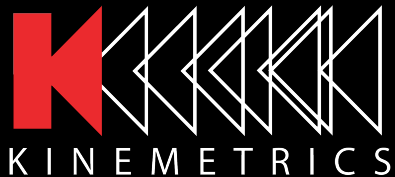


ITALIAN STRONG MOTION NETWORK RAN, ITALY

RANLive Web Tool

Presented by S.Sirignano, A.Ammirati, M.Franke | May 2018



Advancement Through Innovation



Introduction

What is the RAN?

- RAN (*Rete Accelerometric Nazionale*) is the Italian Strong Motion Network managed by the Civil Protection Department (**DPC**)
- The network consists of 573 accelerometric stations, and the maintenance of (currently) 310 stations and the operation of the Data Center (CAED) is carried out by Kinematics operating in Italy through GEOVIS
- BRTT's ANTELOPE software does the core data acquisition and processing acquisition including DATASCOPE database
- The system includes extensive customizations for processing and data storage



Introduction

Restricted access to RAN

3

- The CAED is hosted within DPC's headquarters
- Access to RAN data and servers is very restrictive
- If you want to access RAN data and servers from outside the DPC, you need an on-demand VPN



Introduction

Needs and Request of DPC

DPC requested a tool with following main features:

- Sharing of the ground motion parameters and downloading of the waveforms data in SAC and ASCII format
- Easy access for everyone and from everywhere without knowledge of how to access DataScope
- Easy integration of RAN data with the DPC tools (e.g. SIT-DPC)

RAN's Data Products

Antelope data on the Web

5

We had to find an easy way to share data with DPC users, researchers, students, institutions and in general with any citizen

- The simplest channel for sharing Antelope data and post-processing results is via browser
- A web page can be easily reached by any user using a computer or a smartphone without knowledge of the backend system generating the information
- The user who connects to a web page does not have to have a particular skill, a web page is usually very user-friendly

RANLive

What is RANLive?

- RANLive is born. A web-accessible tool that allows to visualize the locations of seismic events
- Within 2 minutes of an automatic event location it is possible to view the epicenter of the event and the stations that contributed to the localization
- Access to RANLive is reserved only for DPC users. There is also an "open" version without authentication (RANDownload)

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Servizio RAN Download | RANLive

RETE ACCELEROMETRICA NAZIONALE - RANLIVE

DETTAGLI EVENTO (Auth:INGV)
M: 6.0, 2016-08-24 01:36:32 (UTC)
Lat: 42.706 - Lon: 13.223 - Prof: 04.2km
Luogo: Accumoli, Rieti

Dati RAN-DPC
Mw: 6.3 - Momento Sismica: 7.39e+19Nm
PGAmax: 915.97cm/s² nel Comune di Amatrice

REGISTRAZIONI DELLA RAN (ULTIMI 20 EVENTI)

Comune	Km	Pop
Norcia	13	915
Ascoli Piceno	33	49,958
Folignano	38	9,302
Montorio al Vomano	36	8,804
Civitella del Tronto	17	5,833
Campi	28	2,276
Spoletto	40	48,420
Teramo	40	54,294
L'Aquila	42	46,964
Sant'Egidio alla Traiana	47	9,864

DALL'ULTIMO EVENTO:
0 Giorni 0 Ore 4 Minuti 11 Secondi

*DISTANZA E POPOLAZIONE CALCOLATE IN BASE AI DATI INVIATI 2011

The RANLive web address is:
<http://ran.protezionecivile.it/IT/live.php>



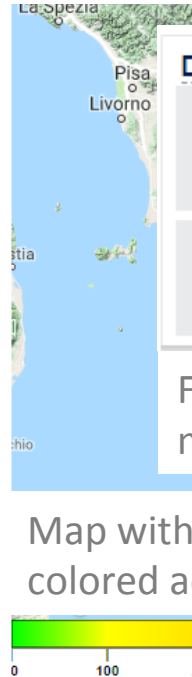
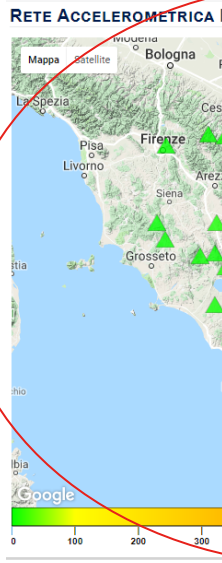
RANLive

