ITACA v 2.1

The accelerometric database **ITACA v 2.1** contains the strong motion data and the relevant metadata acquired by the main strong motion networks operating in Italy from 1972 to October 2015.
The main modification with respect to the release of ITACA 2.0 (February 2014) are listed below.

Data from the main Italian and neighbouring networks

Accelerometric data from the major networks of Italy have been added, as well as accelerometric data from neighbouring networks, for events occurred at the Italian borders.

Network code	**Network name**
IT	Rete Accelerometrica Nazionale
NI	North-East Italy Broadband Network
TV	NULLTemporary INGV network
E	Rete accelerometrica ENEA
RF	Friuli Venezia Giulia Accelerommetric Network
IV	Rete Sismometrica Nazionale
IX	Irpinia Seismic Network
RF	Friuli Venezia Giulia Accelerommetric Network (RAF)
MN	Mednet
BA	Rete sismica Università della Basilicata
ST	Rete sismica della provincia di Trento
ZN	Seismovalp project
GU	Rete sismica dell'Università di Genova
RA	Réseau Accélérométrique Permanent (French Accelerometrique Network), France
FR	French Broadband Seismological Network
G	GEOSCOPE
CH	Swiss Seismic Network
SI	Province Sudtirol

Web site

1. ITACA 2.1 has a new graphic interface and, in particular, the waveform visualization uses Highcharts technology (http://www.highcharts.com/). Users can visualize, zoom and print the time-series and spectra plots (Figure 1).

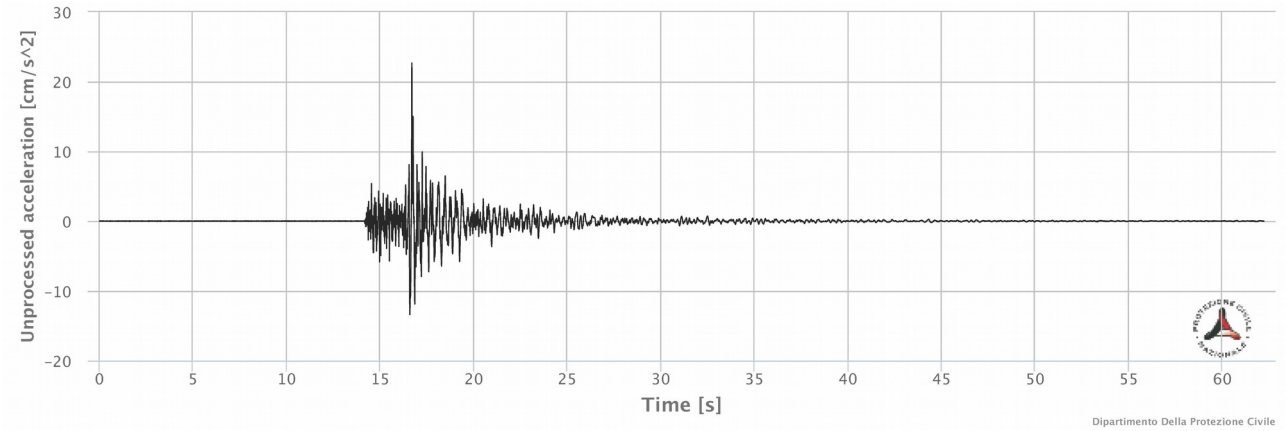

Figure 1: example of plot of an unprocessed time-series

2. The station monographies are synchronized with the database and appear as web pages that can be printed in pdf format. Shear wave velocity profiles are interactive.

3. The seismic events are uniquely identified with the ID's of major seismic catalogues produced by European, International or National agencies (European Mediterranean Seismological Centre catalogue, http://www.emsc-csem.org/; International Seismological Centre http://www.isc.ac.uk/; INGV Seismic Bulletin http://webservices.rm.ingv.it/). Major events (M >5) are linked to the Catalogo Parametrico dei Terremoti Italiani (CPTI, Parametric Catalogue of Italian Earthquakes, http://emidius.mi.ingv.it/CPTI11/)

NEW ASCII HEADER

The ASCII-with-header records (acceleration, velocity, displacement or response spectra) have a header of 64 rows, containing information in order to make the record self-consistent.

