



Use of Antelope for real-time monitoring of strong ground motion

Giovanni Costa

Seismological Reserch and Monitoring Group
Dipartimento di Geoscienze
University of Trieste
rtweb.units.it

European Quanterra & Antelope Users Group Meeting
Bucharest, Romania March 21-23, 2011

dbmw procedure

FAST MOMENT MAGNITUDE ESTIMATION

Schema of the Antelope procedure used at University of Trieste for a fast Mw computation.

Method used to determinate Mw

(Andrews, 1986)

Spectral amplitude at receiver

$$A(f) = D(f)E(f)G(R)$$

Brune (1970) source spectrum

$$D(f) = \frac{M_0}{4\pi k \rho v^3} \left[1 + \left(\frac{f}{f_0} \right)^2 \right]^{-1}$$

Attenuation

$$E(f) = e^{-\left(\frac{\pi f r}{Q(f)} \right)}$$

$$Q(f) = 80 f^{(1.1)}$$

Geometrical spreading

$$G(R) = \frac{1}{R}$$

$$SV2 = 2 \int_0^{\infty} V^2(f) df \quad \rightarrow \quad SV2 = \frac{1}{4} \Omega^2 (2\pi f_0)^3$$

$$SD2 = 2 \int_0^{\infty} D^2(f) df \quad \rightarrow \quad SD2 = \frac{1}{4} \Omega^2 (2\pi f_0)$$

$$\Omega = \sqrt{4(SD2)^{3/2} (SV2)^{-1/2}}$$

$$f_0 = \frac{1}{2\pi} \frac{\sqrt{SV2}}{SD2}$$

$$M_0 = 4\pi \rho v^3 \Omega k$$

$$r = \frac{2.34\beta}{2\pi f_0}$$

$$M_w = \frac{2}{3} \cdot \log_{10}(M_0) - 6.1$$



sta	chamw	orid	evid	mw	m0	f0	eqR	distmw	az	timePmw	Pmw	timeSmw	Smw
ACOM	HH	8819	6667	2.56	9.474e+12	5.78	0.22	54.11	340.26	2/23/2007 (054)	6:14:48.65839 db	2/23/2007 (054)	6:14:55.70432 synt
AKSA	HH	8819	6667	2.49	7.577e+12	3.84	0.33	170.60	261.94	2/23/2007 (054)	6:15:07.93989 db	2/23/2007 (054)	6:15:30.76395 synt
CADS	HH	8819	6667	2.52	1.176e+13	5.55	0.23	93.02	337.89	2/23/2007 (054)	6:14:55.13870 db	2/23/2007 (054)	6:15:07.41429 synt
DS12	HH	8819	6667	2.80	2.211e+13	6.27	0.20	154.06	345.01	2/23/2007 (054)	6:15:07.18839 db	2/23/2007 (054)	6:15:25.78527 synt
KBA	HH	8819	6667	2.51	8.233e+12	2.86	0.44	9.30	217.08	2/23/2007 (054)	6:14:41.72291 db	2/23/2007 (054)	6:14:43.07828 db
LJU	HH	8819	6667	2.66	1.359e+13	6.51	0.19	142.70	318.63	2/23/2007 (054)	6:15:04.29892 synt	2/23/2007 (054)	6:15:22.36621 synt
MOA	HH	8819	6667	2.75	1.872e+13	3.76	0.34	118.28	219.15	2/23/2007 (054)	6:15:01.70288 db	2/23/2007 (054)	6:15:15.01866 synt
OBKA	HH	8819	6667	2.67	1.409e+13	4.37	0.29	111.02	300.26	2/23/2007 (054)	6:14:58.02686 db	2/23/2007 (054)	6:15:12.83156 synt
SABO	HH	8819	6667	2.61	1.135e+13	4.41	0.29	115.85	346.39	2/23/2007 (054)	6:15:00.37839 db	2/23/2007 (054)	6:15:14.28558 synt
VINO	BH	8819	6667	2.30	3.894e+12	4.88	0.26	83.01	359.43	2/23/2007 (054)	6:14:53.89259 synt	2/23/2007 (054)	6:15:04.40291 synt

FAST MOMENT MAGNITUDE ESTIMATION

The signal, in acceleration or velocity, and the instrument response are extracted from the database of the Antelope system



Average and instrument response are removed and bandpass filter applied



EW and NS components are combined to obtain the trasversal one to minimize P-wave interferences

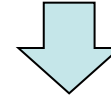


“noise” window and “S” window are retrieved

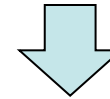


Signal-to-Noise spectral ratio is used to determine the frequency window

Integrate to obtain velocities and displacements



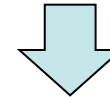
FFT
Correction for geometrical spreading and anelastic attenuation



Velocity and displacement spectra estimated at the source



Seismic moment and the corner frequency are determined following Andrews method



Results are stored in new database tables

FAST MOMENT MAGNITUDE ESTIMATION - Mw tables

dst netmw												
orid	evid	netmw	ml	sigmamw	netm0	netf0	neteQR	usta	rjsta	auth		
13667	12982	2.71	2.99	0.00	0.163E+14	2.82	0.45	1	2	dbmw11	9/29/2008	
13670	12985	3.60	3.55	0.29	0.542E+15	1.31	1.13	21	4	dbmw11	9/29/2008	
13671	12985	3.57	3.55	0.19	0.405E+15	1.35	1.05	21	4	dbmw11	9/29/2008	
13674	12985	3.57	3.55	0.19	0.404E+15	1.35	1.05	21	4	dbmw11	9/29/2008	
13687	13002	2.42	2.07	0.00	0.607E+13	2.16	0.59	1	10	dbmw11	9/29/2008	
13699	13014	2.01	2.04	0.00	0.145E+13	7.10	0.18	1	32	dbmw11	9/29/2008	
13700	13014	2.01	2.04	0.00	0.145E+13	7.10	0.18	1	32	dbmw11	9/29/2008	
13705	13020	1.89	2.34	0.00	0.950E+12	8.14	0.16	1	27	dbmw11	9/29/2008	
13713	13028	2.88	3.12	0.12	0.408E+14	3.38	0.38	6	6	dbmw11	9/29/2008	
13714	13028	2.74	2.97	0.10	0.231E+14	3.67	0.37	8	9	dbmw11	9/29/2008	
13718	13031	2.02	2.24	0.03	0.167E+13	3.32	0.41	5	43	dbmw11	9/29/2008	
13722	13037	3.77	3.53	0.04	0.747E+15	1.64	0.77	2	1	dbmw11	9/29/2008	
13724	13037	3.77	3.45	0.04	0.745E+15	1.64	0.77	2	1	dbmw11	9/29/2008	
13763	13078	1.98	2.38	0.04	0.153E+13	4.53	0.32	3	27	dbmw11	9/29/2008 (273)	14:03:13.20300
13764	13078	1.96	2.42	0.03	0.135E+13	4.83	0.27	3	27	dbmw11	9/29/2008 (273)	14:05:31.34688
13765	13078	1.93	2.37	0.01	0.115E+13	4.85	0.27	3	27	dbmw11	9/29/2008 (273)	14:07:59.65971
13769	13084	2.21	2.34	0.00	0.299E+13	2.37	0.53	2	26	dbmw11	9/29/2008 (273)	14:10:45.28462
13770	13084	2.21	2.01	0.00	0.301E+13	2.35	0.54	2	26	dbmw11	9/29/2008 (273)	14:12:53.00391

netmw

Network moment magnitude
 This table summarizes estimates of network moment magnitudes
 Station magnitudes used to compute the
 network magnitude are in the relation stamw.

