ITACA: The New Italian Strong-Motion Database

Pacor* F., Paolucci^ R., and Working Groups ITACA of S4 Project
*Istituto Nazionale di Geofisica e Vulcanologia – Milano-Pavia (pacor@mi.ingv.it)
^Politecnico di Milano-Dipartimento di Ingegneria Strutturale (paolucci@stru.polimi.it)

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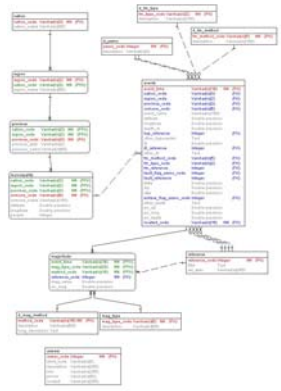
ABSTRACT The main objective of Project S4 is to make available through the Internet an updated and improved release of the Italian strong motion database (ITACA), originally developed within project S6, in the framework of the 2004-2006 DPC-INGV agreement. This work starts from the alpha version of ITACA (Luzi et al., 2008), where 2182 3-component records from 1004 earthquakes where processed and included in the database, together with the earthquake metadata, the recording station information and reports on the available geological-geophysical information of 452 recording sites, corresponding to about 70% of the total. Most records come from the National Accelerometric Netowrk (RAN), operated by DPC, that is expected to include 511 digital stations by 2011, with a 20-30 km average distance in high-risk seismic areas. The beta version of ITACA, which will reach its final stage by the end of the project, around mid-2010, will include several improvements and additional features, namely:
- strong motion records from other local and/or temporary networks, and from recent seismic events, in primis the L'Aquila earthquake of Apr 6, 2009, and its main aftershocks;
- updated reports, with an improved format, on the available geological/geophysical information for all recording stations, including average HVSR from microtremors and earthquakes where available, and the measured Vs profile at about 60 stations, corresponding to about 10% of the total;
- identification of stations and records showing distinctive features, either due to geological/topographic irregularities or due to seismic source effects;
- on-line tools for selection of spectrum-compatible records (Rexelite).
All records were re-processed with respect to the alfa version, with a special care to preserve information about late-triggered events and to ensure compatibility of corrected records, i.e., velocity and displacement traces should be truly the first and second integral of the corrected acceleration signal.
Finally, ITACA is expected to be soon integrated within other international strong motion networks, such as COSMOS and NERIES, in order to promote the dissemination and use worldwide of the Italian strong motion records.

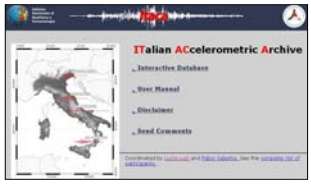
ITACA ALPHA VERSION

Data base structure and web portal
S6 – Project (2004-2006)



The data base contains **48 tables**, with the information concerning seismic events, recording stations, installed instruments and strong-motion parameters, connected through a **relational structure**.
The complete structure is described at: **http://esse6.mi.ingv.it/**
The data base is handled through two different relational data base management systems: **Ms Access® 2003** for data input and DVD release, and **MySQL** for the web distribution.

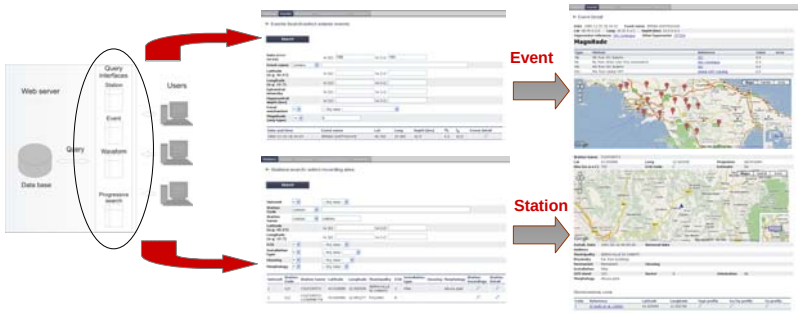
Database block relative to *seismic events*



The dissemination of the Italian strong motion data base is performed through the web portal **http://itaca.mi.ingv.it**.
The data base can be explored through searchable key fields: **10** for the stations, **8** for the seismic events and **9** for the waveforms.

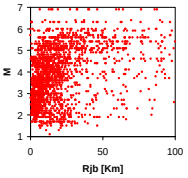
Both recording stations and events are mapped through the Google-Map data©

Selected waveforms can be downloaded in a compressed file format which contains unprocessed and processed acceleration, velocity, displacement time-series and acceleration response spectra.

