2.3 EUROSEISTEST AND CORSSA EXPERIMENTAL TEST SITES IN GREECE

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ABSTRACT

In the last ten years, two important test sites have been created in Greece devoted to the experimental and theoretical studies on site effects and soil-structure interaction. The sites have been funded by the European Commission-Directorate General for Research and Development under the framework of consecutive research projects. The fundamental aim of the sites is twofold; (a) to perform specific tests and studies in different well defined and state-of-the-art subjects; and (b) to create a rigorous, high-quality database from perfectly known sites from a seismological, geological, geophysical, geotechnical, and topographical point of view, with the aim of providing the European and international scientific community the opportunity to perform joint studies to validate their models and to improve or develop new ones.

The selection of the sites has been made based on multiple criteria: suitable geotechnical, geological and geometrical conditions, good coverage by a permanent seismological network, easy accessibility, close vicinity to important university laboratories (geotechnical, structural, seismological), high seismicity, and good overall knowledge of the seismological background, adequacy with the experimental targets. Both experimental sites were created with the active participation of many European institutes and university laboratories covering all disciplines (including civil and geotechnical engineers, seismologists, geophysicists, geologists all with long and well recognized experience and expertise in different topics). In both sites, and according to their respective goals and particularities, an extensive program of all necessary surveys, *in-situ* and laboratory tests have been made to perfectly constrain the geotechnical and geological conditions, as well as the dynamic soil properties. Strong-motion instrumentation is composed by a network of surface and downhole digital accelerometric stations and a few pore pressure transducers.

EUROSEISTEST

EUROSEISTEST was established in the epicentral area of the Thessaloniki 1978 earthquake (Ms=6.5) R=30 km northeast from Thessaloniki. The region is an active graben with an annual extension rate of few millimeters (http://euroseis.civil.auth.gr). The test site area is covering the whole valley (6 km wide and 10 km long). The south border of the valley is limited by the active seismic fault of the 1978 earthquake. The depth of the valley varies from 200 m (at the eastern part) to 400 m (at the western part). In total, the strong-motion array is composed by 13 surface stations, 8 downhole, and 2 pore pressure transducers. The "reference site" stations are on the bedrock at -50 m at the north edge of the valley and at -200 m at the centre. Seismological stations (one broadband at the site) are covering the area.

Besides the permanent strong-motion network, temporary seismic surveys have been installed at different periods. A large number of instruments (Reftek, Lennartz) have been deployed and set under continuous recording for few months.

A specific feature of EUROSEISTEST research infrastructure are the two R/C model structures built and instrumented at the centre of the valley (at TST). A 5-story R/C building (scale 1:3) with infill masonry walls and a pier bridge with deck (also scale 1:3). Both have surface foundation. Forced vibration tests, short and long distance deep blast tests and pull-out tests are the main experimental excitation sources, while few records of real earthquakes (rather small) are also available. The model structures are specially designed to study foundation-soil-structure interaction (SSI) problems (in the elastic and inelastic range), in real and quite favorable site conditions (soft-loose soils at the surface with Vs<160m/sec).

A short list (keywords) of the possibilities of EUROSEISTEST experimental site is as follows: Soil and site characterization, nonlinear behavior, 1D-2D-3D site effects, basin edge effects, geometric and topographic effects, SSI effects, validation/improvement/development of numerical models and codes, experimental techniques for site effects, and database of well constrained and high-quality data.

CORINTH SOFT SOIL ARRAY (CORSSA)

The Corinth Soft Soil Array (CORSSA)has been established in one of the most seismic areas in Greece, the central western part of the Gulf of Corinth. The most recent severe earthquake occurred in 1995 (Aegion Ms=6.4). It is constructed in the frame of a large multi-task European Union funded project (CORSEIS) coordinated by IPGParis-France. The CORSSA web page is under preparation. Information about the general project may be found in http://www.corinth-rift-lab.org. The CORSSA array, with few other surface stations, is a special array which is operated and maintained by a consortium of three institutes (Aristotle University, Institut des Recherches de Surete Nucleaire (IRSN) – France, and the National Kapodistrian University of Athens).

The downhole vertical array (200-m deep) is located few hundred meters (about 300 m) from the foot of the large Aegion fault with an escarpment of about 50 m. Soft, loose silty clays and silts dominate the surface layers (N-SPT<10, Vs<180m/sec). Currently, the strong-motion array is composed of 4 downhole stations (the deepest at 200 m in conglomerate), 2 pore pressure transducers, one surface station, and one station on the terrace. In the future, more stations will be installed, with access to the recordings of other strong ground motion stations deployed around and in deep boreholes. Nearby, a very deep borehole (1000 m) has been already drilled (<500 m), which crosses the Aegion fault. It will be instrumented in the near future. Many seismological and accelerometric stations are deployed around, covering the whole gulf of Corinth. These arrays do not directly belong to CORSSA, but in the event of an earthquake the results and records are available. In its almost three years of operation, numerous small and moderated intensity earthquakes have already been recorded.

The specific goals of CORSSA array is to create, in a very seismically prone area where numerous moderate and strong earthquakes are expected in the next decade, a good quality strong ground motion array, to study the following topics: soil nonlinear behavior, liquefaction, site effects in the vicinity of major faults and geological discontinuities, topographic effects, wave field near-fault systems and site characterization in complex geological conditions, and validation of numerical and experimental techniques for site effects under complex geometric and geologic conditions.

Numerous publications have been already released from the EUROSEISTEST research groups (see References), while some publications have been also released from the CORSSA experiment (see References). A description of the two experimental test sites with few characteristic results is given in the Power Point Presentation, which can in found in the companion CD-Rom.

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