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An analysis of the Kephalonia/Lefkada seismic sequences of 2014/2015

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The Kephalonia Transform Zone (KTZ) is a seismically active dextral transform fault decoupling the extensional deformed area of the Ionian Abyssal Plain and the compressional deformed area of the Mediterranean Ridge. In January and February 2014 a seismic sequence on the KTZ culminated in the Mw = 6.09 event of Jan. 26, the Mw = 6.14 event of Feb. 3. The Mw=6.4 of November 17, 2015 took place on the Lefkada segment of the KTZ. The estimated epicenters lie within a few kilometers from each other, on the western side of Kephalonia Island, at a hypocentral depth $\leq$ 10 km. The measured coseismic displacements of the National Observatory of Athens GNSS stations fit the expected surface dislocation which can be predicted for an elastic half-space using the measured fault-plane solutions as input. The steady state strain rate estimated from the mean velocities of permanent GNSS stations in East Italy and West Greece is 225 $\pm$ 20 nstrain/year across the KTZ. Based on the regional statistical seismicity we investigate the energetic balance between stress accumulated as a consequence of the continuous dextral shear deformation, and the average stress released by shallow seismicity. We show that the estimated a and b parameters of the local Gutenberg-Richter relation and the geodetically determined shear-strain rate set an upper limit to the regional stress drop $\leq$ 0.4 MPa, if the maximum expected magnitude is Mw = 7.4. If the hypocenters of the aftershocks are taken as an indicator of optimal dextral shear-stress orientation, then a low regional deviatoric stress of 0.4 MPa, that is comparable with the maximum regional stress drop estimated above, is required for the Coulomb stress to match the pattern of the aftershocks of the 2014 sequence. As a consequence, the regional deviatoric stress and the seismically released shear stress are in close balance in the KTZ seismic province.