In particular, the following lines have been added: line 21 to take into account the sensor depth, for instruments installed in boreholes or in buildings; lines 53-54 to include the license for data use and the citation of the data provider; lines 55 - 59 reserved for information on data provenance.

The last 5 header lines are reserved to users.

1	EVENT_NAME	Name of the seismic event
2	EVENT_ID	Event ID in the database
3	EVENT_DATE_YYYYMMDD	GMT event date (YYYYMMDD)
4	EVENT_TIME_HHMMSS	GMT event origin time (hhmmss)
5	EVENT_LATITUDE_DEGREE	Event Latitude (decimal degrees)
6	EVENT_LONGITUDE_DEGREE	Event Longitude (decimal degrees)
7	EVENT_DEPTH_KM	Event depth (km)
8	HYPOCENTER_REFERENCE	Hypocentre reference
9	MAGNITUDE_W	Moment magnitude (Mw)
10	MAGNITUDE_W_REFERENCE	Moment magnitude reference
11	MAGNITUDE_L	Local magnitude (Ml)
12	MAGNITUDE_L_REFERENCE	Local magnitude reference
13	FOCAL_MECHANISM	Focal mechanism (NF, SS, TF, U, etc.)
14	NETWORK	Network code
15	STATION_CODE	Station code
16	STATION_NAME	Station name
17	STATION_LATITUDE_DEGREE	Station Latitude (decimal degrees)
18	STATION_LONGITUDE_DEGREE	Station Longitude (decimal degrees)
19	STATION_ELEVATION_M	Station elevation (m.a.s.l.)
20	LOCATION	Flag indicating the location
21	SENSOR_DEPTH_M	Sensor depth below ground level (m)
22	VS30_M/S	$V_{S,30}$ (m/s)
23	SITE_CLASSIFICATION_EC8	Geotechnical classification (EC8): A, A*, B, B*, etc.; where the * indicates that site classification is not based on a direct Vs,30 measurement
24	MORPHOLOGIC_CLASSIFICATION	Morphologic classification
25	EPICENTRAL_DISTANCE_KM	Epicentral distance (km)
26	EARTHQUAKE_BACKAZIMUTH_DEGREE	Earthquake backazimuth (degrees)
27	DATE_TIME_FIRST_SAMPLE_YYYYMMDD_HHMMSS	Time (GMT) of the first sample (YYYYMMDD_hhmmss.dec)
28	DATE_TIME_FIRST_SAMPLE_PRECISION	seconds / milliseconds
29	SAMPLING_INTERVAL_S	Sampling interval (s)
30	NDATA	Number of observations
31	DURATION_S	Duration (s)
32	STREAM	Channel code (3 digits, e.g. HNE)
33	UNITS	Units (cm/s^2, cm/s or cm)
34	INSTRUMENT	Instrument (sensor and digitizer)
35	INSTRUMENT_ANALOG/DIGITAL	Flag to indicate whether the instrument is digital or analog
36	INSTRUMENTAL_FREQUENCY_HZ	Instrument Frequency (Hz)
37	INSTRUMENTAL_DAMPING	Instrument Damping
38	FULL_SCALE_G	Fullscale (g)
39	N_BIT_DIGITAL_CONVERTER	Number of bits of the Analog to Digital Converter
40	PGX_UNITS	PGA, PGV or PGD (cm/s^2, cm/s or cm)
41	TIME_PGX_S	Time corresponding to the PGA, PGV, PGD
42	BASELINE_CORRECTION	Flag indicating the baseline corrction

