

Southern Coyote Creek Fault to Superstition Hills Fault: New Insight to the San Jacinto Fault System

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Abstract

The Superstition Hills fault (SHF) is an active fault in the San Jacinto fault zone that also creeps aseismically. 58 interferograms from ERS-1 and ERS-2 satellite data (descending, track 356, frame 2943) spanning a time period from 1992 to 2000 were analyzed to measure surface deformation along and near the fault. Interferograms were analyzed separately and as a stacked image. Clear signals due to both groundwater extraction and tectonic movement were observed. Fault creep is observed along the Superstition Hills and Elmore Ranch faults. A broad zone of line-of-sight deformation extends from the north end of the Superstition Hills fault to the southernmost Coyote Creek fault.

Phase gradient images were useful in identifying faults, and revealed a previously unknown extension of the Coyote Creek fault. The existence of the fault was confirmed by field measurements, which included both surface mapping and a trench across the fault. The fault exhibited indications of recent motion including both vertical and strike-slip components.

The InSAR data is modeled using a series of finite faults in an elastic half-space. The observed deformation along the Superstition Hills fault and Elmore Ranch fault can be modeled assuming shallow (< 5 km) creep. Various models were tested to explain the pattern of surface deformation between the Superstition Hills and Coyote Creek fault. The preferred model included a northwest trending vertical right-lateral strike-slip fault north of the Elmore Ranch fault.