

The Lefkada 2015 earthquake (Mw 6.4) rupture process as seen by regional and local seismic data

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On November 17th, 2015, a strong earthquake (Mw 6.4) occurred on Lefkada island, western Greece. It caused structural damage and triggered earthquake effects, i.e. landslides, rock falls, liquefaction etc., mainly at the southern part of the island. Two people died and four were injured. The dextral Cephalonia Transform Fault (CTF) that runs along the western coast of Lefkada was immediately identified as the causative fault. We studied the rupture properties of the earthquake using broad band and strong motion data at regional and local distances, using full waveform inversion methods. After extensive spatial grid search the centroid position was found at the depth of 5 km, shifted with respect to epicenter by 10 km southward and 5 km westward. The focal mechanism solution indicated a strike slip fault (strike/dip/rake, $24^\circ/80^\circ/-149^\circ$) compatible with CTF. Source complexity was investigated using iterative deconvolution at frequencies 0.03-0.08 Hz. Results indicated two main subevents: the first, smaller one and close to hypocenter ($M_0=0.17e19$ Nm) and the second, major one ($M_0=0.28e19$ Nm) that occurred \sim 3-4 seconds later, as far as 15 km from epicenter in the SSW direction. Focal mechanisms of the two subevents ($s/d/r = 189^\circ/77^\circ/146^\circ$ and $27^\circ/79^\circ/-150^\circ$ for the first and second, respectively) were basically right-lateral strike slips with a small thrust component, similar to the centroid solution. Slip inversion was calculated using the non-linear slip-patch and the linear slip inversion method. Both of them provided similar results, with maximum slip of about 1.5 m and a SSW directivity. Results of our analysis indicate that this earthquake ruptured a part of the Cephalonia-Lefkada strike-slip fault that didn't rupture during the last strong events in the area, i.e. the Lefkada 2003 (Mw 6.2) and Cephalonia 2014 (Mw 6). This recent finding and the well-analyzed Cephalonia earthquake sequence of 2014 provide strong evidence of segmentation of the major dextral Cephalonia-Lefkada Transform Fault (CTF), with obvious implications for the seismic hazard in the area.