Primary key: **orid**
 Foreign keys: **orid evid commid**
 Record Size (bytes): 137
 Records: 1292
 Size (bytes): 177004
 Permissions: may be modified
 File: db/dig.netmw

orid	evid	netmw	ml	sigmamw	netm0	netf0	neteQR	usta	rjsta	quality
auth	commid	lddate								

Dismiss

dst stamw																			
sta	chamw	orid	evid	mw	m0	f0	eqR	distmw	rotaz	timePmw	Pmw	timeSmw	Smw	segtype	auth	lddate			
BOJS	HHT	13667	12982	2.71	0.163E+14	2.82	0.45	132.15	267.16	7/18/2008 (200)	21:57:36.45670	db	7/18/2008 (200)	21:57:52.71838	synt	V	dbmw11	9/29/2008 (273)	13:27:00.48080
ACOM	HHT	13670	12985	3.50	0.252E+15	1.76	0.72	102.66	100.72	7/18/2008 (200)	22:54:22.38839	db	7/18/2008 (200)	22:54:35.30874	synt	V	dbmw11	9/29/2008 (273)	13:27:28.62895
PALA	HHT	13670	12985	3.67	0.451E+15	1.92	0.66	149.03	115.73	7/18/2008 (200)	22:54:29.37951	synt	7/18/2008 (200)	22:54:48.06624	synt	V	dbmw11	9/29/2008 (273)	13:27:35.67075
PALA	HGT	13670	12985	4.27	0.360E+16	0.51	2.51	149.03	115.73	7/18/2008 (200)	22:54:29.37951	synt	7/18/2008 (200)	22:54:48.06624	synt	A	dbmw11	9/29/2008 (273)	13:27:46.97971
GEPT	HHT	13670	12985	3.58	0.330E+15	1.45	0.87	139.63	110.16	7/18/2008 (200)	22:54:29.32000	db	7/18/2008 (200)	22:54:45.72917	synt	V	dbmw11	9/29/2008 (273)	13:27:53.69353
GEPT	HGT	13670	12985	3.73	0.550E+15	1.16	1.09	139.63	110.16	7/18/2008 (200)	22:54:29.32000	db	7/18/2008 (200)	22:54:45.72917	synt	A	dbmw11	9/29/2008 (273)	13:28:05.01923
PERS	HHT	13670	12985	3.56	0.309E+15	1.91	0.66	137.30	41.05	7/18/2008 (200)	22:54:27.91570	db	7/18/2008 (200)	22:54:45.11139	synt	V	dbmw11	9/29/2008 (273)	13:28:19.69972
GORS	HGT	13670	12985	3.38	0.163E+15	1.53	0.83	127.85	81.73	7/18/2008 (200)	22:54:26.85470	db	7/18/2008 (200)	22:54:42.59842	synt	A	dbmw11	9/29/2008 (273)	13:28:31.84541
VINO	HLT	13670	12985	3.92	0.109E+16	0.98	1.29	138.36	105.59	7/18/2008 (200)	22:54:28.05904	synt	7/18/2008 (200)	22:54:45.39137	synt	A	dbmw11	9/29/2008 (273)	13:28:39.15390
VINO	HHT	13670	12985	3.66	0.443E+15	1.04	1.22	138.36	105.59	7/18/2008 (200)	22:54:28.05904	synt	7/18/2008 (200)	22:54:45.39137	synt	V	dbmw11	9/29/2008 (273)	13:28:46.46456
MYKA	HHT	13670	12985	3.32	0.136E+15	1.18	1.07	92.26	95.82	7/18/2008 (200)	22:54:20.61957	synt	7/18/2008 (200)	22:54:32.23587	synt	V	dbmw11	9/29/2008 (273)	13:28:53.32872
SOKA	HHT	13670	12985	3.74	0.573E+15	0.53	2.39	129.62	41.36	7/18/2008 (200)	22:54:26.85169	synt	7/18/2008 (200)	22:54:43.06806	synt	V	dbmw11	9/29/2008 (273)	13:29:00.13401
ABTA	HHT	13670	12985	3.33	0.141E+15	1.54	0.82	123.38	140.82	7/18/2008 (200)	22:54:25.48839	db	7/18/2008 (200)	22:54:41.41056	synt	V	dbmw11	9/29/2008 (273)	13:29:06.99149
MBA	HHT	13670	12985	3.17	0.793E+14	2.05	0.62	57.95	-49.42	7/18/2008 (200)	22:54:14.32733	db	7/18/2008 (200)	22:54:33.13988	synt	V	dbmw11	9/29/2008 (273)	13:29:13.29195
ARSA	HHT	13670	12985	3.62	0.384E+15	0.78	1.63	135.06	9.05	7/18/2008 (200)	22:54:22.38839	db	7/18/2008 (200)	22:54:35.30874	synt	V	dbmw11	9/29/2008 (273)	13:29:20.15390
KBA	HHT	13670	12985	3.19	0.867E+14	1.71	0.74	52.52	127.24	7/18/2008 (200)	22:54:22.38839	db	7/18/2008 (200)	22:54:35.30874	synt	V	dbmw11	9/29/2008 (273)	13:29:28.62895
KBA	HLT	13670	12985	3.37	0.159E+15	1.78	0.71	52.52	127.24	7/18/2008 (200)	22:54:22.38839	db	7/18/2008 (200)	22:54:35.30874	synt	V	dbmw11	9/29/2008 (273)	13:29:35.67075
OBKA	HLT	13670	12985	3.71	0.512E+15	1.44	0.88	121.09	60.05	7/18/2008 (200)	22:54:20.61957	synt	7/18/2008 (200)	22:54:32.23587	synt	V	dbmw11	9/29/2008 (273)	13:29:43.06806
OBKA	HHT	13670	12985	3.51	0.256E+15	1.45	0.87	121.09	60.05	7/18/2008 (200)	22:54:20.61957	synt	7/18/2008 (200)	22:54:32.23587	synt	V	dbmw11	9/29/2008 (273)	13:29:53.32872
GORS	HHT	13670	12985	3.81	0.743E+15	1.07	1.18	127.85	81.73	7/18/2008 (200)	22:54:26.85470	db	7/18/2008 (200)	22:54:42.59842	synt	A	dbmw11	9/29/2008 (273)	13:30:01.13401
ROBS	HHT	13670	12985	3.69	0.479E+15	0.79	1.61	136.06	98.34	7/18/2008 (200)	22:54:28.05904	synt	7/18/2008 (200)	22:54:45.39137	synt	V	dbmw11	9/29/2008 (273)	13:30:13.29195
CADS	HHT	13670	12985	3.78	0.661E+15	0.94	1.34	136.51	91.15	7/18/2008 (200)	22:54:28.05904	synt	7/18/2008 (200)	22:54:45.39137	synt	V	dbmw11	9/29/2008 (273)	13:30:20.15390
ACOM	HHT	13671	12985	3.50	0.253E+15	1.76	0.72	102.66	100.72	7/18/2008 (200)	22:54:22.38839	db	7/18/2008 (200)	22:54:35.30874	synt	V	dbmw11	9/29/2008 (273)	13:30:28.62895
PALA	HHT	13671	12985	3.67	0.451E+15	1.92	0.66	149.03	115.73	7/18/2008 (200)	22:54:29.37951	synt	7/18/2008 (200)	22:54:48.06624	synt	V	dbmw11	9/29/2008 (273)	13:30:35.67075
PALA	HGT	13671	12985	3.77	0.638E+15	1.55	0.82	149.03	115.73	7/18/2008 (200)	22:54:29.37951	synt	7/18/2008 (200)	22:54:48.06624	synt	A	dbmw11	9/29/2008 (273)	13:30:46.97971

stamw

Station moment magnitude
 This table summarizes station moment magnitude estimates.

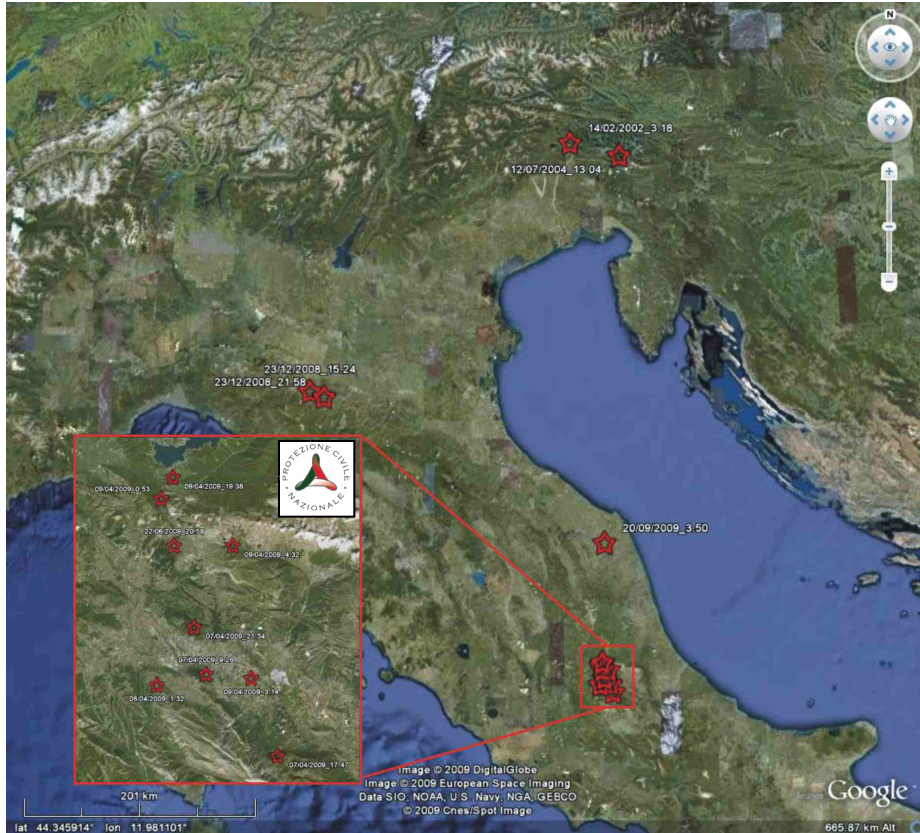
Primary key: **sta orid**
 Foreign keys: **orid mwid orid evid commid**
 Record Size (bytes): 183
 Records: 12223
 Size (bytes): 2236809
 Permissions: may be modified
 File: db/dig.stamw

sta	chamw	orid	evid	mw	m0	f0	eqR	distmw	rotaz
quality	timePmw	Pmw	timeSmw	Smw	segtype	auth	commid	lddate	

