Towards Detailed Characterization of Spatio-temporal Variations in Stress Parameters along the San Jacinto Fault Zone

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Accurate determination of stress parameters (orientation of principal stress axes and stress ratio) operating on fault zones provides refined knowledge on source physics and deformation processes.

In this study we apply refined stress inversion methodology on San Jacinto Fault Zone in order to analyze the following:

- Obtain a reliable high resolution information of stress parameters throughout the San Jacinto fault zone (SJFZ) in Southern California.
- Spatial distribution of stress: Potential stress changes along and across the fault and also through the seismogenic depth.
- Temporal changes of stress field, specifically before and after large events (e.g. the 2010 M\(_{w}\) 7.2 El Mayor-Cucapah earthquake).

DATA AND METHODOLOGY

In this work we aim to do a 2D inversion on data from San Jacinto Fault Zone. The earthquake focal mechanisms are obtained from the catalogue by Yang et al., (2012). The earthquake catalogue is firstly declustered following Zaliapin and Ben-Zion, (2013). We utilize focal mechanisms recorded between 1981 to 2014.

OBJECTIVES

- Spatial: The initial results are in agreement with the expected stress type due to the tectonic setting and the geology of the region. Results are generally consistent along the fault, showing transtensional stress regime in the northwestern section of SJFZ and more complex oblique faulting within the main fault traces in the middle and southeastern sections.
- Temporal: Hot Spring region shows more heterogeneity in stress ratio than in the Trifurcation area. After 2010 stress ratio varies significantly more to a 4.9 Mw June 2010 event. Inside the traces shows more complex stress ratios.

The continuing work focuses on potential spatial changes in the stress field related to damage zones and depth, and variable temporal changes of stress parameters including analyzing seasonal changes of stress distribution in the areas with higher seismicity.

REFERENCES:


