Modernization of the IM (now IPMA) Seismic Network

Supported by

- Portuguese National Science Foundation, FCT (20 new stations + 6 upgrades)
- Private Donation (GALP – oil company) (2 new stations)
- Instituto de Meteorologia, I.P.

Solve some constrains:

- frequency band (SP stations …)
- dynamic range
- non real time (digital)

by performing major improvements in the present network:

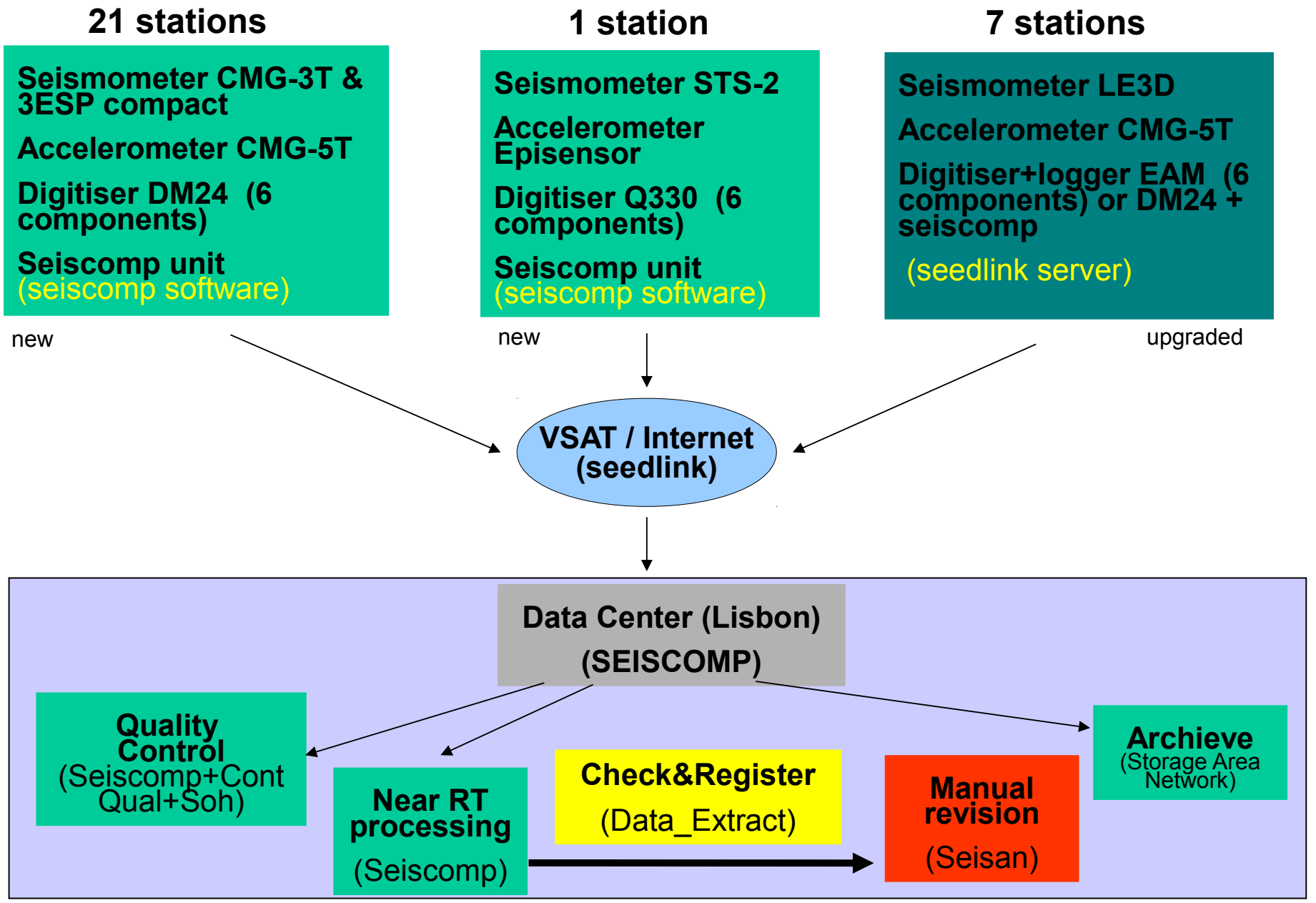
- introduce significant enhancements in the remote stations
- adopt (near) real-time transmission of signals
- real-time processing capability