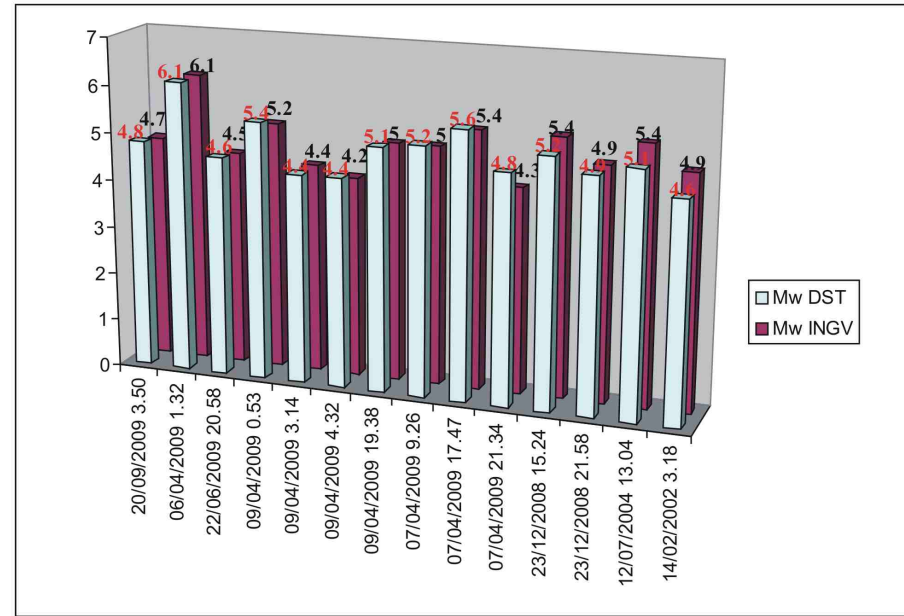
Dismiss



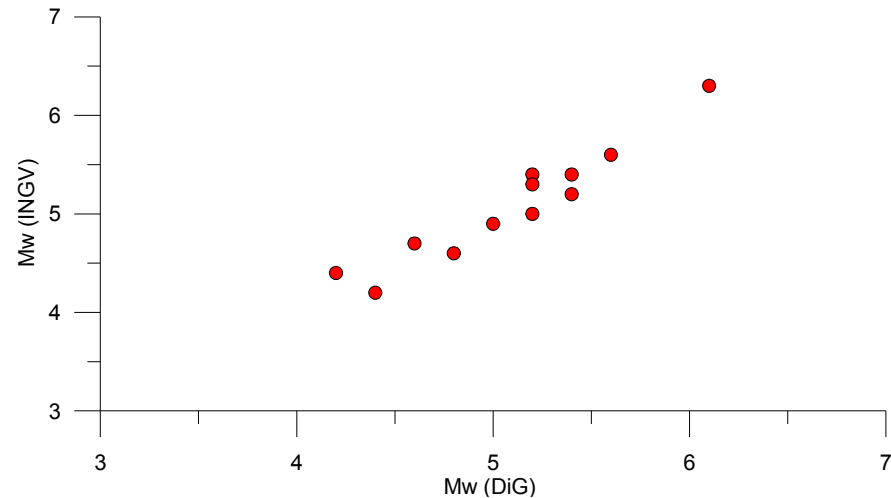
dbmw procedure FAST MOMENT MAGNITUDE ESTIMATION



Comparison between moment magnitude determined at DST and moment magnitude determined at INGV by waveform inversion.



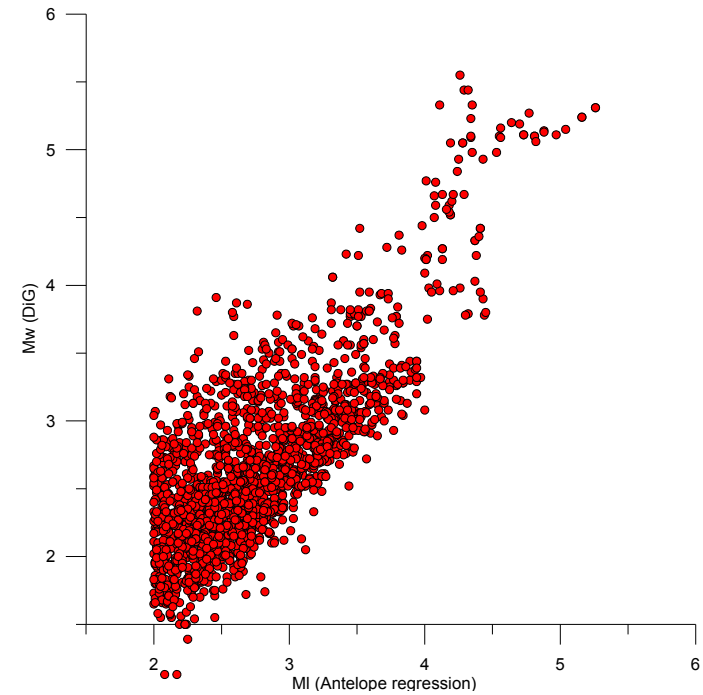
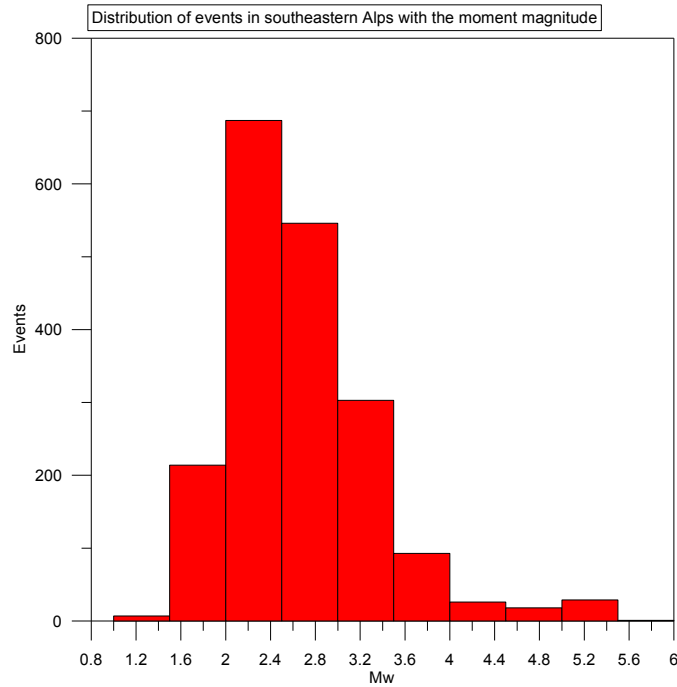
Map of the events, for which an independent Mw determination is available, used to test the procedure.



dbmw procedure

FAST MOMENT MAGNITUDE ESTIMATION

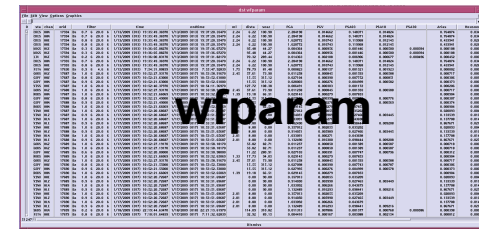
Real-time procedure - Not reviewed by human
Data from the Southeastern Alps Transfrontalier Network



date	time	lat	lon	sigma	usta	rsta	Mw(DST)	Mw(OGS)	MI(ant)
02/14/2002	3:18	46.42	13.10	0.04	5	2	4.2	4.7	5.6
07/12/2004	13:04	46.30	13.63	0.07	9	0	5.0	5.1	5.4
1/14/2005	7:58	46.19	14.01	0.15	18	3	3.9	3.8	4.7
1/14/2005	8:05	46.18	14.02	0.06	11	2	3.7	3.6	4.3
12/28/2006	14:10	46.11	12.15	0.11	12	12	3.7	3.6	4.0
01/01/2007	14:59	46.49	14.21	0.27	16	9	4.0	3.8	4.6
02/05/2007	8:30	44.99	15.10	0.08	8	2	4.6	4.3	4.9
5/19/2007	16:19	47.17	10.58	0.7	5	6	4.0	3.7	4.0

