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The 2016 seismic series in the south Alboran Sea: Seismotectonics, Coulomb Failure Stress changes and implications for the active tectonics in the area.

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The Southern Alboran Sea, particularly the area offshore Al Hoceima Bay, presents moderate but continuous seismic activity since the Mw 6.0 1994 Al Hoceima earthquake. The maximum magnitude occurred in the area was a Mw 6.3 earthquake in the 2004 Al Hoceima – Tamasint seismic series. Since then, the seismicity in the Al Hoceima area has been usual, with maximum seismic magnitudes around 4. An increase in the seismic rate was registered during 2015, especially from May, culminating in the seismic series in January 2016. The mainshock occurred on January 25th 2016 with a magnitude Mw 6.3 and it was preceded by a Mw 5.1 foreshock on January 21st. The seismic series took place at the western end of the Alboran Ridge. Towards the northeast the Alboran Ridge bends, and seems to be connected with the NW-SE right-lateral transtensional Yusuf Fault. The recorded seismicity is mainly located in the Alboran Ridge area and along the N-S Al-Idrisi Fault that seems to continue southwards, towards the Al Hoceima Bay. The focal mechanisms calculated previously in the area showed a left-lateral strike-slip faulting with some normal component in the Alboran Ridge; but always within a complex system of diffuse deformation and high rupture type variability. We have used 41 computed focal mechanisms of this seismic series to analyze its seismotectonics and structural characteristics. To group the focal mechanisms we used a clustering algorithm using the spatial distribution of the events and also the type of rupture mechanism. For each cluster we have obtained the composed focal mechanism, associating it to a particular fault or family of structures. We have tested the mechanical compatibility of these structures by Coulomb Failure Stress transfer modeling. The mainshock of the series occurred in the Al Idrisi Fault intersecting the western Alboran Ridge. This event triggered aftershocks and independent series in left-lateral strike-slip faults associated with the Al Idrisi Fault System towards the south, but also in near pure reverse faults in the fault zone bounding the the Alboran Ridge. Both types of faults and rupture-mechanisms coexist, linked mechanically by stress transfer, being coeval the uplift of the Alboran Ridge and its northwestward displacement due to the left-lateral motion of the Al-Idrisi Fault. It is also discussed how the contrasting faulting processes and seismic ruptures are developed in two differentially oriented fault zones in the context the current NW-SE plate convergence between the African and Eurasian plates in the Westernmost Mediterranean.