Modernization of the IM (now IPMA) Seismic Network

These improvements allowed:

- quality data acquisition in highly sensitive stations which are also equipped with strong-motion sensors
- higher quality digital transmission
- real time monitoring at the Operational Center
- automatic signal detection
- automatic association of detections, event location and magnitude evaluation
- development of a rapid earthquake information system for Civilian Protection authorities
- automatic archive of recorded data
- development of high-level products (bulletins, shakemaps, etc.)
- contribute to international monitoring efforts (FDSN, ORFEUS, tsunami projects [NEAREST, IOC])
- data for scientific research purposes

New and Upgraded Seismic Network



New Seismic Stations

PVAQ
(Vaqueiros)

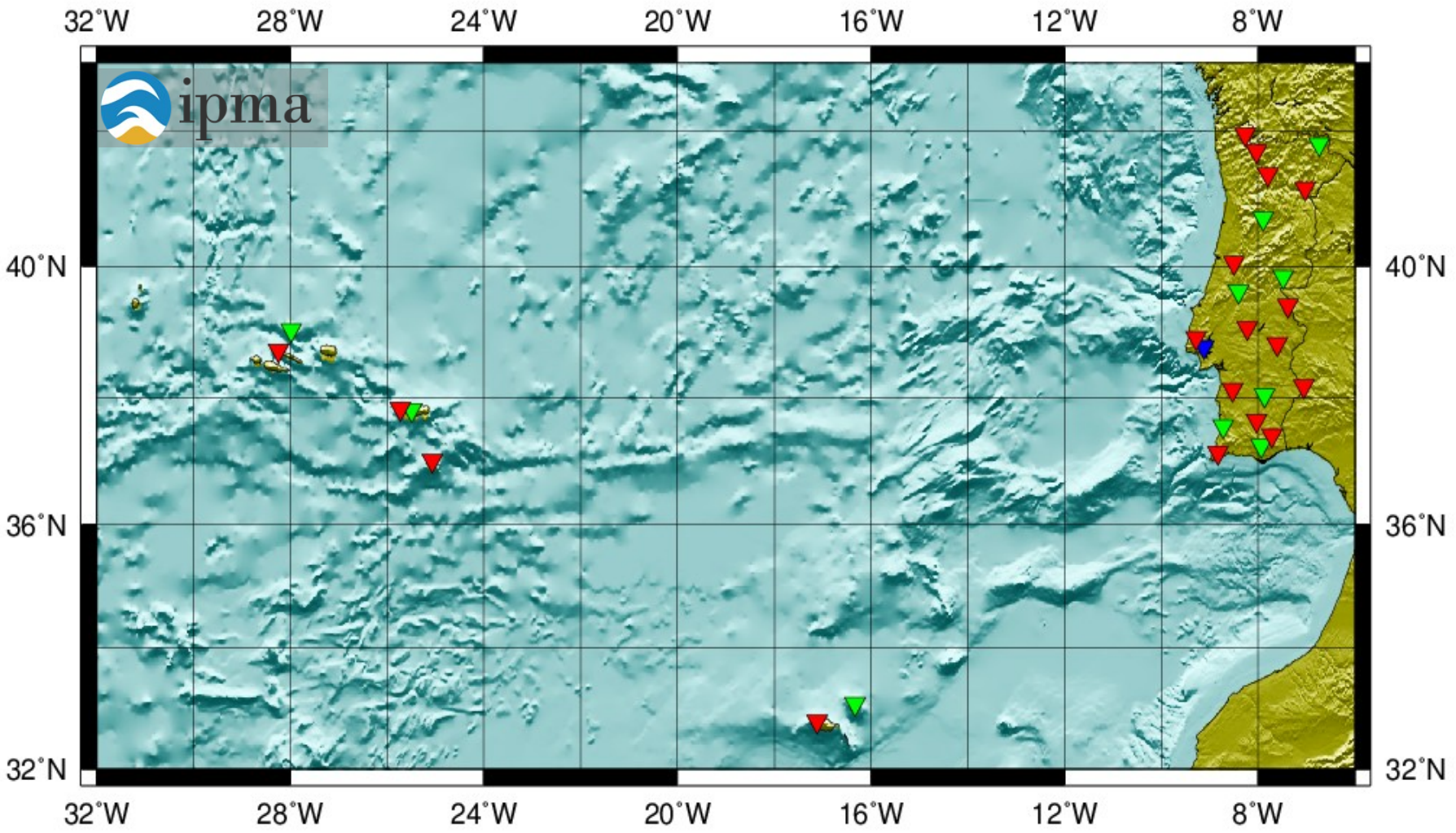
Broadband sensor

accelerometer

IPMA Accelerometer Station List

Code	Place Name	Latitude (+North)	Longitude (+West)	digitizer	sensor	sample rate	Acquisition mode	Instal. type	Date
PMAFR	Mafra	38.9122	09.2835	Q330	EPISENSOR	100hz	continuous	free-field	2006-224
PESTR	Estremoz	38.8191	07.6125	DM24	CMG-5T	100hz	continuous	free-field	2006-224
PFVI	Vila do Bispo	37.1328	08.8268	DM24	CMG-5T	100hz	continuous	free-field	2007-009
MVO	Moncorvo	41.1645	07.0288	DM24	CMG-5T	100hz	continuous	free-field	2007-043
PBDV	Barranco-do-Velho	37.2440	07.9317	DM24	CMG-5T	100hz	continuous	free-field	2007-008
PBAR:	Barrancos	38.1729	07.0609	DM24	CMG-5T	100hz	continuous	free-field	2007-015
PVAQ	Vaqueiros	37.4039	07.7175	DM24	CMG-5T	100hz	continuous	free-field	2006-356
PCAS	Casmilo	40.0528	08.4983	DM24	CMG-5T	100hz	continuous	free-field	2009-204