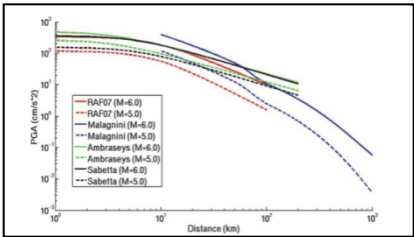
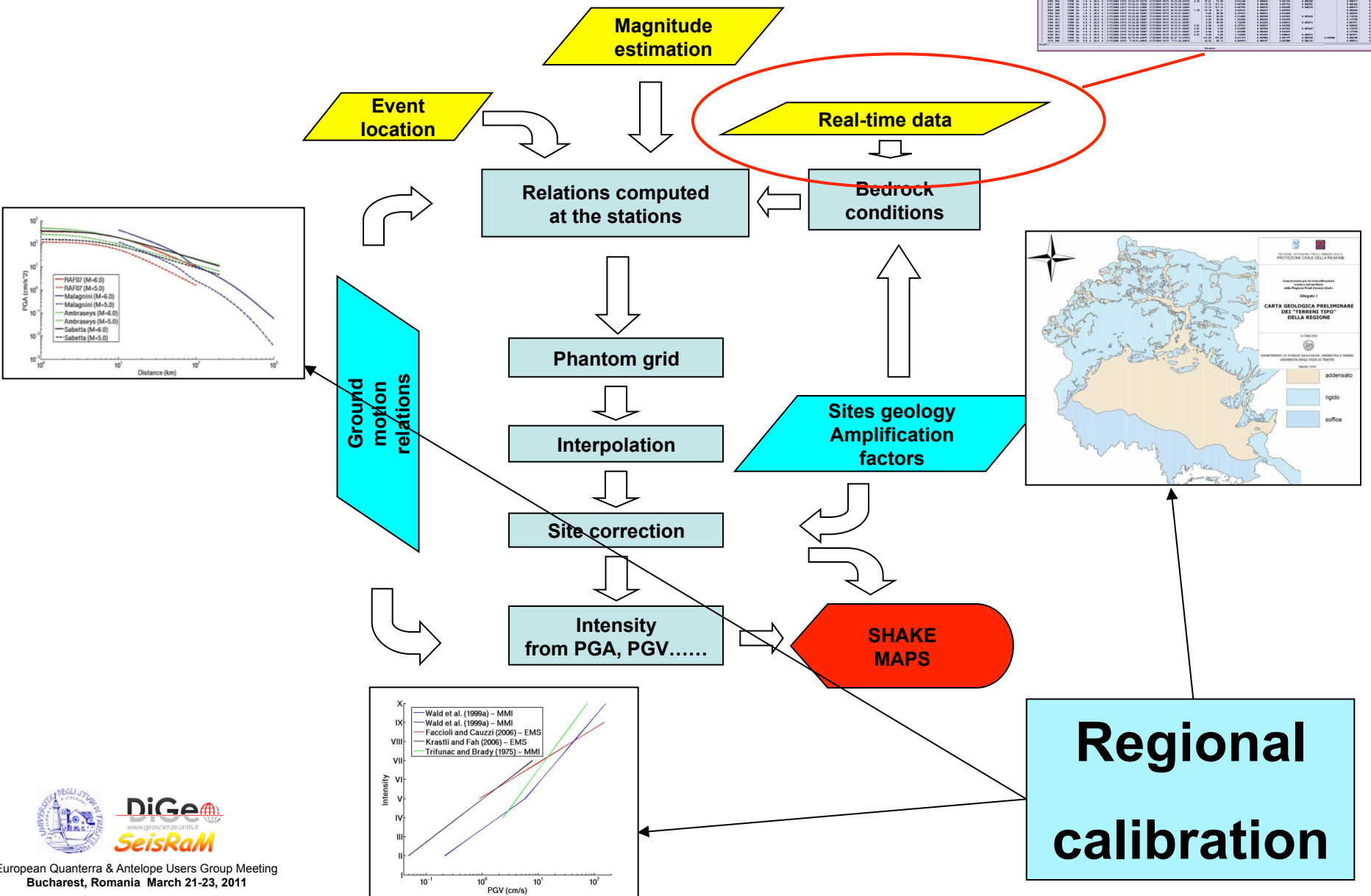


ShakeMap computation

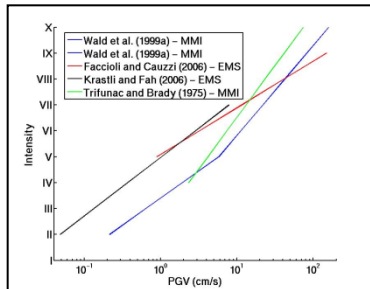
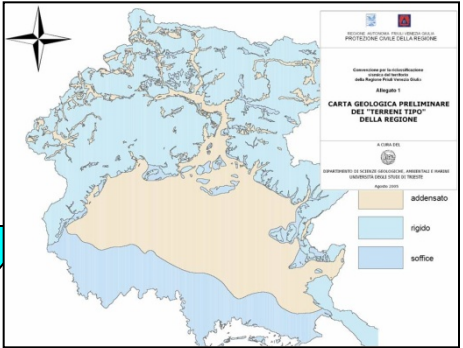


STATION	LONG	LAT	DEPTH	PERIOD	SCALE	...
010101	14.0000	41.0000	0.000	0.100	0.010	...
010102	14.0000	41.0000	0.000	0.100	0.010	...
010103	14.0000	41.0000	0.000	0.100	0.010	...
010104	14.0000	41.0000	0.000	0.100	0.010	...
010105	14.0000	41.0000	0.000	0.100	0.010	...
010106	14.0000	41.0000	0.000	0.100	0.010	...
010107	14.0000	41.0000	0.000	0.100	0.010	...
010108	14.0000	41.0000	0.000	0.100	0.010	...
010109	14.0000	41.0000	0.000	0.100	0.010	...
010110	14.0000	41.0000	0.000	0.100	0.010	...