The elements of RANLive



RETE ACCELEROMETRICA NAZIONALE - RANLIVE

List of cities with details of the population and the distance from the event (ISTAT 2011)



DETTAGLI EVENTO (AUTH:INGV)

Mi: 6.0, 2016-08-24 01:36:32 (UTC)
 Lat: 42.706 - Lon: 13.223 - Prof: 04.2km
 Luogo: Accumoli, Rieti

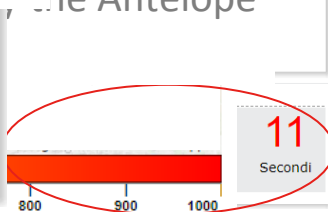
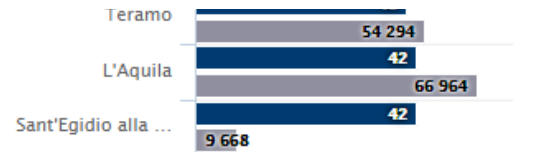
Dati RAN-DPC

Mw: 6.3 - Momento Sismico: 7.39e+18Nm
 PGAm_{ax}: 915.97cm/s² nel Comune di Amatrice

11
 minuti Secondi

For each registered event the elapsed time and the most significant seismic parameters are shown.

the elapse time and the most significant seismic parameters are shown.



Map with colored markers

DISTANZA E POPOLAZIONE CALCOlate IN BASE AI DATI ISTAT 2011

RANLive

The elements of RANLive

IT - AMT

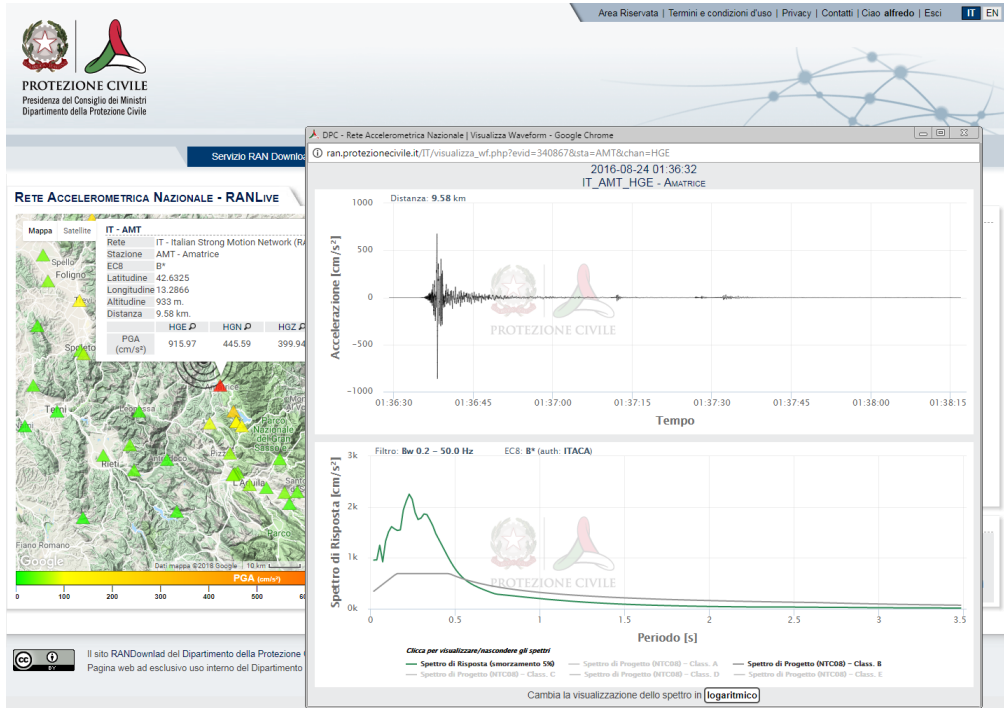
Rete IT - Italian Strong Motion Network (RAN)
 Stazione AMT - Amatrice
 EC8 B*
 Latitudine 42.6325
 Longitudine 13.2866
 Altitudine 933 m.
 Distanza 9.58 km.

	HGE ρ	HGN ρ	HGZ ρ
PGA (cm/s ²)	915.97	445.59	399.94

By clicking on a station icon, you access a layer with detailed station information and details of the PGA values measured per channel.

RANLive

The elements of RANLive



Furthermore, clicking on the name of the channel accesses a layer with the graph of the recorded waveform and the relative response and design spectrum.

