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The Stress Triggering Role of the 1923 Kanto Earthquake, Japan

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This study revisits the mechanism of the 1923 M_s=7.9 Kanto earthquake in Japan and uses it to compute its influence on the static stress field in the region. The focal mechanism is computed from a geodetic data set that consists of vertical displacements from leveling and angle changes from 1^{st} and 2^{nd} order triangulation measurements obtained in surveys between 1883 and 1927. We apply a correction to remove interseismic deformation. We use the low-angle fault plane, recently observed in a seismic reflection study [Sato et al., Science, 2005] as a priori information in our modeling. Our final uniform-slip elastic dislocation model consists of two adjacent low-angle planes accommodating reverse dextral slip of about 7 m with azimuths of $145°$. Coseismic stress changes calculated under Coulomb failure assumptions show a general spatial consistency with the regional seismicity rate changes associated with the 1923 earthquake [Hamada et al., Zisin, 2001]. Positive changes in Coulomb failure stress in Odawara and central Boso coincide with clusters of aftershocks and a drop in Coulomb failure stress around Tokyo agrees with the still ongoing seismic quiescence. We also compute the coseismic Coulomb stress change on different sources of seismic hazard in the Kanto region and find that active faults in the Tokyo Bay area were affected by the 1923 earthquake. The Coulomb stress level increased on Izu Peninsula, which may have triggered the 1930 $M_s = 7.3$ Kita-Izu earthquake. Furthermore, Coulomb stress increase on the Western Sagami Bay fracture is inconsistent with this structure's presumed delayed rupture. Finally, Coulomb stresses were also raised on the down-dip extension of the 1923 rupture plane, and on the 1703 earthquake fault plane southeast of Boso Peninsula, bringing these structures closer to failure.