wfparam

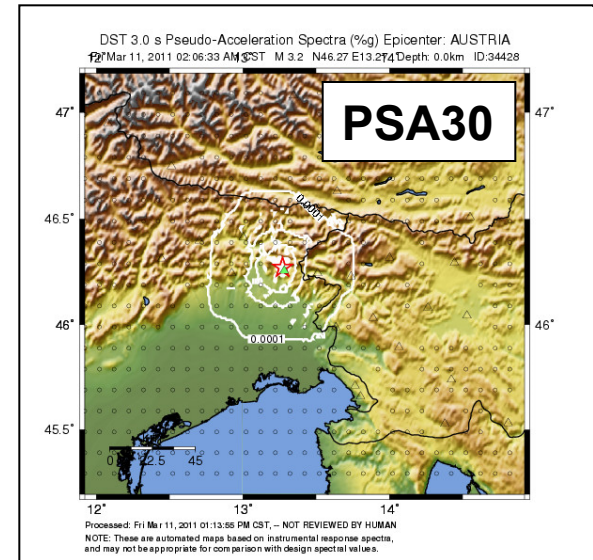
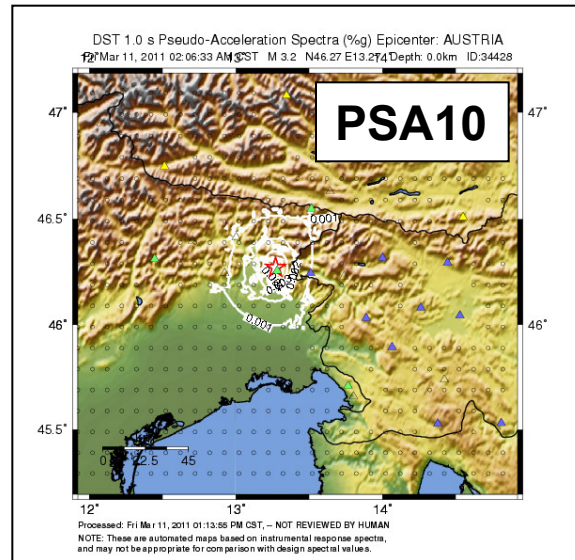
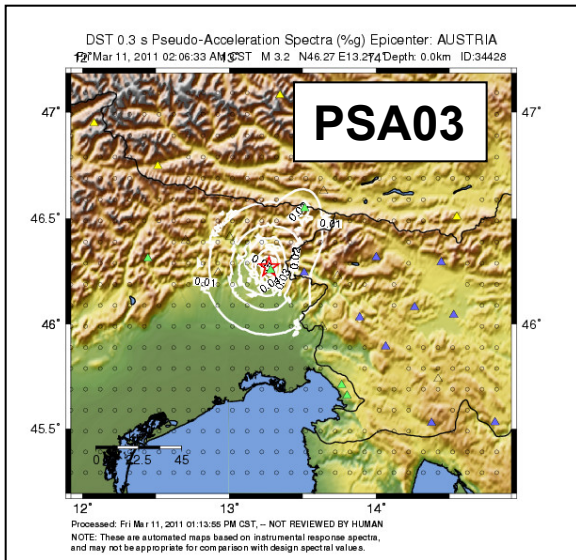
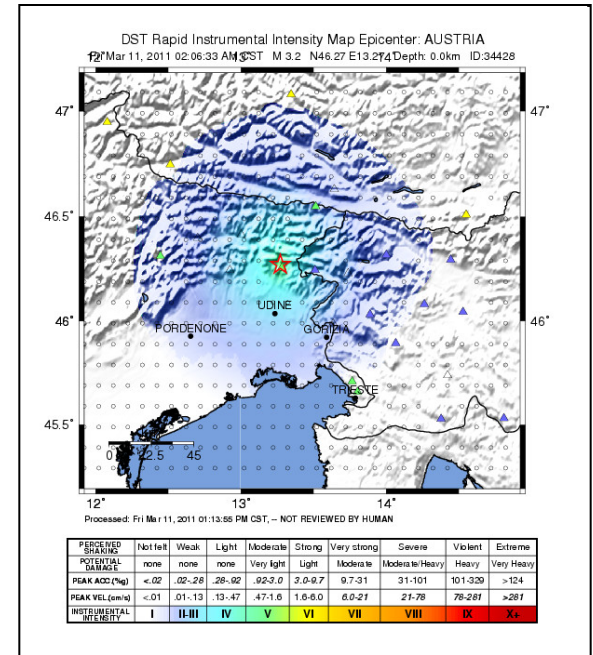
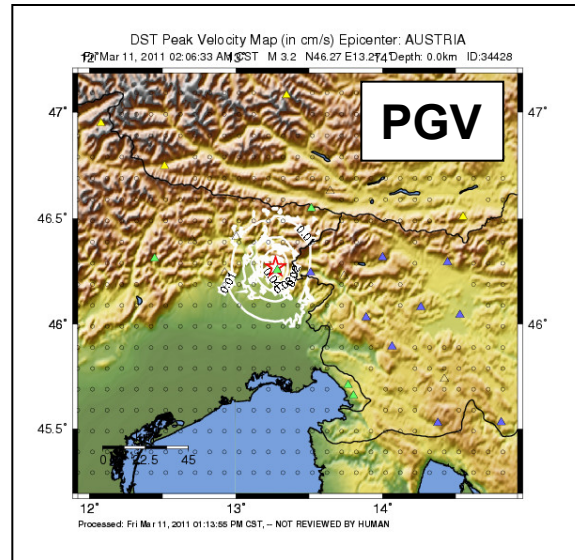
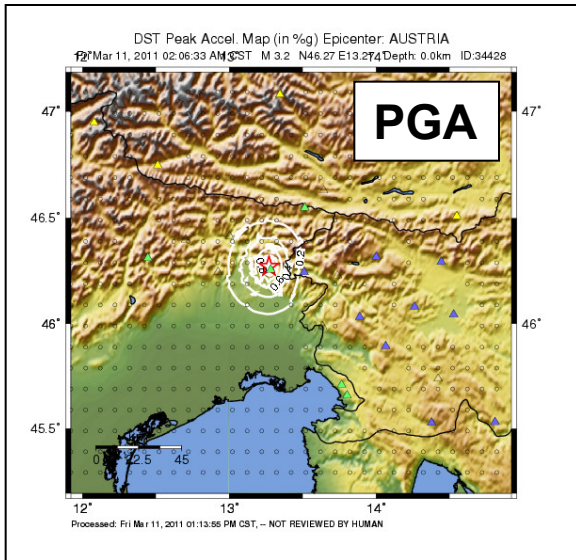


Ground motion relations



Regional calibration

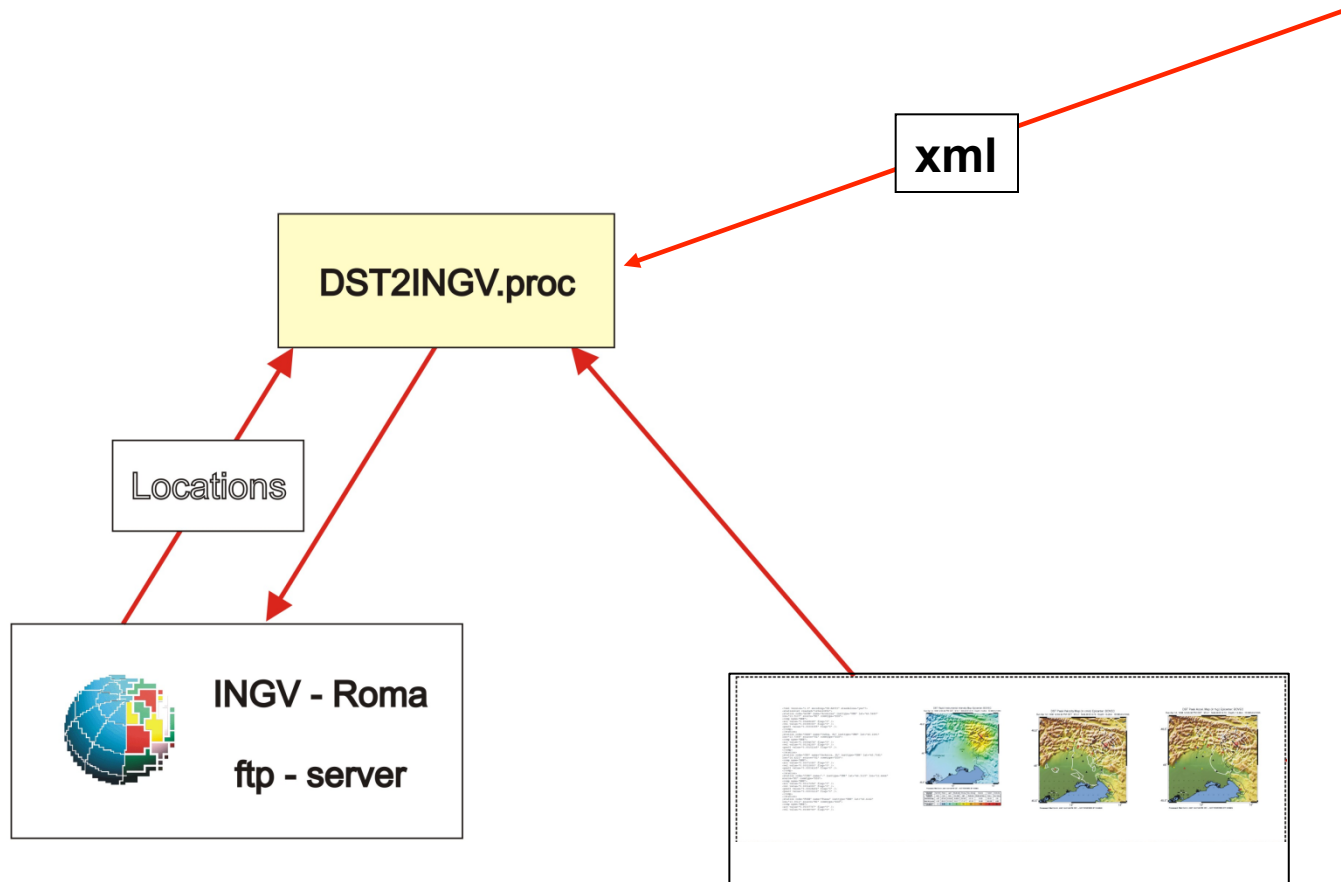
ShakeMap computation (Wald)



ShakeMap computation

wparam

Station	Time	Amplitude	Phase	Duration	Quality	Weight	Location	Depth	Magnitude	Distance	Direction	Velocity	Acceleration	Frequency	Period	Waveform	Station	Time	Amplitude	Phase	Duration	Quality	Weight	Location	Depth	Magnitude	Distance	Direction	Velocity	Acceleration	Frequency	Period	Waveform	
...





