QuakeSim Earthquake Modeling, Forecasting, and Data Access Tools

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QuakeSim is being developed to study, model, and forecast earthquakes from a system perspective. The computational infrastructure that integrates data sources and modeling tools creates an ACES Community Forecasting Environment that can be extended beyond the current focus of California. QuakeSim takes into account entire earthquake cycle of strain accumulation and release and on simulating the multi-scale nature of earthquake processes through the integration of multiple data types and models. Key data sources are spaceborne observations from navigation and radar satellites, earthquake locations, and paleoseismic fault data. The QuakeTables federated multimedia database contains spaceborne interferograms for the California region as well as UAVSAR interferograms. The first UAVSAR interferogram of an earthquake occurred in Southern California at the northern extent of the April 4, 2010 El Mayor-Cucapah earthquake and resides in the QuakeTables database. QuakeSim tools have also been used to invert the interferogram for fault slip. Examination of results from RDAHMM, RIPI, Virtual California, and inversions of GPS data suggests an active shear zone that extends from the Big Bend of the San Andreas fault southward, through the San Fernando Valley. The zone steps eastward near downtown Los Angeles and continues southward along the Elsinore and San Jacinto fault zones. Continued modeling will illuminate any relationships between the shear zones and the Landers and El Mayor-Cucapah earthquakes. The zone of shear correlates with hot spots identified through RIPI from seismicity data, and a line of anomalous GPS stations as identified through RDHAMM. GPS velocity vectors also show a velocity gradient of 5-15 mm/yr along this shear zone. The fusion of these multiple data types and methodologies resulted in the identification of the proposed zone of shear. Models are being developed using Virtual California to simulate fault interactions, and Simplex to invert the velocity field data to identify the geometry and rates along the shear zone.