Agreement INGV-DPC 2007-2009

Project S4: ITALIAN STRONG MOTION DATA BASE

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http://esse4.mi.ingv.it

Deliverable # 10

Revised seismic classification of the ITACA stations, according to the EC8 and the Italian norms site classes

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1. Scope and Description of the Deliverable

The activities carried out within Task 2 aim to collect, organize and synthesize geological, geomorphological, geotechnical and geophysical data for the location site of the Accelerometric National Network (RAN) stations in Italy, managed by the Department of Civil Protection, to improve the knowledge about the subsoil (see Delverable D05) and to permit a subsoil and topographic site classification based on EC8 categories.
At the end of the project the subsoil of 695 stations have been classified using an hybrid approch, based on surface geology, spectral classification and Vs profils from different recording tecniques (DH, CH, MASW, ESAC).
These activities have been useful to link the ITACA database with the software REXEL to select natural accelerograms, compatible with Norme Tecniche per le Costruzioni (NTC2008) and EUROCODE 8 (EC8) spectra, which may also reflect characteristics of the source in terms of magnitude and epicentral distance.
For 688 station sites have been provided also a topographic classification using a GIS based semiautomatic method with “by-hand” corrections using topographic maps and/or Google Earth software.
A Microsoft Excel Database which also allows to track all changes that have been made since the beginning of the project related to the site classification has been developed. In particular, the database contains the fields in table 1 and is related to 695 accelerometric stations. For many stations not all fields have been completed, due to a lack of information. The completeness of each database field (number of records compiled and percentage of compiling) is quantified in table 1 and shown in figure 1. For more information about data in each fields, see the Deliverable D5.

Table 1. Number of records compiled for each database field and percentage of compiling.

Field	Number of records	%
Station code	695	100
Latitude (N)	695	100
Longitude (E)	695	100
Station name	695	100
Altitude (m a.s.l.)	593	85
EC8 site classification based on surface geology (vers. 1.1)	614	88
EC8 site classification based on surface geology (vers. 2.0)	686	99
Vs30 (m/s)	107	16
Notes Vs30	107	16
Depth to bedrock (m)	67	9
Vs to bedrock (m/s)	60	8
F0, calc (Hz)	17	2
F0, exp (Hz)	31	4
Spectral classification	209	30
EC8 site classification (vers. 1.1)	615	88
EC8 site classification (vers. 2.0)	616	89
EC8 site classification (vers. 3.0)	695	100
Site morphology	199	29
EC8 topographic classification (vers. 1.0)	688	97
Landslides from IFFI project	199	29
General notes	113	16

