SECOND EUROPEAN CONFERENCE ON EARTHQUAKE ENGINEERING
AND SEISMOLOGY, ISTANBUL AUG. 25-29, 2014

Turkish Earthquake Foundation - Earthquake Engineering Committee
Prime Ministry, Disaster And Emergency Management Presidency

THE NATIONAL ACCELEROGRAPHIC NETWORK IN GREECE: TOWARDS THE UNIFICATION OF DATA PROCESSING AND DISSEMINATION OF THE STRONG GROUND MOTION INFORMATION

Basil MARGARIS[1], Ioannis KALOGERAS[2], Christos PAPAIOANNOU[3], Alexandros Savvaidis[4] and Nikolaos THEODOULIDIS[5]

The basic aim of strong motion instrumentation program in Greece is to adopt uniform standards for strong motion data acquisition and processing, enriching the Greek accelerogram data bank with reliable data for scientific and engineering studies and further improvement of seismic codes. Gradual installation of the first analog strong motion instruments began in early 70's by the Institute of Geodynamics, National Observatory of Athens (NOA-IG) followed by the Institute of Engineering Seismology and Earthquake Engineering (ITSAK) in the 80's, in the highest seismicity areas of Greece. The development and the spatial distribution of the first strong motion network in Greece was mainly based on Theodulidis et al. (1986) study, in terms of seismotectonic, seismicity and seismic hazard assessments of the region. After almost 30 years and two major upgrading efforts, the 3rd instrumentation project financially supported by Earthquake Planning Protection Organization (EPPO) is in its last phase deploying almost 400 accelerographs throughout Greece working either with trigger level or continuous (Fig. 1).

In this work an analytical description of the present situation is presented concerning the criteria on which the site selection were based for the enrichment of the network, the spatial distribution of the instruments, and the evolution of the different types of data processing techniques applied by the two research centers is given using recordings from both Institutes. The site characterization of the strong motion recording sites and the available information for those stations are presented as well. The work concluded that the establishment of rules and specifications for quick data dissemination to the research and scientific community as well as real time information of governmental authorities is of vital importance towards seismic risk reduction in Greece.

A significant number of strong motion data, has been collected by both Institutes in Greece (EPPO-ITSAK and NOA-IG) (Fig. 2), and it became obvious that the applied processing and correction techniques would be an important step before the final engineering use of those recordings. Although the two Institutes followed their own processing approaches (Margaris, 1986, Kalogeras, 2002), discussions and efforts for a unified processing method were established (Skarlatoudis et al.,

[1] Dr., EPPO-ITSAK, Institute of Engineering Seismology and Earthquake Enginnering, Thessaloniki, margaris@itsak.gr
[2] Dr., Institute of Geodynamics, National Observatory of Athens, Athens, i.kalog@noa.gr
[3] Dr., EPPO-ITSAK, Institute of Engineering Seismology and Earthquake Enginnering, Thessaloniki, chpapai@itsak.gr
[4] Dr., EPPO-ITSAK, Institute of Engineering Seismology and Earthquake Enginnering, Thessaloniki, alexandros@itsak.gr
[5] Dr., EPPO-ITSAK, Institute of Engineering Seismology and Earthquake Enginnering, Thessaloniki, ntheo@itsak.gr

2003, Theodulidis et al., 2004). As the analogue instruments replaced firstly by low resolution digital instruments and the network is enriched by high resolution digital instruments, the processing procedure became faster and more reliable, giving the opportunity not only to calculate the peak values of the ground motion and the response spectra up to a frequency of 25Hz but to examine various parameters as well, like residual displacements, long-period site response and basin waves, as well as long-period trends of displacement response spectra and strains within structures (Boore, 2001).

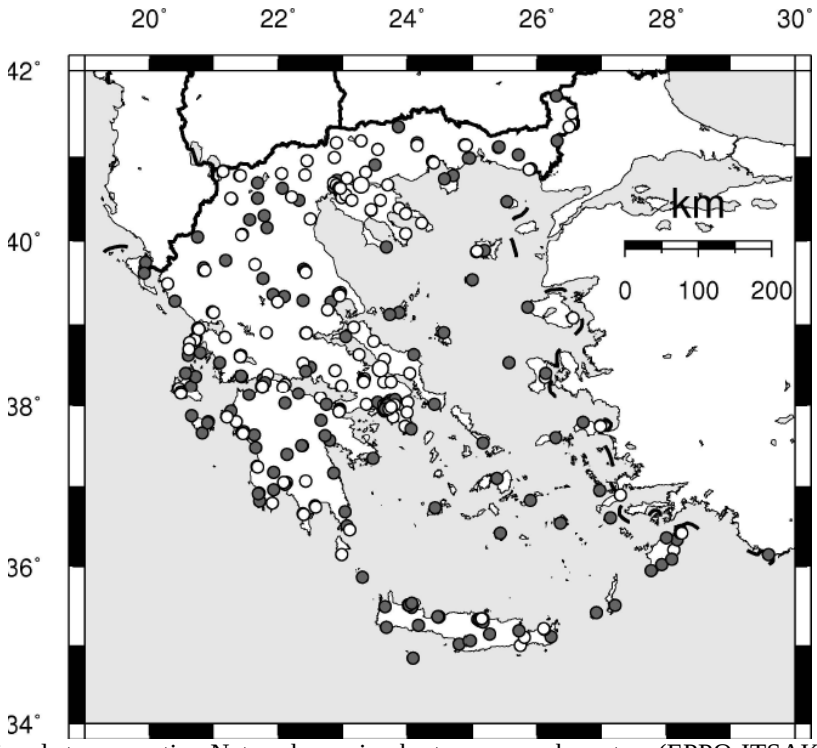

Figure 1. The National strong motion Network running by two research centers (EPPO-ITSAK & NOA-IG: open circles represent the sites equipped with strong motion instruments working on trigger mode while the grey circles depict the accelerographic broadband network working on continuous recording).

