

The November 2015 Mw=6.4 earthquake of Lefkada, Ionian Sea: Strong ground motion and its impact on the environment and the structures

Ioannis Kassaras (1), Athanassios Ganas (2), Danai Kazantzidou-Firtinidou (1), Jerome Maxant (3), Herve Yesou (3), Jianghui Geng (4), Dimitrios Psarris (1), and Efthimios Lekkas (1)

(1) National and Kapodistrian University of Athens, School of Science, Geology and Geoenvironment, Athens, Greece (kassaras@geol.uoa.gr), (2) National Observatory of Athens, Institute of Geodynamics, 11810 Athens, Greece, (3) ICube SERTIT, Université de Strasbourg, France, (4) GNSS Research Center, Wuhan University, 129 Luoyu Road, Wuhan, Hubei, China

This work deals with the effects of the 17.11.2015 earthquake with Mw6.4 occurred onshore at the SW part of Lefkada Island. The earthquake produced a large co-seismic horizontal displacement $u=40$ cm towards a SSW direction ($N210^\circ$), recorded at a near-field, permanent GPS station of NOA (PONT). Extensive geo-environmental and limited structural impacts were caused. Seismic effects have been extensively investigated during several in-situ surveys conducted by our research group and a thorough damage databank was constructed. Comparison with damage due to the previous strong event with Mw=6.2 occurred on 14.8.2003, showed that the effects of the current quake were significantly lower.

Geo-environmental effects were observed throughout the western flanks of the mountain massif of the mainland, related with slope failures, rock falls, rock mass slides, leading thus to significant damage of several vital infrastructures. The building stock of the island comprising both modern and traditional buildings exhibited notable seismic performance during this earthquake. Structural damage was concentrated in the epicentral area where macroseismic intensity was assessed VIII, based on registered damage and vulnerability.

The analysis of 3D strong ground motion recordings at two permanent accelerometric stations on the island and of the GNSS 1 Hz three-component data at PONT indicate directional dynamic effects, parallel with the T- principal axis of the event's stress field and the regional slope dip that may likely have triggered extensive landslides. Moreover, the ground motion pattern indicates a rupture complexity involving two discrete sources. Besides the exceptional behavior of the buildings across the island, the spectral content of the strong ground motion has been found to be discrete from the elastic response of the low-rise traditional constructions, thus favoring amenable structural damage distribution.

The damage databank compiled in this work has been employed into a holistic building-by-building GIS scheme applying a vector base-map of the buildings footprints in the epicentral area available by the analysis of optical satellite imagery, undertaken within the framework of the RASOR project (<http://www.rasor-project.eu>). Thereafter, the poly-thematic outcome of the present study may be considered a valuable tool for the scientific community toward studying the seismic risk of Lefkada.