RANLive

The elements of RANLive

The screenshot displays the RANLive web application interface. At the top, there is a header with the logo of the Italian Civil Protection (Protezione Civile) and navigation links for 'Termini e condizioni d'uso', 'Privacy', 'Contatti', 'Ciao Sismico', 'Esci', and language options 'IT' and 'EN'. Below the header, there are tabs for 'Servizio RAN Download' and 'RANLive'. The main content area is titled 'RETE ACCELEROMETRICA NAZIONALE - RANLIVE' and features a map of Italy with numerous green and yellow triangles representing seismic stations. A red circle highlights a download icon in the 'DETTAGLI EVENTO' section. To the right of the map, there are three panels: 'DETTAGLI EVENTO' showing event parameters like magnitude (Mw 6.3) and location (Amatrice); 'REGISTRAZIONI DELLA RAN (ULTIMI 20 EVENTI)' listing recent seismic events with their magnitudes and locations; and 'COMUNI PIÙ VICINI ALL'EPICENTRO*' showing a bar chart of nearby communities with their distances and populations.

Moreover, for each event it is possible to consult the summary data in tabular format and to download the waveforms in SAC and ASCII format.

GROUND MOTION PARAMETERS

EVENT DATA (AUTH: INGV): ML 6.0, 2016-08-24 01:36:32 (UTC) - ACCUMOLI, RIETI

Net	Sta	Can	Lat (°)	Lon (°)	Nome Stazione	Filtro Hz	dist km	PGA cm/s ²	PGV cm/s	PGD cm	PSA03 cm/s ²	PSA10 cm/s ²	PSA30 cm/s ²	Td s	Arias cm/s	Housner cm	EC8
IT	AMT	HGE	42.6325	13.2866	Amatrice	Ba	0.2 6 50.0 6 9.58	915.97	44.25	2.96	1,786.88	199.93	20.85	3.89	171.23	130.40	B*
IT	AMT	HGN	42.6325	13.2866	Amatrice	Ba	0.2 6 50.0 6 9.58	445.59	39.11	7.03	566.87	356.08	41.43	3.60	65.00	135.27	B*
IT	AMT	HGZ	42.6325	13.2866	Amatrice	Ba	0.2 6 50.0 6 9.58	399.94	27.45	4.46	414.57	328.56	57.23	5.25	51.02	94.64	B*
IT	RQT	HGE	42.8130	13.3110	Arquata_Del_Tronto	Ba	0.2 6 50.0 6 13.91	447.87	13.85	2.05	930.23	75.56	21.70	6.87	136.60	47.05	B*
IT	RQT	HGZ	42.8130	13.3110	Arquata_Del_Tronto	Ba	0.2 6 50.0 6 13.91	396.54	9.16	1.92	411.45	42.19	19.67	6.07	88.59	34.37	B*
IT	NOR	HGE	42.7924	13.0924	Norcia	Ba	0.2 6 50.0 6 14.25	192.12	31.06	8.20	306.03	411.44	69.77	10.78	50.90	137.85	C*
IT	NOR	HGN	42.7924	13.0924	Norcia	Ba	0.2 6 50.0 6 14.25	165.66	15.21	4.33	442.27	242.97	51.25	17.84	31.25	80.39	C*
IT	NOR	HGZ	42.7924	13.0924	Norcia	Ba	0.2 6 50.0 6 14.25	258.33	14.68	2.82	279.99	120.86	18.62	8.69	28.24	47.81	C*
IT	NRC	HGE	42.7925	13.0964	Norcia	Ba	0.2 6 50.0 6 14.25	331.61	29.20	6.25	711.12	237.14	51.36	6.31	94.72	108.96	B
IT	NRC	HGN	42.7925	13.0964	Norcia	Ba	0.2 6 50.0 6 14.25	376.96	19.16	5.67	631.13	193.98	48.16	7.51	75.39	84.24	B
IT	NRC	HGZ	42.7925	13.0964	Norcia	Ba	0.2 6 50.0 6 14.25	208.60	8.74	2.27	563.85	100.20	17.27	6.14	34.71	42.87	B
IT	CSC	HGE	42.7190	13.0122	Cascia	Ba	0.2 6 50.0 6 17.45	104.40	5.46	0.90	196.47	74.73	7.50	9.01	7.20	24.19	B
IT	CSC	HGN	42.7190	13.0122	Cascia	Ba	0.2 6 50.0 6 17.45	91.91	5.47	1.11	197.07	51.42	7.20	8.45	8.15	19.01	B
IT	CSC	HGZ	42.7190	13.0122	Cascia	Ba	0.2 6 50.0 6 17.45	64.32	2.27	0.67	94.74	39.26	6.27	10.46	3.74	10.74	B
IT	PCB	HGE	42.5580	13.3380	Poggio_Cancelli	Ba	0.2 6 50.0 6 18.91	190.70	10.64	1.33	372.79	110.44	13.82	8.55	18.35	33.32	B*
IT	PCB	HGN	42.5580	13.3380	Poggio_Cancelli	Ba	0.2 6 50.0 6 18.91	207.02	10.67	1.73	528.22	140.39	19.45	9.03	29.35	44.59	B*
IT	PCB	HGZ	42.5580	13.3380	Poggio_Cancelli	Ba	0.2 6 50.0 6 18.91	80.89	5.43	1.09	218.86	103.23	17.50	7.89	3.62	26.71	B*
IT	MTR	HGE	42.5240	13.2448	Montereale	Ba	0.2 6 50.0 6 20.15	88.90	9.35	2.22	141.88	120.78	20.96	15.82	5.26	39.69	B*
IT	MTR	HGN	42.5240	13.2448	Montereale	Ba	0.2 6 50.0 6 20.15	69.30	6.82	2.30	156.79	96.64	35.02	12.84	5.61	27.88	B*
IT	MTR	HGZ	42.5240	13.2448	Montereale	Ba	0.2 6 50.0 6 20.15	39.16	5.75	1.77	74.61	75.13	25.64	15.89	2.24	18.63	B*
IT	MSC	HGE	42.5268	13.3508	Mascioni	Ba	0.2 6 50.0 6 22.42	109.38	9.45	1.53	273.21	145.50	11.87	11.16	7.64	36.75	B*
IT	MSC	HGN	42.5268	13.3508	Mascioni	Ba	0.2 6 50.0 6 22.42	87.51	6.30	1.70	130.50	91.81	18.29	12.67	6.52	27.92	B*