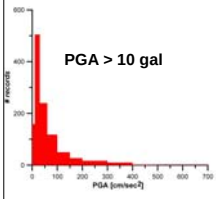


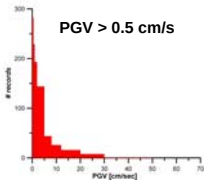
ITACA BETA VERSION

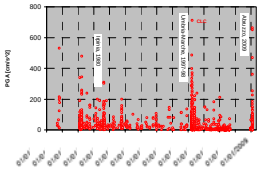
ITACA - Italian strong motion data base
S4 – Project (2007 - 2009)

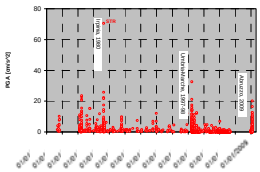


Magnitude-Distance distribution









1002 earthquake from 1972 to 2004.
2 events from the 2008 Parma seismic sequence
13 from the 2009 L'Aquila seismic sequences are present.

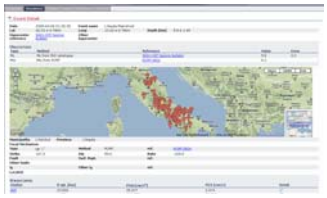
2550 3-component waveforms in the uncorrected version

2401 3-component waveforms in the corrected version together with acceleration velocity and displacement time series and acceleration response spectra at 121 periods up to 4s (5% damping)

Each station is characterized by: name, code, address, coordinates, topographic map location, EC8 classification , type of installation, etc.

About **500** sites are **mapped** on a topographic map or an aerial photograph and/or a geological map.

About **100** sites will be characterized by **geotechnical or geophysical parameters**, such as: stratigraphy logs, NSPT logs, Vs/Vp profiles, dispersion curves, fundamental frequencies, site response functions, etc.



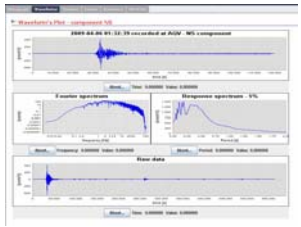
Structure of **Station Table** is modified in order to allow dynamic compilation of station report and include new information about site classification

Structure of the **Waveform Table** is modified in order to include the waveforms distinctive features and information from new processing procedure

Information about stations was revised and/or added

New graphic interface

New version of corrected data

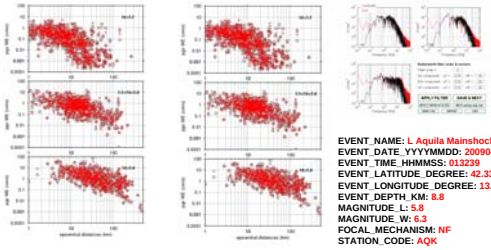


ITACA BETA VERSION

New Features

- **New header of files**, with the explicit specification of the different fields
- **Acceleration response spectra** computed at 121 periods from 0 to 4 s
- **Re-corrected records** according to a uniform procedure aimed at:
  - *checking, and if needed modifying, the band-pass filter frequency range of the previous records;*
  - *both analog and digital records filtered using Butterworth filter*
  - *ensuring the compatibility of corrected accelerograms, so that the no further correction is required to obtain by single and double integration the velocity and displacement traces;*
  - *applying a specific treatment for late-triggered records, typically on the S-phase, to provide meaningful and usable corrected waveforms.*
- **Preliminary site classification** according to Eurocode 8
- **New format** for the station report are going to include in ITACA
- **REXELite**, software for automatic selection of a suite of 7 accelerograms from the ITACA database compatible with a target spectrum.

NEW Processing of ITACA accelerograms



EVENT_NAME: L Aquila Mainshock
EVENT_DATE_YYYYMMDD: 20090406
EVENT_TIME_HHMMSS: 013239
EVENT_LATITUDE_DEGREE: 42.334
EVENT_LONGITUDE_DEGREE: 13.334
EVENT_DEPTH_KM: 8.8
MAGNITUDE_L: 5.8
MAGNITUDE_W: 6.3
FOCAL_MECHANISM: NF
STATION_CODE: AQK
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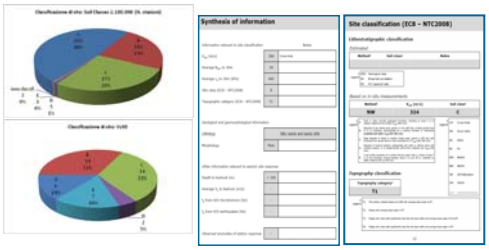
REXELite

Preliminary EC8 site classification of 616 stations



New site parameters