PMRV	Marvão	39.4088	07.3896	DM24	CMG-5T	100hz	continuous	free-field	2007-201
PCVE	Castro Verde	37.6320	08.0390	DM24	CMG-5T	100hz	continuous	free-field	2007-319
PMPST	Porto Santo	33.0788	16.3334	DM24	CMG-5T	100hz	continuous	free-field	2008-185
PBRG	Bragança	41.8153	06.7413	DM24	CMG-5T	100hz	continuous	free-field	2008-263
PMTG	Montargil	39.0690	08.2253	DM24	CMG-5T	100hz	continuous	free-field	2008-185
PNCL	Canal Caveira	38.1118	08.5290	DM24	CMG-5T	100hz	continuous	free-field	2008-270
POLO	Lamas de Olo	41.3740	07.7946	DM24	CMG-5T	100hz	continuous	free-field	2008-300
PGAV	Gavieira	41.9653	08.2698	DM24	CMG-5T	100hz	continuous	free-field	2008-301
PMOZ	Porto Moniz	32.7937	17.1137	DM24	CMG-5T	100hz	continuous	free-field	2008-276
PSMN	Santa Maria	37.0030	25.0653	DM24	CMG-5T	100hz	continuous	free-field	2008-329
ROSA	Rosais	38.7208	28.2470	DM24	CMG-5T	100hz	continuous	free-field	2008-331
PSET	Sete Cidades	37.8233	25.7208	DM24	CMG-5T	100hz	continuous	free-field	2009-034
PGRA	Graciosa	39.0293	27.9813	DM24	CMG-5T	100hz	continuous	free-field	2009-094
INMG	Lisboa	38.7743	09.1257	GSR-24	CMG-5T	100hz	trigger	building	2006-200
PTEO	São Teotónio	37.5455	08.7242	EAM	CMG-5T	100hz	continuous	free-field	2011-153
PCBR	Castelo Branco	39.8403	07.4775	EAM	CMG-5T	100hz	continuous	free-field	2011-168
PBEJ	Beja	38.0263	07.8663	EAM	CMG-5T	100hz	continuous	free-field	2011-166
PVIS	Viseu	40.7157	07.8947	EAM	CMG-5T	100hz	continuous	free-field	2011-207
PTOM	Tomar	39.6180	08.4107	EAM	CMG-5T	100hz	continuous	free-field	2011-208
PCAB	Cabril	41.7102	08.0270	EAM	CMG-5T	100hz	continuous	free-field	2011-242
PCALD	Caldeiras da Ribeira Grande	37.7972	25.4877	DM24	CMG-5T	100hz	continuous	free-field	2011-307