The table contains the following parameters:

- Distance
- PGA
- PGV
- PGD
- PSA03
- PSA10
- PSA30
- Td
- Arias
- Housner
- EC8

The Ground Motion Parameters are automatically calculated by custom Antelope programs developed by the **SeisRAM** group at the University of Trieste, under an agreement with DPC.



DOWNLOAD SAC & ASCII

ESCLUSIONE DI RESPONSABILITA', CONDIZIONI D'USO E POLITICA DEI DATI

PROCEDURA AUTOMATICA

Scarica le registrazioni accelerometriche della RAN in formato SAC e ASCII, selezionate automaticamente per i terremoti annunciati da INGV (responsabile della sorveglianza sismica in Italia), e i relativi PARAMETRI calcolati per la descrizione dello scuotimento.

La selezione, le registrazioni ed i valori dei parametri sono soggetti ad eventuale revisione.

DATI STRONG-MOTION

Le forme d'onda sono disponibili sia in formato SAC che in formato ASCII. Nell'interfaccia dei files è indicata, tra l'altro, la polarità del segnale. I dati di accelerazione sono riportati in nm/sec², l'unità standard per le forme d'onda di accelerazione in formato SAC.

Il valore medio del segnale non è stato rimosso così come il trend.

Il data set delle forme d'onda è reso disponibile senza fare alcuna selezione sulla qualità del segnale.

CONDIZIONI D'USO E POLITICA DEI DATI

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Per ulteriori informazioni sulla RAN, fare riferimento a <http://www.protezionecivile.gov.it/jcms/it/ran.wp>

DOWNLOAD SAC - DOWNLOAD ASCII

For each seismic event it is possible to download the waveforms in SAC and ASCII format.

RANLive

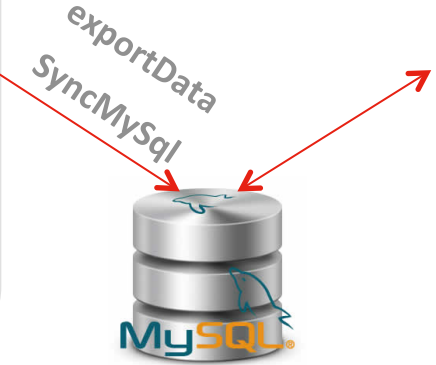
How it works and how it integrates with Antelope

