Transient Strain Accumulation in the East California Shear Zone Observed With InSAR

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Using 8 years of ERS radar interferometry data of Southern California, we mapped surface velocities associated with elastic strain accumulation near active faults within the East California Shear Zone. For each individual radar image pair, a precise estimate of the interferometric baseline was obtained by non-linear least-square adjustment of the observed phase to a simulated phase including both the topographic component, based on the USGS digital elevation map, and surface displacement components based on best existing models. The plate motion component was derived from the long-term SCEC velocity solution and the surface displacement component produced by large earthquakes was computed from published fault solutions. The error related to the phase propagation delay through the troposphere was reduced to better than 1 mm/yr in line of sight change rate by averaging 25 interferometric maps. The resulting, averaged line of sight velocity field reveals transient strain accumulation along the Blackwater-Little Lake fault system within the Eastern California Shear Zone. The 120 km-long, 20 km-wide shear zone trends NNW between the southern end of the 1872 Owens Valley earthquake surface break and the northern end of the 1992 Landers earthquake surface break. Dislocation model of the observed shear indicates right-lateral slip at ~ 7 mm/yr on a vertical fault below the depth of ~5 km, a rate that is 2 to 3 times greater than the geologic rate estimated on north-west trending faults in the eastern Mojave. The observed shear zone is continuous through the Garlock fault, which does not show any evidence of left-lateral slip during the same time period.