IPMA Strong-Motion Network

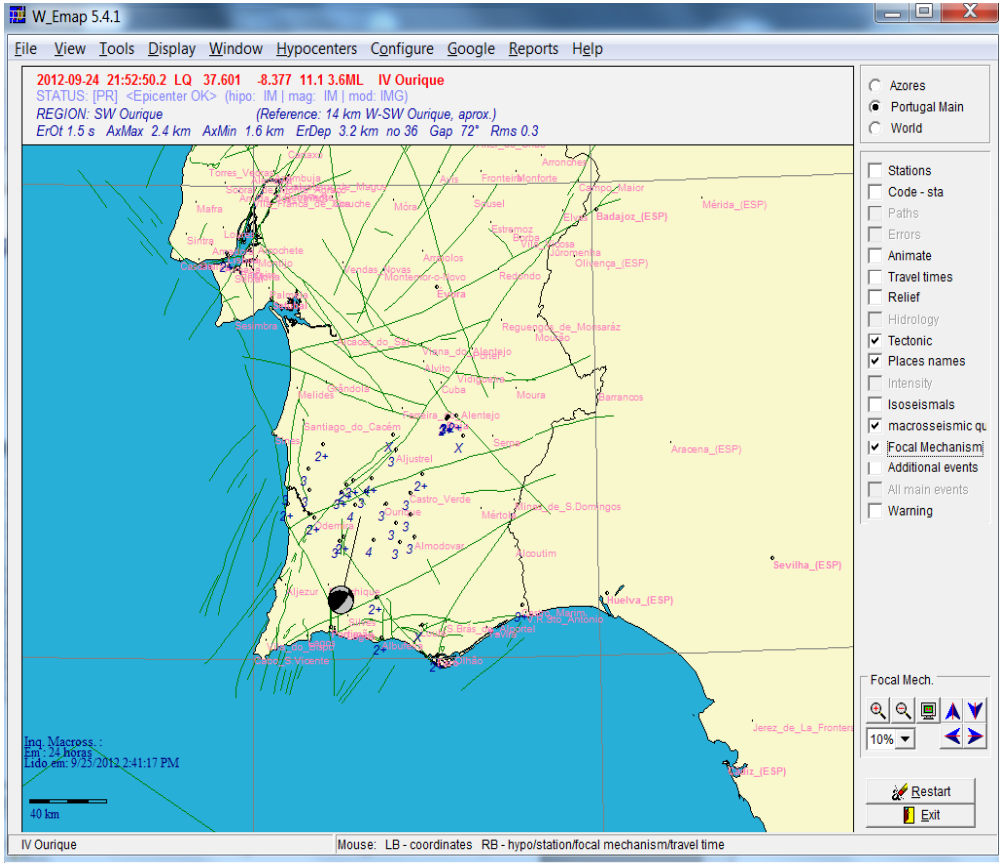


- Satellite [VSAT]