43	FILTER_TYPE	Filter type (Butterworth, etc.)
44	FILTER_ORDER	Filter order
45	LOW_CUT_FREQUENCY_HZ	LP1 (low-cut frequency)
46	HIGH_CUT_FREQUENCY_HZ	LP2 (roll-on frequency)
47	LATE/NORMAL_TRIGGERED	LT/NT
48	DATABASE_VERSION	Database version
49	HEADER_FORMAT	Header format version
50	DATA_TYPE	Data type ("ACCELERATION", "ACCELERATION RESPONSE SPECTRUM", "VELOCITY", "PSEUDO-VELOCITY RESPONSE SPECTRUM", "DISPLACEMENT" or "DISPLACEMENT RESPONSE SPECTRUM")
51	PROCESSING	Processing reference ("none" indicates unprocessed acceleration)
52	DATA_TIMESTAMP_YYYYMMDD_HHMMSS	Date of file compilation
53	DATA_LICENSE:	License for data use
54	DATA_CITATION:	Network or data service citation
55 ... 59	UNUSED1 ... UNUSED5	Reserved fields
60 ... 64	USER1 ... USER5	User defined fields

Data citation and data license

Data can be tracked as the metadata to reproduce the complete path that leads from the original data source to the processed data are included (lines 55-59 of the file header and waveform web page, before downloading). The appropriate citation (line 54 of the file header) is also reported, together with the network DOI, if available. A license is provided by network operators, following the Creative Commons standards (http://creativecommons.org), in order to enable the sharing and use of data through free legal tools and guarantee visibility to the original author (line 53 of the file header).

Metadata revision

1. Location and local magnitudes of seismic events were updated from the INGV Bulletin (http://webservices.rm.ingv.it/fdsnws/event/1/ in case of events located in Italy)

2. New shear wave velocity profiles have been acquired in the framework of the S2-2014 project (INGV-DPC agreement) and GeoRan Project (CNR-IGAG-DPC Agreement). Table 1 lists the Vs30 values and the update of the EC8 site class for the updated stations.

Table 1 – List of the detailed $V_{S,30}$ values and EC8 classes before and after S2 project.

