On Improving Seismic Risk Assessment for a Large Magnitude Rupture on the San Andreas Fault in the Northern Salton Trough, Southern California

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The Coachella Valley in the northern Salton Trough contains the southernmost portion of the San Andreas Fault that is long overdue for a large earthquake (M≥7) rupture. Accurate knowledge of sedimentary basin shape and thickness, and fault geometry is required to improve the accuracy of seismic hazard and risk studies in the region. First P-wave arrival times of abundant seismicity (39,998 local earthquakes) recorded by the Southern California Seismic Network and explosion data (251 land/sea shots) from the 2011 Salton Seismic Imaging Project were inverted to produce a 3-D velocity model of the Coachella Valley. Various inversion schemes and resolution tests were performed to generate a robust velocity model that represents a smooth version of the actual earth structure in the region. Velocity variations are largest in the top ~ 3 km of the model and conform well with the surface geology. Sedimentary basin depth in the Coachella Valley basin ranges from ~4-5 km at the southern end of the valley and decreases to less than 2 km at the northern end. The basin shape is asymmetric with more sedimentary fill along the eastern side close to the San Andreas Fault. Strong lateral velocity contrasts across structural features interpreted in the model provide evidence for a northeast-dipping San Andreas Fault, which also coincide with the boundary between the Peninsular Ranges and Transverse Ranges blocks.