3D NUMERICAL INVESTIGATIONS INTO THE EVOLUTION OF THE SOUTHERN BEND BEND OF THE SAN ANDREAS FAULT

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During the last 1Ma the southern San Andreas fault within the San Gorgonio Pass region has been interpreted to have successively abandoned two strands before taking up activity along its present-day configuration. This evolution is simulated within three-dimensional models to test the hypothesis that fault systems evolve to increase mechanical efficiency. The three-dimensional Boundary Element Method models are validated by comparison of modeled fault slip rates and uplift rates with geologic data. The partitioning of slip among active faults changes between the three phases of southern San Andreas fault evolution and reveals both a trade-off in strike-slip rates between the San Jacinto and San Andreas faults as well as a trade-off between strike slip on the San Andreas and reverse slip along faults associated with uplifting the San Bernardino Mountains. Mechanical efficiency of the entire model increases from the Mission Creek to Mill Creek fault configuration and decreases from the Mill Creek configuration to the present day configuration strain energy density patterns highlight regions of fault growth over the past 1 Ma and may be used to predict future fault configuration. The decrease in mechanical efficiency with the transition to the present-day fault geometry may reflect inaccuracies in the models. For example downwelling of the mantle beneath the San Bernardino Mountains may foster the activity of otherwise inefficient thrust faults. Alternatively, the present-day geometry may be a short-lived transition phase to a more efficient geometry.