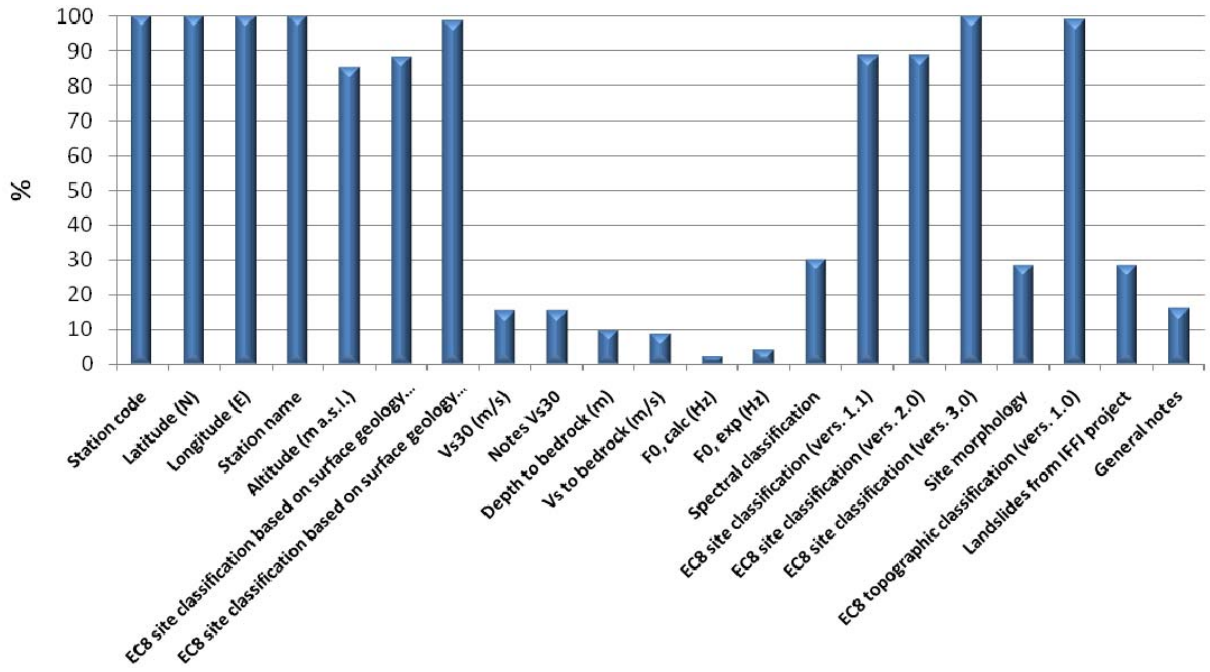

Figure 1. Percentage of compiling for each database field.

Appendix A – EC8 subsoil classification of ITACA stations based on surface geology
(*Di Capua and Peppoloni*)

Since it was necessary to acquire the classification for all ITACA stations, a first classification based on geological data available at a homogeneous level for all the sites was proposed. Using a lithological map at a national scale (1:100,000), by INGV, this goal has been achieved. This map derives from the Geological Map of Italy at 1:100,000 scale, with unification of geological formations in the EC8 subsoil classes, based on lithological and geological age criteria. The resolution of this instrument does not give a detailed result, but it certainly allows a first level of knowledge. During the project has been obtained two version of this site classification: one in the first phase (vers. 1.1) and an upgrade version during the second phase (vers. 2.0).

Appendix B – NTC topographic site classification of ITACA stations
(*Pessina*)

Morphometric analyses of high resolution digital elevation models (DEM), with the support of Geographic Information Systems (GIS), have been implemented to provide a practical tool for the identification of recording stations on topographic sites possibly affected by relevant seismic amplification effects. Analysis havs been applied to 691 recording stations of the RAN (Italian National Accelerometric Network) with the aim to collect information for the ITACA database.

Appendix C – EC8 subsoil classification of ITACA stations based on Vs profiles (Vs30)
(*Lanzo*)

A database was constructed containing the accelerometric stations with shear wave velocity profile. The compiling work has been carried out using the data already available or collected in the previous S6 project (DPC-INGV 2004-2006 agreement) and that obtained in the

framework of the new S4 Project, collected as well as measured front *ad hoc* in situ tests performed by different research units. Overall, 102 monographs with V_S profile were compiled using the new standard format. For each monograph the value of V_{S30} was computed and the corresponding EC8 subsoil classification was assigned.

Appendix D – Spectral classification of ITACA stations
(*Rovelli*)

A site classification scheme has been adopted based on the predominant period of the ITACA station site. The site predominant period is identified from the average horizontal-to-vertical (H/V) spectral ratios of the 5%-damped response spectra of accelerograms of ITACA.

Appendix E – EC8 subsoil and NTC topographic classification of ITACA stations (version 3.0)
(*Di Capua, Lanzo, Peppoloni, Pessina, Rovelli*)

At the end of the second year activity the EC8 site classification, version 3.0, according to the EC8 subsoil classes and NTC topographic categories, has been produced for all ITACA stations. It will be used in the ITACA-REXEL interfacing and in ground motion prediction equation (GMPE) studies.

2. Availability/Restrictions and contact person

All appendices of this Deliverable are available at the project web site: http://esse4.mi.ingv.it.

3. Relevance for DPC and/or for the scientific community

The site classification according to EC8 subsoil and topographic categories represents a fundamental step for studies on new empirical prediction equations of ground motion, and then for seismic hazard studies. Furthermore, it allows ITACA-REXEL interfacing with the selection of natural accelerograms for seismic design and in general permits to have syntetic lithological and morphological information in order to better analyze the seismic response of each ITACA site.

4. Changes with respect to the original plans and reasons for it

No major changes occur in the plans for this Deliverable.