13

- Due to security restrictions it was not possible to integrate RANLive directly to the Antelope database
- It was necessary to export data to a MySQL database in order to
 - connect to the SIT-DPC proprietary software
 - provide easy access for creating the web pages
- The MySQL database contains a set of tables that are replications of DataScope tables and others created "ad hoc" to provide the functionalities of RANLive
- The MySQL database is constantly synchronized with Antelope's production database

RANLive

Simplified view of the architecture



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Servizio RAN Download RANLive

RETE ACCELEROMETRICA NAZIONALE - RANLIVE

Mappe Satelliti

DETTAGLI EVENTO (AUTHINGV)
ME: 3.9, 2016-03-06 08:12:36 (UTC)
Lat: 38.184 - Lon: 16.751 - Prof: 36.5km
Luogo: Mar Ionio
Dati RAN-OPC:
Mw: 4.1 - Momento Sismico: 3.74e+15Nm
PGAmax: 1.06cm/s² nel Comune di Sfilio

REGISTRAZIONI DELLA RAN

2016-03-06 08:12:36	M:3.9 Prof:36.5km Nrics:21
2016-03-06 15:51:19	M:3.4 Prof:08.4km Nrics:25
2016-03-03 05:01:17	M:3.7 Prof:10.0km Nrics:44
2016-02-08 17:57:38	M:3.7 Prof:07.1km Nrics:18
2016-02-08 15:35:43	M:4.8 Prof:04.4km Nrics:30
2016-02-08 11:23:56	M:2.7 Prof:23.7km Nrics:15
2016-02-07 01:41:58	M:3.4 Prof:08.0km Nrics:18
2016-02-03 22:41:02	M:3.2 Prof:08.0km Nrics:33
2016-02-03 21:37:39	M:3.0 Prof:13.3km Nrics:08
2016-02-01 09:11:48	M:2.9 Prof:11.0km Nrics:21
2016-01-16 10:37:16	M:2.4 Prof:15.3km Nrics:42
2016-01-17 22:09:23	M:3.6 Prof:11.0km Nrics:42
2016-01-16 18:55:11	M:4.1 Prof:09.0km Nrics:50
2016-01-13 17:01:28	M:4.2 Prof:39.4km Nrics:15
2016-01-06 15:20:21	M:3.0 Prof:27.1km Nrics:29
2015-12-22 05:55:09	M:3.4 Prof:09.0km Nrics:20
2015-12-22 02:13:39	M:3.4 Prof:08.0km Nrics:18
2015-12-22 00:40:25	M:3.0 Prof:08.4km Nrics:12
2015-12-20 09:46:03	M:3.0 Prof:05.0km Nrics:22
2015-12-15 23:30:16	M:2.9 Prof:52.3km Nrics:13

COMUNI PIÙ VICINI CON ALMENO 4000 ABITANTI

Comune	Pop.
Roccella Ionica	31
Caulonia	29
Marina di Gioiaca	23
Siderno	16679
Guardavalle	4763
Gioiosa Ionica	3924
Loai	43
Arion	162
Bovato	114
Bianco	4193

DALL'ULTIMO EVENTO:

1 7 30 47
Giorni Ore Minuti Secondi

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The **SyncMySQL** process performs a daily synchronization of the following Antelope database tables with the corresponding tables in MySQL:

- **datascope: site** → **mysql: ant_site**
- **datascope: instrument** → **mysql: ant_instrument**
- **datascope: sensor** → **mysql: ant_sensor**
- **datascope: sitechan** → **mysql: ant_sitechan**
- **datascope: stage** → **mysql: ant_stage**
- **datascope: affiliation** → **mysql: ant_affiliation**
- **datascope: Geosite** → **mysql: ant_geosite**
- **datascope: Polsite** → **mysql: ant_polsite**
- **datascope: Spetpar** → **mysql: ant_spetpar**

- The tables synchronized by SyncMySQL concern the metadata of the stations -> Therefore daily synchronization is sufficient
- The program performs a daily check if new records have been added since the last synchronization
- New records are read from the Antelope database and inserted into the MySQL database
- A "sync" table is used to check whether new records have been added to the Antelope tables since the last synchronization

Sync table:

