PFDHA using Geodetic Data

Can we use measurements of distributed surface displacement from geodetic image data for PFDHA?

Image correlation:

- Correlation of optical images tracks shifts in surface features
Measure:

1. How is total or cumulative displacement distributed across fault-zone?
2. Attenuation of shear strain
   - Geodetic data for ~9 earthquakes.
   - Challenges:
     - Strain is scale dependent requires data to be resolved to same scale.
     - Can’t resolve each fracture
Probabilistic method

PFDHA distributed ‘knife-edge’ displacement using field data

\[
\lambda(d \geq d_0)_{xyz} = \alpha P[ sr \neq 0 | m] \int_{r} P[d \neq 0| r, z] P[d \geq d_0| r, m, d \neq 0] f_R(r) dr
\]

This study

PFDHA - strain using geodetic data

\[
\lambda(\epsilon \geq \epsilon_o) = \alpha \cdot P[ sr \neq 0 | m] \cdot P(\epsilon > \epsilon_{inelastic} | r, z) \cdot P(\epsilon \geq \epsilon_o | r, \epsilon_{inelastic}, m)
\]

This study

PFDHA – total displacement using geodetic data

\[
\lambda(Dd \geq Dd_o) = \alpha \cdot P( sr \neq 0) \cdot P(\epsilon > \epsilon_{inelastic} | z, m) \cdot P(Dd \geq Dd_o | Tr, z, \frac{l}{L}, m)
\]
**Scenario**: Building has footprint of 30 m, located at 164 (scenario A), and 264 m (scenario B)

**Event**: $M_w$ 7.3, slip rate = 1 mm/yr

**Product**

**Strain profiles**

- Landers rupture
- $n = 81$

**Geodetic-based scaling laws**

- Hazard curve for distributed strain