Accelerographic stations must be well documented in terms of geology, geomorphology, type of instrument and its housing so that recordings could be exploited to their full potential. Lack of such metadata may lead to restricted or/and misuse of strong motion recordings affecting consequently seismic hazard assessment. Under this point of view, ITSAK started the geotechnical - geophysical documentation of the installation sites and the evaluation of the local site condition effect on the strong ground motion by '90s and through various projects. Methods like the in situ cross-hole and down-hole investigation or the ambient noise array measurements as a non-invasive geophysical method, have been performed at several tens of accelerograph stations in Greece. Similarities and differences as well as advantages or disadvantages of the non-invasive method are discussed based on geology description, topographic and terrain based proxies of V_{S30}, aiming to expand site characterization to all accelerograph stations in Greece. In order to accomplish the on-going site characterization work a database that has been initially developed during the NERIES EC project (www.monographs.itsak.gr) greatly facilitates metadata compilation and organization. This database is continuously fulfilled by new site information regarding accelerographic stations in Greece.

A basic goal of deploying accelerographic stations is to acquire important ground acceleration and building response data from significant earthquakes. The planning and deployment of the accelerographic network in Greece were mainly based on the various advancements, which have been carried out during the last four decades in Greece. A rational Hellenic accelerographic network was deployed in whole territory, with the next target being to install additional stations in order to study near field, site effects and structural dynamic behavior. Processing of acceleration recordings with techniques recently adopted can contribute to a better correction of the collected data and can afford more reliable information for geoscientists and engineers.

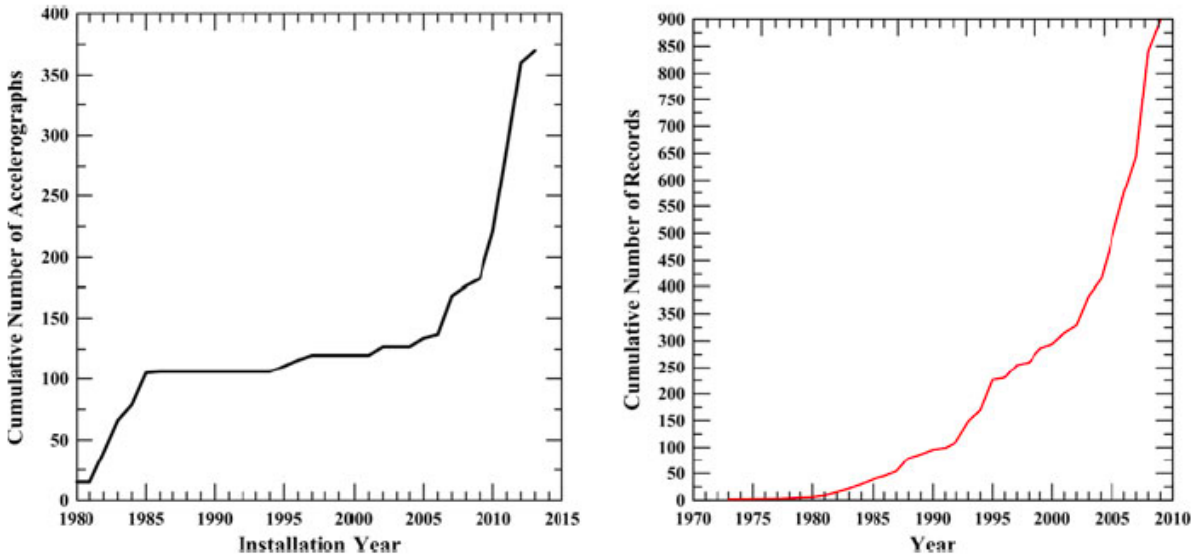

Figure 2. Cumulative number of accelerographs of the national strong motion network in Greece since early‘70s (left); Cumulative number of strong motion recordings during the period 1973–2009 (right).

The new accelerographic network in Greece provides high quality broadband data which will expand the frontiers of research in the field of engineering seismology and earthquake engineering. Given the research interest of both research organizations, EPPO-ITSAK and NOA-IG, it is obvious that data utilization will be at the highest possible degree.

Recent strong earthquakes that occurred in Greece during the last 5 years (like the recent one Mw6.1 at Cephalonia island, western Greece) provided numerous high quality accelerographic records, recorded by the permanent stations as well as temporary ones, gave the opportunity to EPPO-ITSAK & NOA-GI to develop rules and criteria for a quick and reliable well documented data dissemination for scientific and engineering use.

ACKNOWLEDGEMENTS

This research has been co-financed by the European Union (European Social Fund – ESF) and Greek national funds through the Operational Program "Education and Lifelong Learning" of the National Strategic Reference Framework (NSRF) - Research Funding Program: Thales. Investing in knowledge society through the European Social Fund, THALIS –AUTH, 85330, by THALIS-UC 80198 and by the Black Sea project CN18316, MIS-ETC2614.

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