STATION CODE	STATION NAME	REGION	RESPONSIBLE	$V_{S,30}$ [m/s]	EC8 class	$V_{S,30}$ [m/s] updated	EC8 class updated
ALF	Alfonsine	Emilia-Romagna	OGS-BARNABA		C*	240	C
ALT	Auletta(Petina)	Campania	CNR-IMAA	1149	A	1028	A
ARI	Ariano Irpino	Campania	IMAA-CNR		B*	384	B
ASG	Asiago(Roana)	Veneto	OGS-BARNABA		B*	960	A
BRC	Barcis	Friuli-Venezia Giulia	OGS-BARNABA		A*	860	A
BRM	Brasimone(Camugnano)	Emilia-Romagna	UNIBO		B*	410	B
BRZ	Berzsezio	Piemonte	UNIGE		B*	1103	A
CGL	Cagli	Marche	UNISI		B*	>800	A
CNG	Conegliano 5	Veneto	OGS-BARNABA		B*	220	C
CRD	Cortina D'Ampezzo	Veneto	OGS-BARNABA		A*	880	A
CRN	Crotone (Montedison)	Calabria	IMAA-CNR		B*	295	C
CSC	Cascia	Umbria	UNISI		B*	698	B
CSD	Castel Viscardo	Umbria	UNISI		B*	480	B
CST	Castelfranco 5	Veneto	INGVMI		C*	323	C
CTS	Città di Castello (Regnano)	Umbria	OGS-LAU		C*		C*(1)
DMN	Demonte	Piemonte	UNIGE		C*	514	B
FRN	Fornovo	Emilia-Romagna	UNIBO		B*	309	C
GLD	Gildone	Molise	UNISI		B*	470	B
GRR	Giarre	Sicilia	CNR-IGAG		A*		A*(2)
GSN	Gioia Sannitica	Campania	IMAA-CNR		C*	456	E
LNG	Langhirano (Lesignano Bagni)	Emilia-Romagna	INGVMI		C*	296	C
LRS	Lauria	Basilicata	IMAA-CNR		B*	1010	A
MAI	Maiano	Friuli-Venezia Giulia	OGS-BARNABA		C*	200	C
MLC	Malcesine	Trentino-Alto Adige	OGS-BARNABA		A*	580	B
MLD	Meldola	Emilia-Romagna	UNIBO		A*	214	C
MND	Manfredonia	Puglia	UNISI		A*		A*(2)
MNS	Monselice	Veneto	OGS-BARNABA		C*	190	C
MTL	Matelica	Marche	UNISI		C*	580	B
MZR	Mazara del Vallo	Sicilia	UNIBO		C*	520	B
NAS	Naso	Sicilia	UNIBO		B*	310	C
NCS	Nicosia	Umbria	UNIBO		A*	360	B
NZZ	Nnizza Monferrato	Piemonte	UNIGE		B*	328	C
PGL	Peglio	Marche	UNISI		B*	330	C
PNN	Pennabilli	Emilia-Romagna	UNIBO		B*	335	C
PNT	Pontecorvo	Lazio	CNR-IGAG		C*		C*(2)
PTL	Pietralunga	Umbria	OGS-LAU		B*		B*(1)
RCC	Roccamonfina	Campania	IMAA-CNR		C*	242	C
RNC	Rincine (Londa)	Toscana	UNISI		B*	870	A
SGR	S. Giorgio La Molara	Campania	IMAA-CNR		B*	701	B
SNG	Senigallia	Marche	UNISI		B*	260	C
SRL	Sirolo	Marche	UNISI		B*	270	C
SRP	Sorbolo (Pezzani)	Emilia-Romagna	INGVMI		C*	227	C
SRT	Sortino	Sicilia	CNR-IGAG		A*	866	A
STG	S. Agapito	Molise	CNR-IGAG		B*		B*(2)
STS	S. Sofia	Emilia-Romagna	UNIBO		B*	460	B
TDG	Torre del Greco	Campania	IMAA-CNR		B*	435	B
TLM2	Tolmezzo (Ambiesta- 2)	Friuli-Venezia Giulia	OGS-BARNABA	522	B	520	B
UMB	Umbertide	Umbia	OGS-LAU		B*		B*(1)
VLS2	Villa San Giovanni-1	Calabria	IMAA-CNR		C*	315	C

(1) site characterization is performed by GIT (Generalized Inversion Technique).
(2) site characterization is in progress.

3. The Department of Civil Protection has provided about 380 microtremor

measurements relative to 2 campaigns conducted in the period 2011-2014. The results of the first campaign are included in ITACA 2.0 and the other results are in this version of the database. In order to make these measurements comparable, all records were processed with the same numerical approach implemented by Puglia et al. (2011). For each microtremor measurement, a report is generated and published in the station monograph under the section "Microtremor H/V spectral ratio".

4. Faults geometries for all events with magnitude larger than or equal to 5.5 after 2012 are included (Emilia mainshock and second shock)

New tools

A waveform processing tool is available at http://itaca.mi.ingv.it/processing/.
Users can access the strong-motion processing service upon registration; a web interface allows registering a new account and login. Waveforms can be selected according to 6 parameters: event ID, event start and end time, magnitude threshold, distance threshold, network code and station code. Users have the advantage of querying the ITACA database directly from the processing interface. The service adopts a robust procedure (Paolucci et al, 2011) implemented to process the Italian strong-motion dataset and tested by Boore et al (2012) against i) padded and filtered time series and ii) the procedure adopted by Pacific Earthquake Engineering Research Center, for the Next Generation Attenuation project (Power et al, 2008).

References

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Puglia R., Albarello D., Gorini A., Luzi L., Marcucci S., Pacor F. (2011a). Extensive characterization of Italian accelerometric stations from single-station ambient-vibration measurements. Bulletin of Earthquake Engineering, 9: 1821-1838. Doi: 10.1007/s10518-011-9305-z.

Power, M., B. Chiou, N. Abrahamson, Y. Bozorgnia, T. Shantz, and C. Roblee (2008). An overview of the NGA project, Earthquake Spectra 24(1), 3–21.