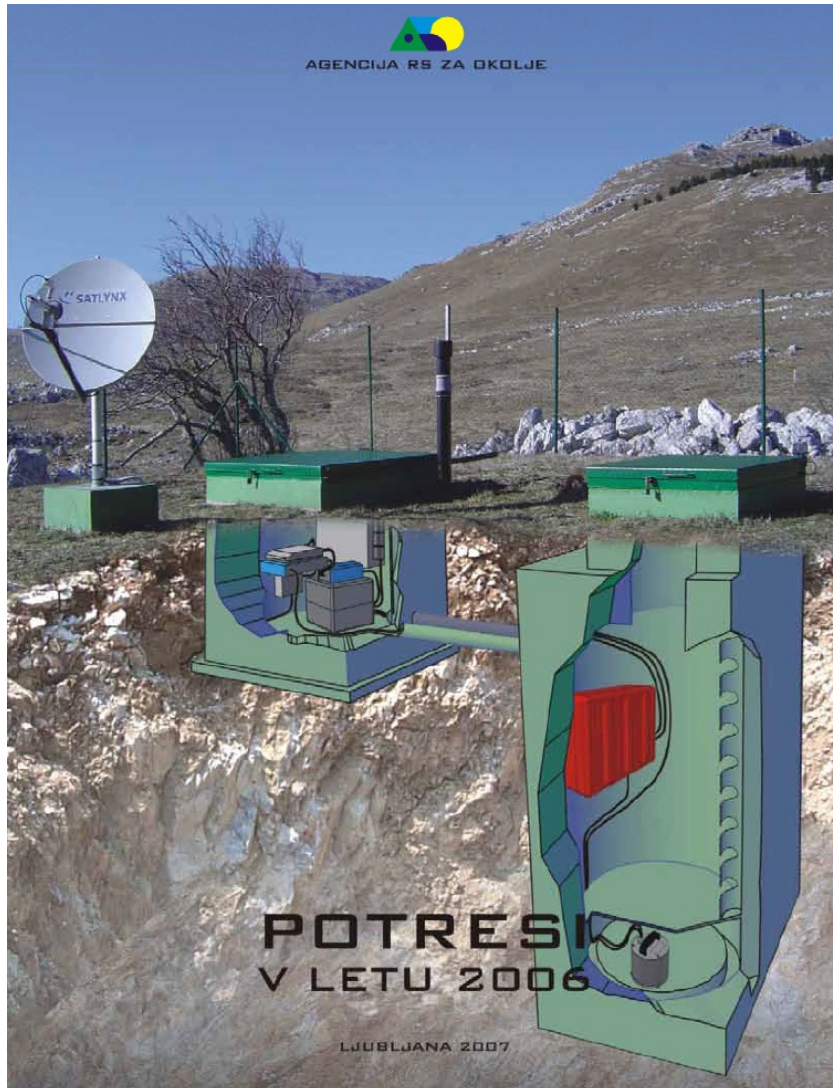
- BB seismometer
- SM instrument
 - 10 online
 - 10 dialup
 - 7 offline
- Portable network
 - 2 Etna
 - 2 BB+SM

Instrument layout



- BB seismometer
- 11 CMG3ESP 120s
- 9 CMG40T 30s
- 5 STS2 120s
- 2 CMG3T 120s
- 1 CMG3ESP 60s
- 1 CMG3T 360s
- 1 CMG3TBH 120s
- SM instrument
- 5 Episensor
- 4 FBA23
- 1 CMG5T
- 9 Etna, 1 K2

Typical station design



Picture from our yearly publication “Earthquakes in YYYY”

