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SOIL-STRUCTURE INTERACTION SCENARIOS IN LEFKAS OLD TOWN (W. GREECE)

Ioannis KASSARAS[1] Christoforos BENETATOS[2] Dimitra KALANTONI[1] George KAVIRIS[1] Katerina MICHALAKI[1] and Konstantinos MAKROPOULOS[1]

Lefkada Island is situated off the west coast of the Greek mainland and belongs to the complex of the Ionian Islands, one of the most seismically prone areas within the SE Mediterranean region, dominated by the right lateral Cephalonia Transform Fault Zone. As it is reported from historical and instrumental catalogues the study area has suffered numerous devastating local earthquakes with M>6.0. The most recent strong earthquake occurred on 14 August 2003, having M=6.2, at a distance of only 10 km from the town of Lefkas where a peak ground acceleration of 0.42g was recorded, being one of the largest observed in Greece during the last decades. Although the earthquake produced limited damage to the building stock, it likely induced damages of geotechnical character, associated with extensive liquefaction mainly in the waterfront of the town. Coseismic failure observations provided an expansive database which tempted us and triggered a multitasking project toward loss assessment in the Lefkada Old Town (LOT), comprising traditional construction practices of architectural significance and high seismic behaviour as a rule.

The project employs several modules which were performed successively during the last years: (A) Macroscopic analysis of the buildings stock in LOT by conducting a comprehensive in-situ inventory of the buildings; (B) Vulnerability classification of the building stock using EMS98; (C) Ground Motion Parameters (GMP) determination for regional hazard assessment; (D) Site effects resulting from a detailed ambient noise study conducted in LOT; (E) Analysis of available geotechnical information and in-situ measurements of the local soil properties; (F) Employment of damage distributions during the recent 2003 earthquake; (G) Development of an ARC-GIS platform to include and allow the process of the massive data collected.

In this paper we present a first attempt to synthesize the above modules in order to investigate soil-structure interactions in LOT, assuming a linear response for both. By using various seismic sources whose characteristics are inferred by the active tectonics and the probabilistic hazard assessment of the study area, strong ground motion has been simulated both stochastically and deterministically for hard bedrock conditions. GMPs were constrained beneath the foundations of the buildings by convolving the simulated ground motion with the soil transfer functions deduced from microtremors. According to this, for each scenario a damage potential has been assigned at each building. The obtained patterns were proven to be fairly comparable with the damage distribution due to the 2003 event, hence constituting a provocative motivation for further investigation and other applications.

[1] Laboratory of Seismology, National & Kapodistrian University of Athens, Greece, Kassaras@geol.uoa.gr
[2] Politecnico di Torino, Petroleum Engineering Group, Torino, christoforos.benetatos@polito.it