- Internet (public & VPN)
- Local

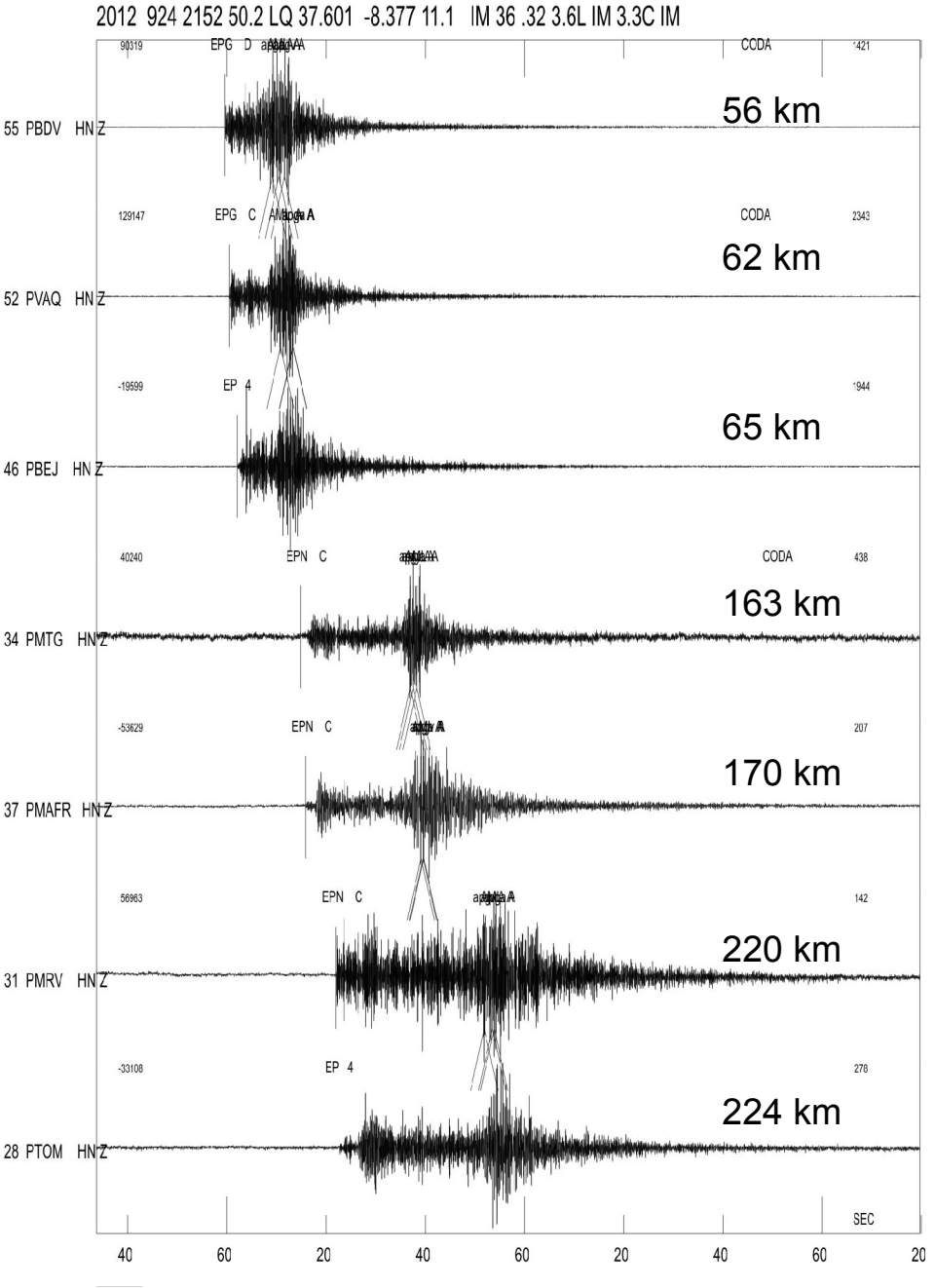
Real-Time (latency <10s)