Network equipment

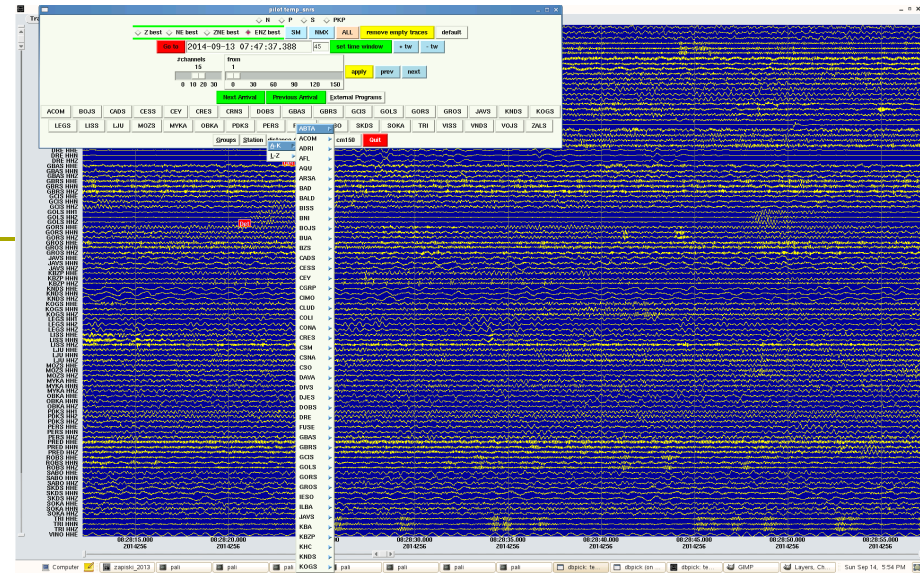
- 30 BB stations
- Seismometers
 - Guralp 30s, 60s, 120s, 360s
 - STS2
- Dataloggers
 - Q730 – upgrading to Q330HR (6/year -> 18 in 2016)
 - NMX Taurus, Centaur
 - ErthData PR6, EDR-209
- 24 SM stations
 - 5 Episensor, 4 FBA23 and 1 CMG5T within SNRS
 - 10 dialup Etna&K2
 - small array for site effects meas. near NPP Krško
- Only 4 portable setups
- >50 import stations
- Redundant data center
 - old Solaris machines with Antelope 4.6 – upgrade needed!
 - different data routes

Data management

- Telemetry not managed by us
- ~2Gb/day (200sps data)
- Main production servers Sun T2000 with Antelope 5.0
- Primary DC – qt2orb from Q730
- Backup DC – slink2orb from SeiscomP
- Archiving daily on NAS disks
- In house developed procedures for data quality monitoring

Data analysis

- 10 analysts rotating daily
- Daily bulletin =
 - + dbpick – local events
 - + Niko's pilot
 - + semiauto M
 - + noredit
 - + SoD review
- Weekly bulletin
 - compiled by SoD
 - inclusion of offline data analysis
 - inclusion of R,D events readings
 - inclusion of AUS bulletins
- Monthly bulletin
 - Inclusion of all available bulletins
- Yearly bulletin – complete with one year delay



The screenshot shows a software interface for data analysis. The main area is a list of data points with columns for '2014', '910', '111', '32.4', 'L', 'STAT SP IPWASH 0 SEHM SECON CODA AMPLIT PERI ASINO VELO SNR AR TRES W DIS CAST', 'KBP BE', '4', '111 32.43'. The list is sorted by '2014'. Below the list, there are several data plots showing waveforms for various stations. The plots are arranged in a grid, with each plot corresponding to a station in the list. The plots show data points over time, with some points highlighted in red. The interface also includes a search bar and various filters.

2014	910	111	32.4	L	STAT SP IPWASH 0 SEHM SECON CODA AMPLIT PERI ASINO VELO SNR AR TRES W DIS CAST	KBP BE	4	111 32.43
2014	910	121	26.9	L	STAT SP IPWASH 0 SEHM SECON CODA AMPLIT PERI ASINO VELO SNR AR TRES W DIS CAST	BOUS BE	4	121 26.90
2014	910	223	9.9	LM 46 39 15 D7 0 IPFLTU	STAT SP IPWASH 0 SEHM SECON CODA AMPLIT PERI ASINO VELO SNR AR TRES W DIS CAST	PERS BE	2	223 14.10
					PERS EN ESq	2	223 17.84	
					PERS BE M	4	223 20.21	3.4 0.28
					SOBA BE	2	223 14.97	
					ZALS BE	0 D	223 9.91	
					ZALS BE M	4	223 12.44	28.0 11
2014	910	300	7.7	L	STAT SP IPWASH 0 SEHM SECON CODA AMPLIT PERI ASINO VELO SNR AR TRES W DIS CAST	BOUS BE	4	300 7.73
2014	910	621	15.1	L	STAT SP IPWASH 0 SEHM SECON CODA AMPLIT PERI ASINO VELO SNR AR TRES W DIS CAST	VISS BE	4	621 15.09