National Accelerometric Network
RAN

Kinematics (Etna)



Friuli Venezia Giulia
Accelerometric Network
RAF



European Quanterra & Antelope Users Group Meeting
Bucharest, Romania March 21-23, 2011

© 2011 Europa Technologies
© 2011 Tele Atlas



National Accelerometric Network
RAN

Syscom



European Quanterra & Antelope Users Group Meeting
Bucharest, Romania March 21-23, 2011

© 2011 Europa Technologies
© 2011 Tele Atlas



National Accelerometric Network
RAN

Kinematics (Etna)

+

Syscom

415 stations



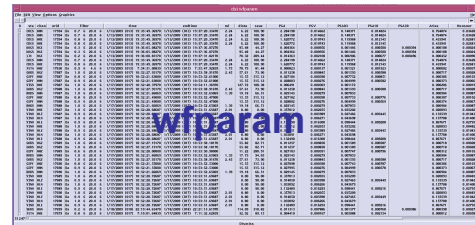
Friuli Venezia Giulia
Accelerometric Network
RAF



European Quanterra & Antelope Users Group Meeting
Bucharest, Romania March 21-23, 2011

© 2011 Europa Technologies
© 2011 Tele Atlas

Civil Defence fast-report



- INTERNAL USE ONLY -

System: antedst MAC OSX - antelope ver.: 5.0

Seismology Research and Monitoring Group
Dipartimento di Geoscienze - University of Trieste

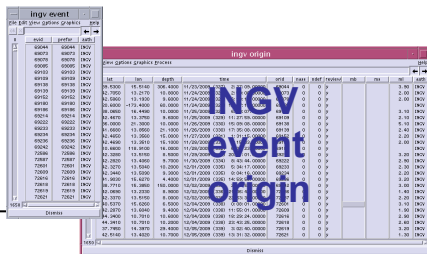
EVENT: L'Aquila

Origin time: 09/01/11 10:58:20 Lat. 42.108 Lon. 13.334 M1 = 3.9 EVID: 7 ORID: 57 Agency: INGV

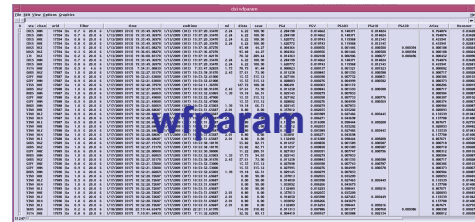
Seismic moment: 4.340e+15 Newton*m - Mw = 4.1

sta	chan	dist	filter	PGA	PGV	PSA30	PSA10	PSA03	Arias	Housner		
	km	Hz	cm/s*s	cm/s	cm/s*s	cm/s*s	cm/s*s	cm/s	cm/s	cm		
AVZ	HGE	16	0.20	20.00	4.1e+00	2.2e-01	1.0e+01	3.1e+00	1.5e-01	2.1e+01	9.8e-01	Avezzano_Castello
AVZ	HGZ	16	0.20	20.00	3.8e+00	2.0e-01	1.1e+01	1.2e+00	8.2e-02	1.3e+01	7.8e-01	Avezzano_Castello
AVZ	HGN	16	0.20	20.00	3.8e+00	2.8e-01	1.3e+01	2.2e+00	2.7e-01	1.9e+01	1.2e+00	Avezzano_Castello
CLN	HGZ	18	0.20	20.00	6.7e-01	3.4e-02	1.6e+00	2.2e-01	2.8e-02	2.1e-01	1.3e-01	Celano
CLN	HGN	18	0.20	20.00	1.2e+00	5.9e-02	2.9e+00	2.4e-01	2.8e-02	4.0e-01	1.9e-01	Celano
CLN	HGE	18	0.20	20.00	7.7e-01	4.4e-02	2.0e+00	3.2e-01	2.7e-02	4.2e-01	1.9e-01	Celano
BTT2	HGN	23	0.20	20.00	2.3e+00	2.4e-01	7.3e+00	3.6e+00	6.1e-01	1.5e+01	1.2e+00	Borgo_Ottomila2
BTT2	HGZ	23	0.20	20.00	1.1e+00	1.2e-01	3.2e+00	1.3e+00	1.9e-01	3.0e+00	7.1e-01	Borgo_Ottomila2
BTT2	HGE	23	0.20	20.00	2.9e+00	3.2e-01	7.8e+00	4.0e+00	6.1e-01	1.3e+01	1.3e+00	Borgo_Ottomila2
PGG	HGZ	31	0.20	20.00	9.3e-01	4.7e-02	3.1e+00	2.1e-01	3.1e-02	1.2e+00	1.9e-01	Poggio_Picenze
PGG	HGN	31	0.20	20.00	1.6e+00	9.0e-02	4.7e+00	7.4e-01	5.6e-02	2.8e+00	3.6e-01	Poggio_Picenze
PGG	HGE	31	0.30	20.00	1.7e+00	8.9e-02	3.9e+00	6.0e-01		3.4e+00	4.0e-01	Poggio_Picenze
AQG	HGE	31	0.20	20.00	1.3e+00	5.1e-02	2.8e+00	4.8e-01	4.6e-02	1.0e+00	2.1e-01	L_Aquila_Colle_dei_Grilli
AQG	HGN	31	0.20	20.00	1.3e+00	1.8e-01	2.1e+00	3.9e-01	9.2e-02	8.4e-01	1.6e-01	L_Aquila_Colle_dei_Grilli
AQG	HGZ	31	0.20	20.00	5.2e-01	3.8e-02	1.3e+00	4.4e-01	3.5e-02	2.2e-01	1.3e-01	L_Aquila_Colle_dei_Grilli
AQA	HGE	31	0.20	20.00	1.7e+00	3.7e-02	1.2e+00	5.1e-01	5.6e-02	9.4e-01	1.6e-01	L_Aquila_Valle_Aterno_Fiume_Aterno
AQA	HGN	31	0.30	20.00	1.4e+00	5.3e-02	2.0e+00	2.6e-01	4.2e-02	1.1e+00	1.7e-01	L_Aquila_Valle_Aterno_Fiume_Aterno
AQA	HGZ	31	0.20	20.00	3.1e-01	2.5e-02	9.3e-01	3.3e-01	3.4e-02	1.5e-01	1.0e-01	L_Aquila_Valle_Aterno_Fiume_Aterno
AQV	HGN	32	0.30	20.00	1.8e+00	7.4e-02	3.1e+00	4.1e-01	6.1e-02	2.3e+00	2.9e-01	L_Aquila_Valle_dell_Aterno
AQV	HGE	32	0.20	20.00	2.4e+00	7.1e-02	4.6e+00	5.0e-01	4.7e-02	2.4e+00	2.4e-01	L_Aquila_Valle_dell_Aterno
AQV	HGZ	32	0.20	20.00	5.5e-01	2.9e-02	1.3e+00	2.9e-01	3.5e-02	2.9e-01	1.2e-01	L_Aquila_Valle_dell_Aterno

INGV
ftp site
Location file



Civil Defence fast-report



INGV
event
origin

dborigin2orb

- INTERNAL USE ONLY -

System: antedst MAC OSX - antelope ver.: 5.0

Seismology Research and Monitoring Group
Dipartimento di Geoscienze - University of Trieste

EVENT: L'Aquila
Origin time: 09/01/11 10:58:20 Lat. 42.108 Lon. 13.334 M1 = 3.9 EVID: 7 ORID: 57 Agency: INGV
Seismic moment: 4.340e+15 Newton*m Mw: 4.1

