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The 16 April 2015 Mw 6.0 off-shore eastern Crete earthquake and its aftershock sequence: implications for local/regional seismotectonics

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We examine the 16 April 2015 Mw 6.0 off-shore eastern Crete earthquake and its aftershock sequence in southern Aegean Sea. Centroid moment tensors for 45 earthquakes with moment magnitudes (Mw) between 3.3 and 6.0 are determined by applying a waveform inversion method. The mainshock is shallow focus thrust event with a strike-slip component at a depth of 30 km. The seismic moment (Mo) of the mainshock is estimated as 1.33×1018 Nm and rupture duration of the mainshock is 3.5 s. The focal mechanisms of aftershocks are mainly thrust faulting with a strike-slip component. The geometry of the moment tensors (Mw$\geq$3.3) reveals a thrust faulting regime with NE-SW trending direction of T-axis in the entire activated region. According to high-resolution hypocenter relocation of the eastern Crete earthquake sequence, one main cluster consisting of 352 events is revealed. The aftershock activity in the observation period between 5 January 2015 and 7 July 2015 extends from N to S direction. Seismic cross-sections indicate that a complex pattern of the hypocenter distribution with the activation of three segments. The subduction interface is clearly revealed with high-resolution hypocenter relocation and moment tensor solution. The best constrained focal depths indicate that the aftershock sequence is mainly confined in the upper crust (depth < 40 km) and are ranging from about 4.5 - 39 km depth. A stress tensor inversion of focal mechanism data is performed to obtain a more precise picture of the off-shore eastern Crete stress field. The stress tensor inversion results indicate a predominant thrust stress regime with a NW-SE oriented maximum horizontal compressive stress (SH). According to variance of the stress tensor inversion, to first order, the Crete region is characterized by a homogeneous interplate stress field. We also investigate the Coulomb stress change associated with the mainshock to evaluate any significant enhancement of stresses along Crete and surrounding regions. Positive lobes with stress more than 3 bars are obtained for the mainshock, indicating that these values are large enough to increase the Coulomb stress failure towards NE-SW and NW-SE directions, respectively.