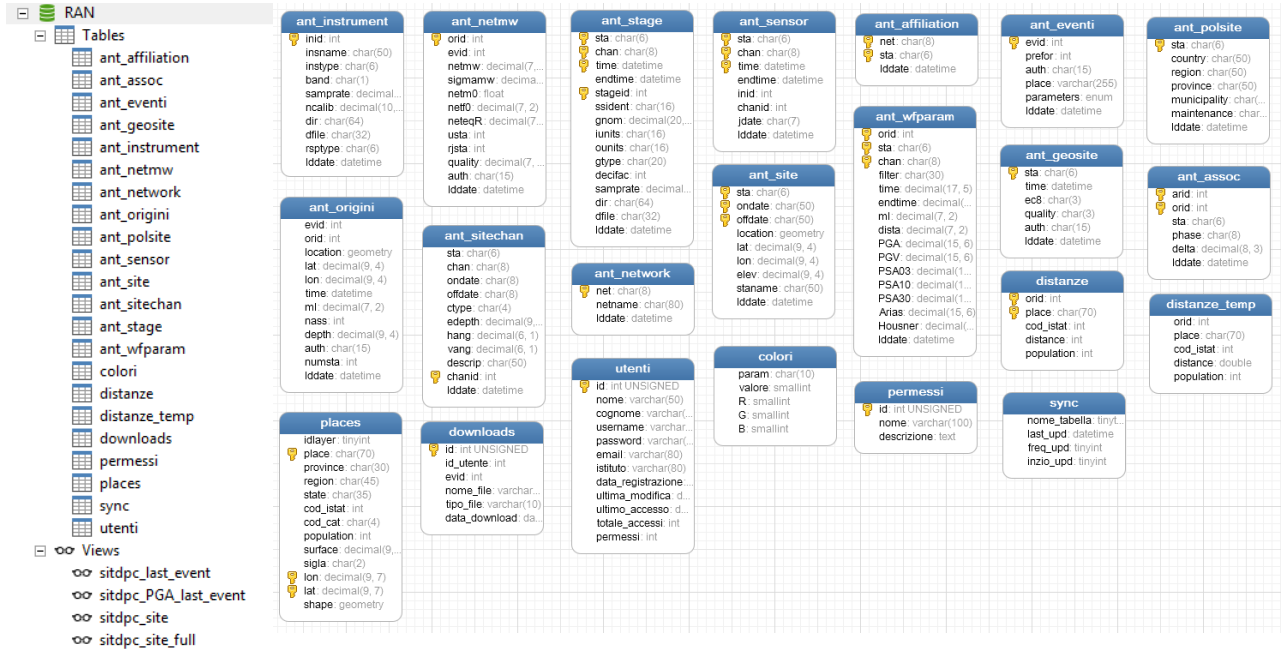
RAN.sync: 9 righe totali (circa)

nome_tabella	last_upd
ant_site	2018-03-22 10:48:59
ant_instrument	2018-02-23 09:37:33
ant_sensor	2018-03-22 10:49:02
ant_sitechan	2018-03-22 10:49:02
ant_stage	2018-03-22 10:49:02
ant_geosite	2017-11-20 13:25:50
ant_polosite	2017-11-27 09:15:40
ant_affiliation	2017-11-20 13:25:32
ant_spetpar	2017-11-20 13:29:04

- The **exportData** program synchronizes the MySQL database every time Antelope records a new event
- The data of the new earthquake are displayed on the RANLive web pages within 2 minutes
- The according waveforms in SAC and ASCII format, as well as the spectra files are exported to RANLive

MySQL tables updated by the **exportData** synchronization are:

- ant_netmw
- ant_wfparam
- ant_wfdamage
- ant_assoc
- ant_netmag
- ant_eventi
- ant_origini
- wfiles

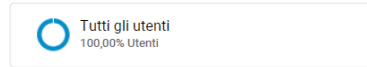


The MySQL database schema presents some tables that are a copy of the DataScope tables plus other tables necessary for the functioning of the web pages. There are also views for integration with the SIT-DPC software owned by the DPC.



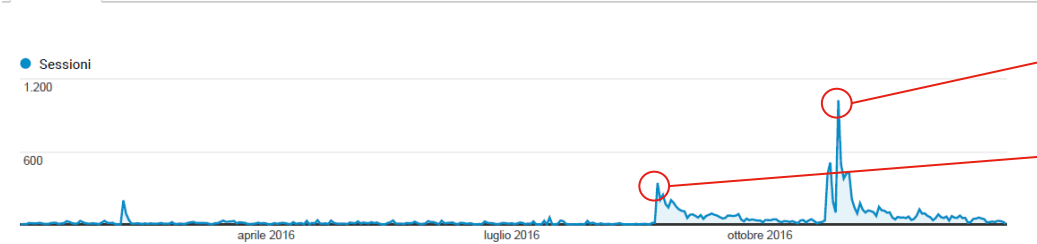
- Accesses to ran.protezionecivile.it mostly occur after felt, moderate earthquakes
- In 2016 and 2017 several moderate earthquakes were recorded in Italy