Seismological duty

- 7 SoD rotating weekly
- Alerting if
 - call from 112
 - call from citizens
 - >2 web questionnaires + increased webtraffic
 - >M_L 2.5
- Alerting includes
 - notice on ARSO web
 - email to 112, media
 - fax to 112
 - message on answering machine
 - bulletin to EMSC and other institutions
 - recorded mp3 message for radio media

SoD tools

- Internal EMSC-like bulletin with all autolocations available
- Monitoring webtraffic on autoloc site

Zadnji potresi - Astra - Mozilla Firefox 3 Beta 5

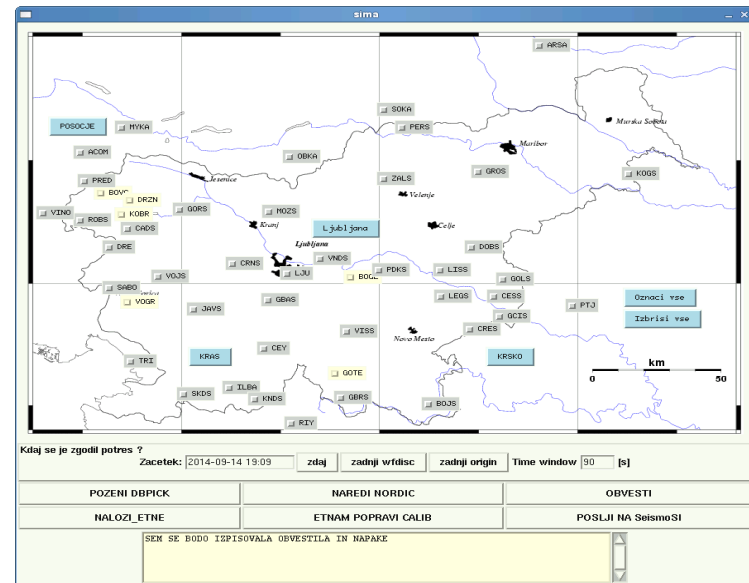
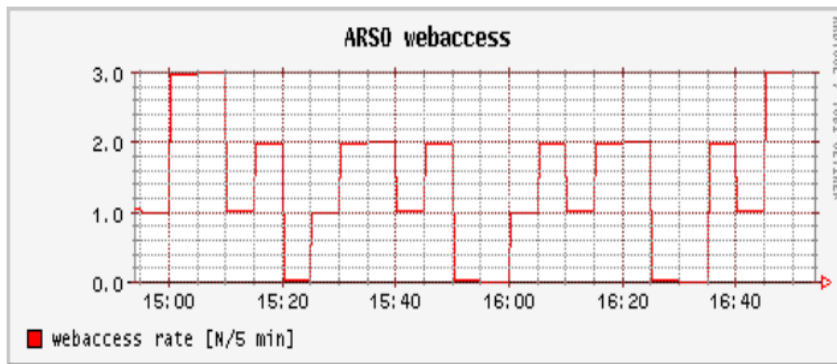
Seismo.SI - Astra
ARSO, Urad za seizmologijo in geologijo, Dunajska 47, Ljubljana, tel: 01/478 72 50.

Izberi dan: Našli:

Mešni potresi v Sloveniji
Žariščni mehanizmi
Opazovalnice
Objave
Zadnji potresi
ARSO strani - Potresi
Obisk ARSO strani
Seizmolotra - makro
ZENIT