sta	chan	dist km	filter Hz	PGA cm/s*s	PGV cm/s	PSA30 cm/s*s	PSA10 cm/s*s	PSA03 cm/s*s	Arias cm/s	Housner cm		
AVZ	HGE	16	0.20	20.00	4.1e+00	2.2e-01	1.0e+01	3.1e+00	1.5e-01	2.1e+01	9.8e-01	Avezzano_Castello
AVZ	HGZ	16	0.20	20.00	3.8e+00	2.0e-01	1.1e+01	1.2e+00	8.2e-02	1.3e+01	7.8e-01	Avezzano_Castello
AVZ	HGN	16	0.20	20.00	3.8e+00	2.8e-01	1.3e+01	2.2e+00	2.7e-01	1.9e+01	1.2e+00	Avezzano_Castello
CLN	HGZ	18	0.20	20.00	6.7e-01	3.4e-02	1.6e+00	2.2e-01	2.8e-02	2.1e-01	1.3e-01	Celano
CLN	HGN	18	0.20	20.00	1.2e+00	5.9e-02	2.9e+00	2.4e-01	2.8e-02	4.0e-01	1.9e-01	Celano
CLN	HGE	18	0.20	20.00	7.7e-01	4.4e-02	2.0e+00	3.2e-01	2.7e-02	4.2e-01	1.9e-01	Celano
BTT2	HGN	23	0.20	20.00	2.3e+00	2.4e-01	7.3e+00	3.6e+00	6.1e-01	1.5e+01	1.2e+00	Borgo_Ottomila2
BTT2	HGZ	23	0.20	20.00	1.1e+00	1.2e-01	3.2e+00	1.3e+00	1.9e-01	3.0e+00	7.1e-01	Borgo_Ottomila2
BTT2	HGE	23	0.20	20.00	2.9e+00	3.2e-01	7.8e+00	4.0e+00	6.1e-01	2.0e+01	1.3e+00	Borgo_Ottomila2
PGG	HGZ	31	0.20	20.00	9.3e-01	4.7e-02	3.1e+00	2.1e-01	3.1e-02	1.2e+00	1.9e-01	Poggio_Picenze
PGG	HGN	31	0.20	20.00	1.6e+00	9.0e-02	4.7e+00	7.4e-01	5.6e-02	2.8e+00	3.6e-01	Poggio_Picenze
PGG	HGE	31	0.30	20.00	1.7e+00	8.9e-02	3.9e+00	6.0e-01		3.4e+00	4.0e-01	Poggio_Picenze
AQG	HGE	31	0.20	20.00	1.3e+00	5.1e-02	2.8e+00	4.8e-01	4.6e-02	1.0e+00	2.1e-01	L_Aquila_Colle_dei_Grilli
AQG	HGN	31	0.20	20.00	1.3e+00	1.8e-01	2.1e+00	3.9e-01	9.2e-02	8.4e-01	1.6e-01	L_Aquila_Colle_dei_Grilli
AQG	HGZ	31	0.20	20.00	5.2e-01	3.8e-02	1.3e+00	4.4e-01	3.5e-02	2.2e-01	1.3e-01	L_Aquila_Colle_dei_Grilli
AQA	HGE	31	0.20	20.00	1.7e+00	3.7e-02	1.2e+00	5.1e-01	5.6e-02	9.4e-01	1.6e-01	L_Aquila_Valle_Aterno_Fiume_Aterno
AQA	HGN	31	0.30	20.00	1.4e+00	5.3e-02	2.0e+00	2.6e-01	4.2e-02	1.1e+00	1.7e-01	L_Aquila_Valle_Aterno_Fiume_Aterno
AQA	HGZ	31	0.20	20.00	3.1e-01	2.5e-02	9.3e-01	3.3e-01	3.4e-02	1.5e-01	1.0e-01	L_Aquila_Valle_Aterno_Fiume_Aterno
AQV	HGN	32	0.30	20.00	1.8e+00	7.4e-02	3.1e+00	4.1e-01	6.1e-02	2.3e+00	2.9e-01	L_Aquila_Valle_dell_Aterno
AQV	HGE	32	0.20	20.00	2.4e+00	7.1e-02	4.6e+00	5.0e-01	4.7e-02	2.4e+00	2.4e-01	L_Aquila_Valle_dell_Aterno
AQV	HGZ	32	0.20	20.00	5.5e-01	2.9e-02	1.3e+00	2.9e-01	3.5e-02	2.9e-01	1.2e-01	L_Aquila_Valle_dell_Aterno



Civil Defence fast-report

06/04/09 01:32:41 MI:5.8 L'Aquila

06/04/09 01:32:41 MI:5.8 L'Aquila

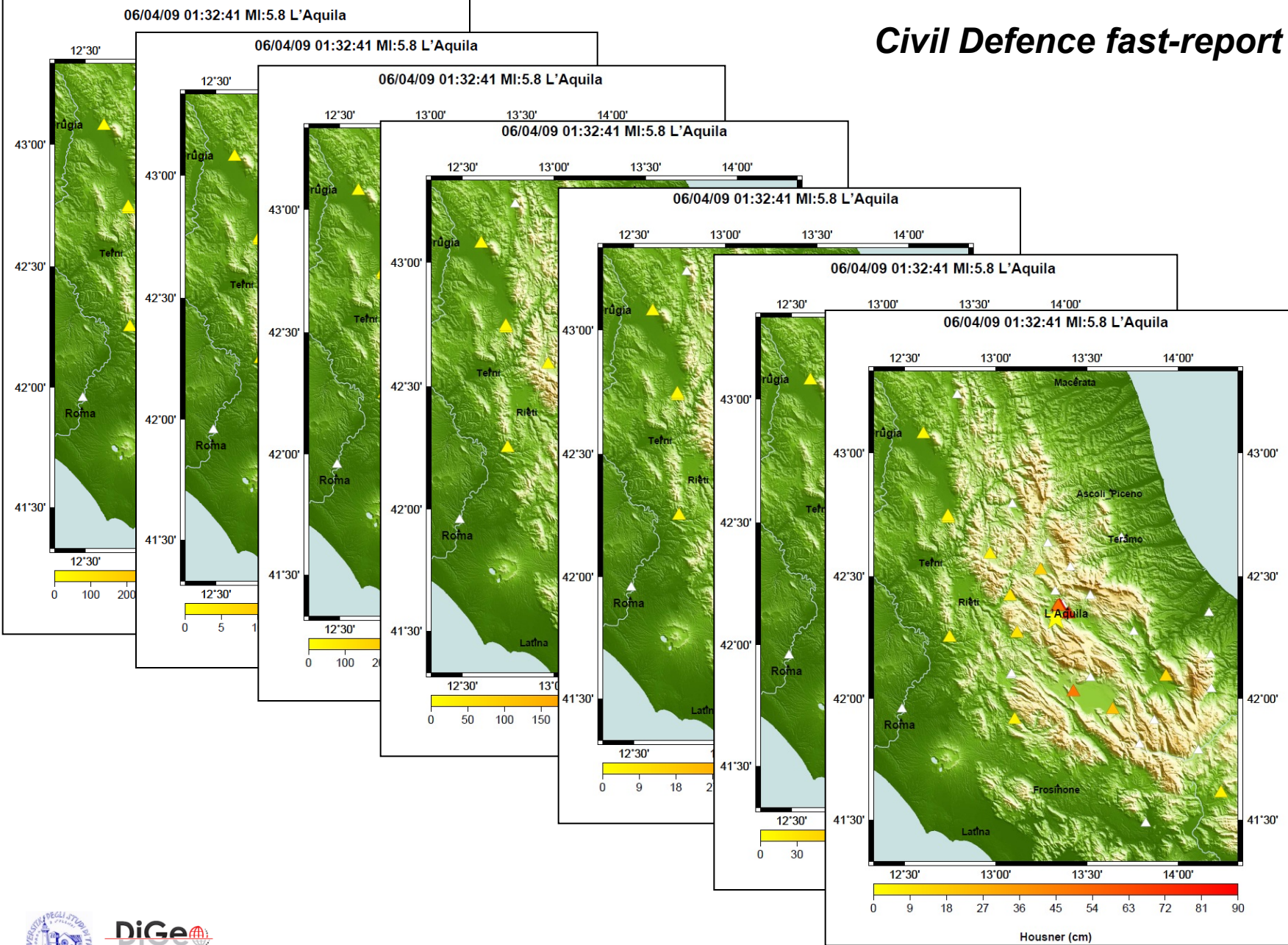
06/04/09 01:32:41 MI:5.8 L'Aquila

06/04/09 01:32:41 MI:5.8 L'Aquila

06/04/09 01:32:41 MI:5.8 L'Aquila

06/04/09 01:32:41 MI:5.8 L'Aquila

06/04/09 01:32:41 MI:5.8 L'Aquila



Civil Defence fast-report

SeisRaM
Region: LUSEVERA (I) Origin time: 2011/03/11 01:06:33.23 - INTERNAL USE ONLY - antedst 2011/03/11 09:09:18.00

System: antedst MAC OSX - antelope ver.: 5.0
Seismology Research and Monitoring Group
Dipartimento di Geoscienze - University of Trieste

Region: LUSEVERA (I) EVID: 8753 OrigID: 9344

Date	Time	Latitude	Longitude	Depth	mb	M _s	M _w	Nata	RMS	Author
2011/03/11	01:06:33.23	46.2744	13.2867	0.0	0.00	0.00	2.16	47	0.78	gabassoso