Panoramica del pubblico



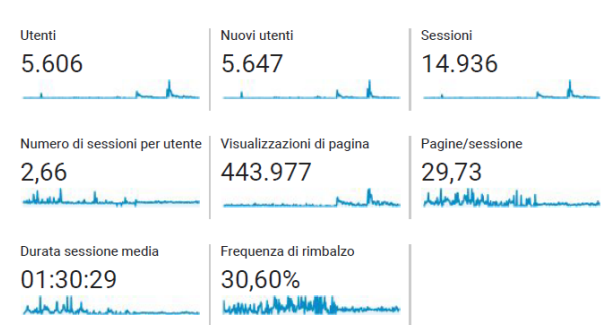
1 gen 2016 - 31 dic 2016

Panoramica

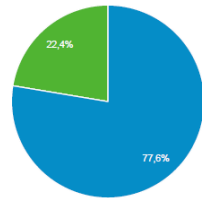


30 October 2016 - ML 6,1 Norcia

24 August 2016 - ML 6,0 Amatrice



■ New Visitor ■ Returning Visitor

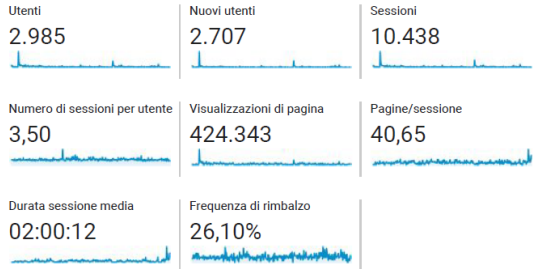


Panoramica del pubblico

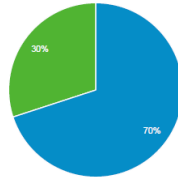
Tutti gli utenti
100,00% Utenti

1 gen 2017 - 31 dic 2017

Panoramica



■ New Visitor ■ Returning Visitor



4 different events greater than ML 5 in the province of L'Aquila

18 January 2017 - ML 5,3 L'Aquila

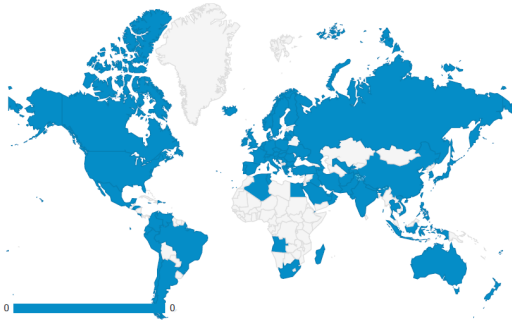
18 January 2017 - ML 5,4 L'Aquila

18 January 2017 - ML 5,3 L'Aquila

18 January 2017 - ML 5,1 L'Aquila

Overlay mappa

Usso del sito



Paese	Utenti	Sessioni	Pagine/sessione	Durata sessione media	% nuove sessioni	Frequenza di rimbalzo
	8.947 % del totale: 100,00% (8.947)	28.713 % del totale: 100,00% (28.713)	38,69 Media per vista: 38,69 (0,00%)	02:01:27 Media per vista: 02:01:27 (0,00%)	32,17% Media per vista: 32,17% (0,00%)	28,15% Media per vista: 28,15% (0,00%)
1. Italy	7.070 (78,39%)	25.817 (89,91%)	41,19	02:07:38	28,39%	26,05%
2. United States	395 (4,38%)	610 (2,12%)	33,36	02:35:19	64,75%	53,44%
3. United Kingdom	319 (3,54%)	402 (1,40%)	9,59	00:34:05	78,86%	63,68%
4. China	155 (1,72%)	259 (0,90%)	17,39	01:01:07	59,46%	31,27%
5. Brazil	106 (1,18%)	107 (0,37%)	1,44	00:01:44	99,07%	94,39%
6. (not set)	96 (1,06%)	111 (0,39%)	8,54	00:26:32	79,28%	57,66%
7. Japan	88 (0,98%)	174 (0,61%)	9,60	00:22:12	50,57%	27,01%
8. France	85 (0,94%)	144 (0,50%)	31,90	02:21:13	59,03%	25,69%
9. Germany	80 (0,89%)	129 (0,45%)	10,00	00:35:28	60,47%	44,96%