Zadnji potresi do 14/09/2014 19:02:41

Čas (UTC)	mvr	lat	lon	globina	območje	Nsta	AM	avtor	vpis / OBVEŠČANJE
2014/09/14 18:59:14	1.92	45.49	16.08	14	37 km S od ZAGREB	3	A	era_snrs	14/09/2014 19:00:29
2014/09/14 18:18:53					MARSHALL ISLANDS REGION	8	A	ursg1_#prior	14/09/2014 18:41:48
2014/09/14 17:28:57	0.78	46.16	14.05	10	5 km NE od CERIKNO	3	A	era_snrs	14/09/2014 17:30:09
2014/09/14 16:38:01	0.85	45.43	15.71	23.8	14 km SE from KARLOVCA (HRVASKA)	6	A	ursg2_snrs	14/09/2014 16:46:41
2014/09/14 16:37:57	1.55	45.24	15.66	20	29 km S od KARLOVAC	5	A	era_snrs	14/09/2014 16:39:33
2014/09/14 16:38:03	1.28	45.52	15.38	16	12 km NE od VINICA (CROATIA)	4	A	era_snrs	14/09/2014 16:39:10
2014/09/14 16:36:01	0.28	45.26	15.05	31.6	26 km S from STARI TRG OB KOLPI	8	A	ursg1_snrs	14/09/2014 16:52:06
2014/09/14 16:36:02	0.28	45.59	15.22	22	2 km NE from CERNOVELJ	3	A	ursg2_snrs	14/09/2014 16:43:29
2014/09/14 16:36:04	0.0	45.62	15.133	3	7 km NW from Cirmetelj	5	A	ursg1_autohp	14/09/2014 16:41:18
2014/09/14 16:33:13		34.69	23	20	400 Central Mediterranean Sea	9	A	era_snrs	14/09/2014 16:37:25
2014/09/14 16:36:01		45.52	15.255	30	5 km SE from Cirmetelj	4	A	ursg1_#prior	14/09/2014 16:37:24
2014/09/14 16:33:13		34.69	23	20	400 Central Mediterranean Sea	8	A	era_snrs	14/09/2014 16:37:02
2014/09/14 16:27:18	-0.4	45.96	14.547	7	1 km E from Ig	4	A	ursg1_autohp	14/09/2014 16:32:08
2014/09/14 16:27:11		46.477	14.246	35	9 km N from Podlublje	5	A	ursg1_#prior	14/09/2014 16:28:33
2014/09/14 16:07:48		12.81	176.03	33	180 North of Fiji Islands	5	A	era_snrs	14/09/2014 16:28:20
2014/09/14 14:30:15		46.28	16.54	8	16 km E od VARAZDIN	3	A	era_snrs	14/09/2014 14:31:55
2014/09/14 14:06:23	1.66	72.54	-8.25	15	JAN MAYEN ISLAND REGION	18	A	ursg2_snrs	14/09/2014 14:28:07
2014/09/14 14:11:36	1.66	48.84	13.92	35	AUSTRIA	6	A	ursg2_snrs	14/09/2014 14:19:33
2014/09/14 14:04:44		79.72	48.69	15	680 Western Kalaallit Nunaat	6	A	ursg1_snrs	14/09/2014 14:18:27
2014/09/14 14:05:36		69.04	39.45	15	EASTERN GREENLAND	12	A	ursg2_snrs	14/09/2014 14:18:15
2014/09/14 14:04:44		79.72	48.69	15	680 Western Kalaallit Nunaat	6	A	ursg1_snrs	14/09/2014 14:16:38
2014/09/14 14:04:44		79.72	48.69	15	680 Western Kalaallit Nunaat	7	A	ursg1_snrs	14/09/2014 14:15:38
2014/09/14 14:04:42		69.19	-54	15	WESTERN GREENLAND	8	A	ursg2_snrs	14/09/2014 14:14:39
2014/09/14 14:05:38		77.06	18	15	636 Eastern Kalaallit Nunaat	14	A	ursg1_snrs	14/09/2014 14:14:09
2014/09/14 14:00:48		60.36	160.42	33	2 Southern Alaska, United States	6	A	era_snrs	14/09/2014 14:13:30
2014/09/14 14:04:06		68.329	-64.391	15	DAVIS STRAIT	8	A	ursg1_#prior	14/09/2014 14:13:20
2014/09/14 14:02:00		54.33	91.02	15	441 Ontario, Canada	7	A	ursg1_snrs	14/09/2014 14:13:25



- App for quick analysis

SoD tools

□ POTROG project

- new web questionnaire <http://www.arso.gov.si/seizmovpr/seizmovpr/>
- graphical view http://www.arso.gov.si/seizmovpr/seizmovpr_view/seizmovpr_view
 - #felt per commune - public
 - #damaged per commune
 - other views possible
- tools for Civil Protection
 - predicted intensity map
 - affected buildings estimate
 - affected population est.
 - selectable autolocations or test scenario

Prikaz odzivov za potres 13.08.2014 ob 10:36 - 2 km V od Ptuja