ArzID	Sta	Dist	EVA	Phase	Time	TRes	SNR	mb	M _s	M _w
39874	CIVO	0.58	273.3	P	01:06:43.318	-1.1	77.80	0.00	0.00	1.82
39817	FUSI	0.24	305.4	P	01:06:37.368	-0.5	193.0	0.00	0.00	2.40
39811	PALA	0.25	263.4	P	01:06:37.945	-0.1	148.3	0.00	0.00	2.47
39822	ACOM	0.32	29.7	P	01:06:38.198	0.1	51.38	0.00	0.00	2.90
39813	CADS	0.31	98.3	P	01:06:39.459	0.3	492.4	0.00	0.00	0.00
39814	ZODI	0.34	322.8	P	01:06:40.000	0.0	0.00	0.00	0.00	0.00
39815	MOSE	0.42	287.2	P	01:06:40.000	0.0	0.00	0.00	0.00	0.00
39906	TLI	0.38	199.8	P	01:06:40.000	0.0	0.00	0.00	0.00	0.00
39818	SANO	0.37	139.9	P	01:06:41.070	0.7	29.23	0.00	0.00	2.71
39834	MYKA	0.43	34.4	P	01:06:41.620	0.1	19.46	0.00	0.00	2.13
39825	VINO	0.02	192.1	P	01:06:43.882	0.3	246.5	0.00	0.00	-0.46
39819	GRSE	0.49	84.8	P	01:06:42.353	-0.2	405.9	0.00	0.00	0.00
39823	VOUS	0.48	120.0	P	01:06:42.628	0.2	628.1	0.00	0.00	0.00
39908	BIA	0.13	243.0	P	01:06:35.920	0.3	62.90	0.00	0.00	2.00
39809	BUSE	0.16	150.9	P	01:06:36.776	0.5	602.8	0.00	0.00	0.00
39821	POLC	0.40	245.8	P	01:06:44.728	0.0	8.632	0.00	0.00	2.59
39870	TRI	0.66	149.4	P	01:06:45.348	-0.5	20.83	0.00	0.00	2.00
39860	BETA	2.11	356.0	P	01:07:11.968	2.2	12.02	0.00	0.00	2.35
39828	JAVI	0.46	125.0	P	01:06:45.450	-0.2	117.1	0.00	0.00	0.00
39826	DIST	0.71	149.7	P	01:06:46.388	-0.5	11.43	0.00	0.00	2.38
39824	CNSI	0.70	155.7	P	01:06:46.393	-0.3	51.33	0.00	0.00	0.00
39835	ABTA	0.71	311.9	P	01:06:46.720	-0.2	26.29	0.00	0.00	1.68
39832	MOZZ	0.80	88.2	P	01:06:48.134	0.2	56.72	0.00	0.00	0.00

Page 1

phases

SeisRaM
System: antedst MAC OSX - antelope ver.: 5.0
Seismology Research and Monitoring Group
Dipartimento di Geoscienze - University of Trieste

Region: Origin time: - INTERNAL USE ONLY -

EVENT: L'Aquila
Origin time: 09/01/11 10:58:20 Lat.: 42.108 Lon.: 13.334 M_l = 3.9 EVID: 7 ORID: 57 Agency: INGV
Seismic moment: 4.340e+15 Newton*m - Mw = 4.1

sta	chan	dist	filter	PGA	PGV	PSA30	PSA10	PSA03	Arias	House		
km	Hz	cm/s/s	cm/s	cm/s/s	cm/s/s	cm/s/s	cm/s/s	cm/s/s	cm/s	cm		
AVZ	HGE	16	0.20	20.00	4.1e+00	2.2e+01	1.0e+01	3.1e+00	1.5e+01	2.1e+01	9.9e-01	Avezzano_Castello
AVZ	HGZ	16	0.20	20.00	3.8e+00	2.0e+01	1.1e+01	1.2e+00	8.2e-02	1.3e+01	7.8e-01	Avezzano_Castello
AVZ	HGN	16	0.20	20.00	3.8e+00	2.8e+01	1.3e+01	2.2e+00	2.7e+01	1.9e+01	1.2e+00	Avezzano_Castello
CLN	HGE	16	0.20	20.00	3.8e+00	2.8e+01	1.3e+01	2.2e+00	2.7e+01	1.9e+01	1.2e+00	Avezzano_Castello
CLN	HGN	16	0.20	20.00	3.8e+00	2.8e+01	1.3e+01	2.2e+00	2.7e+01	1.9e+01	1.2e+00	Avezzano_Castello
CLN	HGE	16	0.20	20.00	3.8e+00	2.8e+01	1.3e+01	2.2e+00	2.7e+01	1.9e+01	1.2e+00	Avezzano_Castello
BTT2	HGN	23	0.20	20.00	2.3e+00	2.4e+01	7.3e+00	3.6e+00	6.1e-01	1.5e+01	1.2e+00	Borgo_Ottomila2
BTT2	HGZ	23	0.20	20.00	1.1e+00	1.2e+01	3.2e+00	1.3e+00	1.9e-01	3.0e+00	7.1e-01	Borgo_Ottomila2
BTT2	HGE	23	0.20	20.00	2.9e+00	3.2e+01	7.8e+00	4.0e+00	6.1e-01	2.0e+01	1.3e+00	Borgo_Ottomila2
PGG	HGZ	31	0.20	20.00	9.3e+01	4.7e+02	3.1e+00	2.1e-01	3.1e-02	1.2e+00	1.9e-01	Poggio_Picenze
PGG	HGN	31	0.20	20.00	1.6e+00	9.0e+02	4.7e+00	7.4e-01	5.6e-02	2.8e+00	3.6e-01	Poggio_Picenze
PGG	HGE	31	0.20	20.00	1.7e+00	8.9e+02	3.9e+00	6.0e-01	3.4e+00	4.0e-01	Poggio_Picenze	
AQG	HGE	31	0.20	20.00	1.3e+00	5.1e+02	2.8e+00	4.8e-01	4.6e-02	1.0e+00	2.1e-01	L'Aquila_Colle_dei_Grilli
AQG	HGN	31	0.20	20.00	1.3e+00	1.8e+01	2.1e+00	3.9e+02	8.4e-01	1.6e+01	1.6e+01	L'Aquila_Colle_dei_Grilli
AQG	HGZ	31	0.20	20.00	5.2e+01	3.8e+02	1.3e+00	4.4e-01	3.5e-02	2.2e+01	1.3e+01	L'Aquila_Colle_dei_Grilli
AQA	HGE	31	0.20	20.00	1.7e+00	3.7e+02	1.2e+00	5.1e-01	5.6e-02	9.4e-01	1.6e+01	L'Aquila_Valle_Aterno_Piume_Aterno
AQA	HGN	31	0.20	20.00	1.4e+00	5.3e+02	2.0e+00	2.6e+01	4.2e+02	1.1e+00	1.7e+01	L'Aquila_Valle_Aterno_Piume_Aterno
AQA	HGZ	31	0.20	20.00	3.1e+01	2.5e+02	9.3e+01	3.3e+01	3.4e+02	1.5e+01	1.0e+01	L'Aquila_Valle_Aterno_Piume_Aterno
AQV	HGN	32	0.30	20.00	1.8e+00	7.4e+02	3.1e+00	4.1e-01	6.1e-02	2.3e+00	2.9e-01	L'Aquila_Valle_dell_Aterno
AQV	HGE	32	0.20	20.00	2.4e+00	7.1e+02	4.6e+00	5.0e-01	4.7e-02	2.4e+00	2.4e-01	L'Aquila_Valle_dell_Aterno
AQV	HGZ	32	0.20	20.00	5.5e+01	2.9e+02	1.3e+00	2.9e-01	3.5e-02	2.9e+01	1.2e+01	L'Aquila_Valle_dell_Aterno

Page 1

Ground motion parameters

sms



Seismological Research and Monitoring Group
Dip. di Geoscienze - Università degli Studi di Trieste

Home Seismology Dip. Geoscienze SeisRaM University of Trieste

Shakemaps

- Scientific background
- Project S4-Report
- VRMS
- Scenario
- Historical

Real Time Shakemaps

The Real Time shakemaps at DNG are performed in the framework of the project
 Progetti Sismologici di interesse per il Dipartimento della Protezione Civile
 Progetto S3: Valutazione rapida dei possibili effetti e degli effetti dei forti terremoti in Italia e nel Mediterraneo
 Recently updated according to the "Seismological Data Exchange in the Alpine region"
 and of the International Agreement for "Real Time Seismological Data Exchange in the ALPE-ADRIA region".

REAL TIME

Open | Int. | Lon. | Alt. | Sea

PGA
 PGV
 Intensity

PSA03
 PSA10
 PSA30

Seismological Networks

- Trials Venezia Giulia Accelerometric Network S4E
- NE Italy Broadband Network

Regional Networks

- RAE
- ARSO
- ZAMB
- ONS

<http://rtweb.units.it>



More site information – Geosite and Polsite tables

Polsite

Administrative site table
 This relation is the the table containing administrative information about the station site

Primary key: sta ondate offdate

Record Size (bytes): 604

Records: 1

Size (bytes): 604

Permissions: may be modified

File: /Volumes/antelope/rt/Antelope/dbmaster/dst.Polsite

sta	ondate	offdate
Village	addr	lcode
Iddate		

Geosite

Geotechnical site table
 This relation is the the table containing geotechnical information about the station site

Primary key: sta ondate offdate

Record Size (bytes): 430

Records: 1

Size (bytes): 430

Permissions: may be modified

File: /Volumes/antelope/rt/Antelope/dbmaster/dst.Geosite

sta	ondate	offdate	housing	topo	morpho	geology
resp_spect	geo_prof	stratigraphy	Vs30	f_0	NEHRP	EC8
Quality	Iddate					

Dismiss