RANLive receives access from many countries in the world

1.	Italy	7.070 (78,39%)
2.	United States	395 (4,38%)
3.	United Kingdom	319 (3,54%)
4.	China	155 (1,72%)
5.	Brazil	106 (1,18%)
6.	(not set)	96 (1,06%)
7.	Japan	88 (0,98%)
8.	France	85 (0,94%)
9.	Germany	80 (0,89%)

The distribution of accesses is as follows :

- 78% Italy
- 4% USA
- 3% Great Britain
- Almost 2% China
- Brazil, Japan, France and Germany to 1%
- Other countries around 2%

Conclusions

- RANLive is a tool that allows near real-time access to earthquake information and data
- RANLive is an easy to use web interface

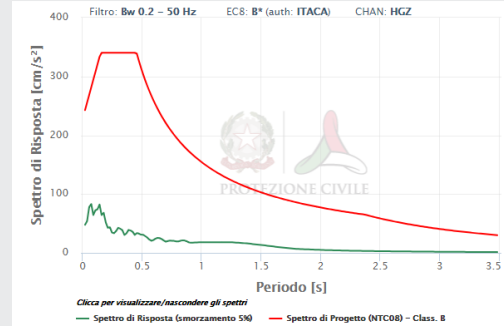
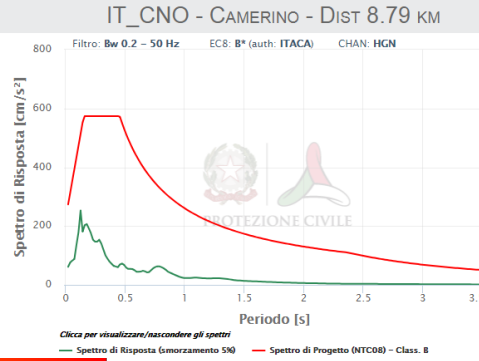
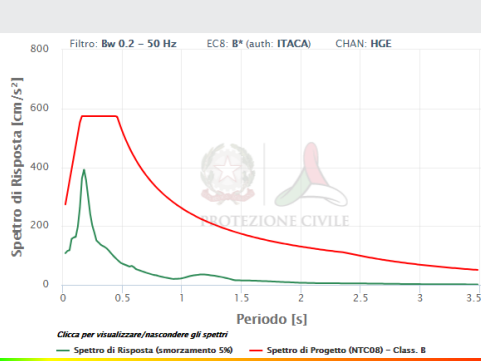
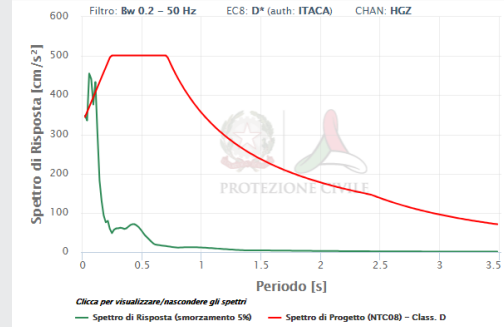
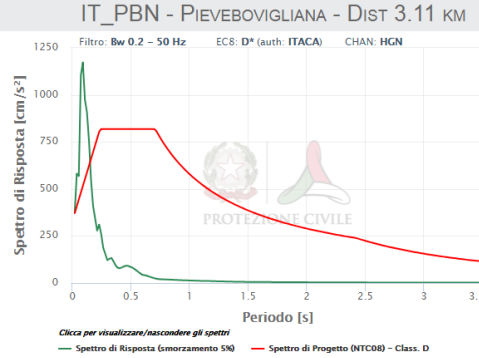
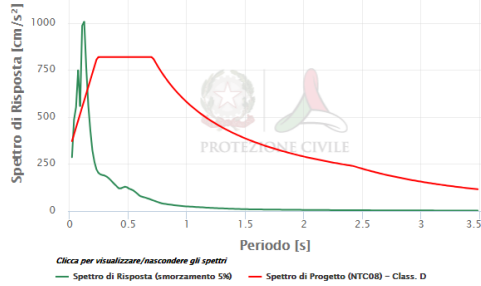
Upcoming developments

ML: 4.6 - 2018-04-10 03:11:30 (UTC) - MUCCIA, MACERATA - PROF: 8KM (INGV)

PGAMAX: 349.91 cm/s² NEL COMUNE DI PIEVEBOVIGLIANA



A single page with all the stations response spectra



Thank you