Title:	Structural Controls Over the 2019 Ridgecrest Earthquake Sequence Investigated by High-Fidelity Elastic Models of 3D Velocity Structures
Authors:	Ojha, Chandrakanta (/jspui/browse?type=author&value=Ojha%2C+Chandrakanta)
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Abstract:	We develop finite element models of the coseismic displacement field accounting for the 3D elastic structures surrounding the epicentral area of the 2019 Ridgecrest earthquake sequence containing two major events of Mw7.1 and Mw6.4. The coseismic slip distribution is inferred from the surface displacement field recorded by interferometric synthetic aperture radar. The rupture dip geometry is further optimized using a novel nonlinear-crossover-linear inversion approach. It is found that accounting for elastic heterogeneity and fault along-strike curvilinearity improves the fit to the observed displacement field and yields a more accurate estimate of geodetic moment and Coulomb stress changes. We observe spatial correlations among the locations of aftershocks and patches of high slip, and rock anomalous elastic properties, suggesting that the shallow crust's elastic structures possibly controlled the Ridgecrest earthquake sequence. Most of the coseismic slip with a peak slip of 7.4 m at 3.6 km depth occurred above a zone of reduced S-wave velocity and significant post-Mw7.1 afterslip. This implies that viscous materials or fluid presence might have contributed to the low rupture velocity of the mainshock. Moreover, the zone of high slip on the northwest-trending fault segment is laterally bounded by two aftershock clusters, whose location is characterized by intermediate rock rigidity. Notably, some minor orthogonal faults consistently end above a subsurface rigid body. Overall, these observations of structural controls improve our understandings of the seismogenesis within incipient fault systems.
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