Example

2012-09-24 21:52 UTC 3.6ML
SW Ourique, Portugal mainland

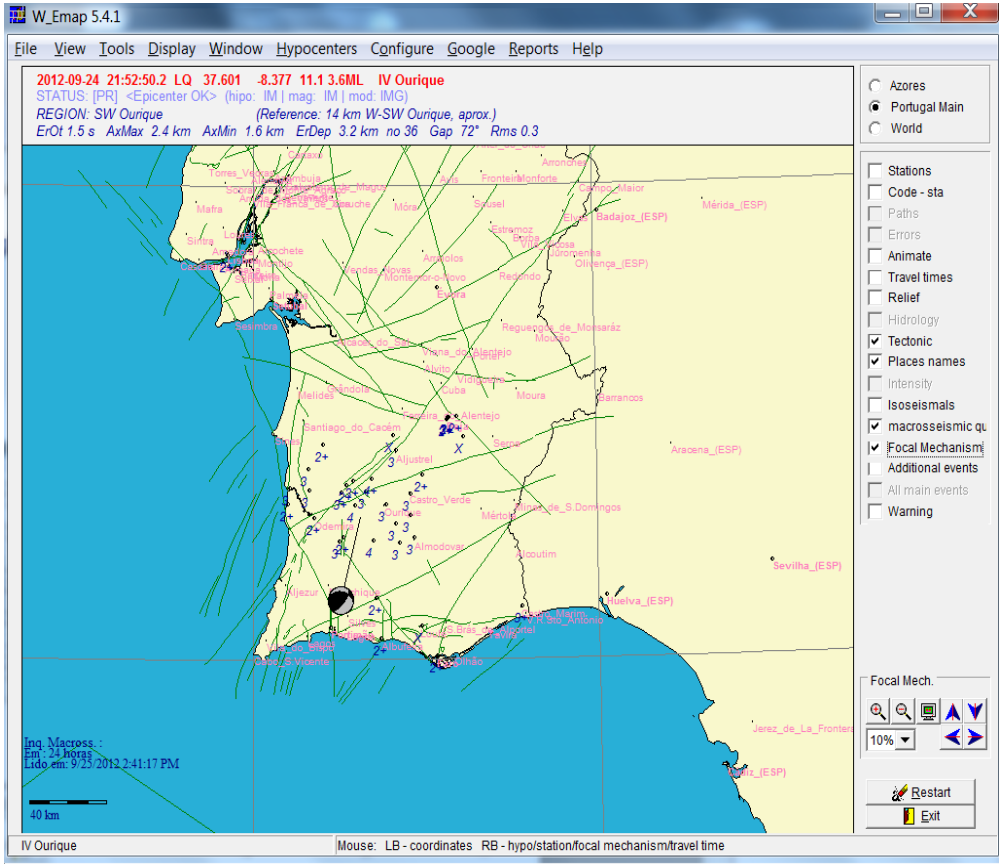


Macroseismic observations (DYFI)



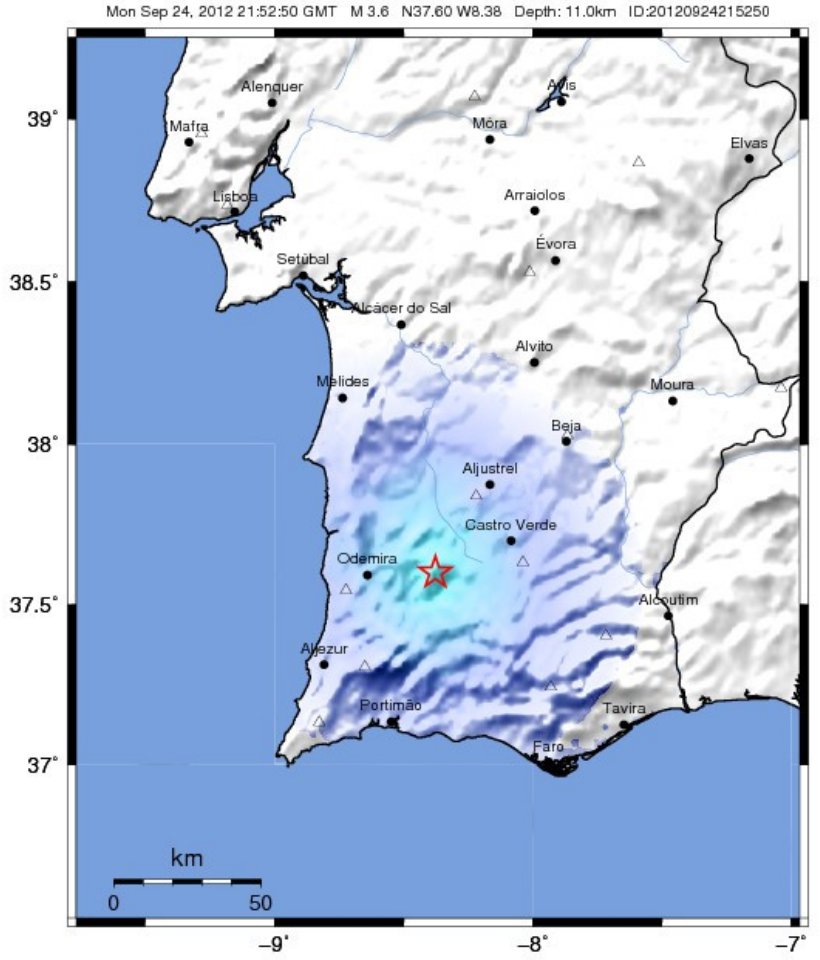
Example

2012-09-24 21:52 UTC 3.6ML
SW Ourique, Portugal mainland



Macroseismic observations (DYFI)

ShakeMap



VIBRAÇÃO PERCEPTÍVEL	N/ sent	Fraco	Moderado	Forte	Bast/ Forte	Muito Forte	Ruinoso	Desastroso	Extremo
DANOS POTENCIAIS	n/a	n/a	n/a	Mto ligeiro	Ligeiro	Moderado	Moderado/Forte	Forte	Muito Forte
PGA(%g)	*<.08*	*.08–0.9*	*0.9–2.8*	*2.8–7*	*7–12*	12–20	20–36	36–63	>63
PGV(cm/s)	<0.1	0.1–1.1	1.1–3.4	3.4–8.1	*8.1–16*	*16–31*	*31–60*	*60–116*	*>116*
INTENSIDADE INSTRUMENTAL	I	II–III	IV	V	VI	VII	VIII	IX	X+