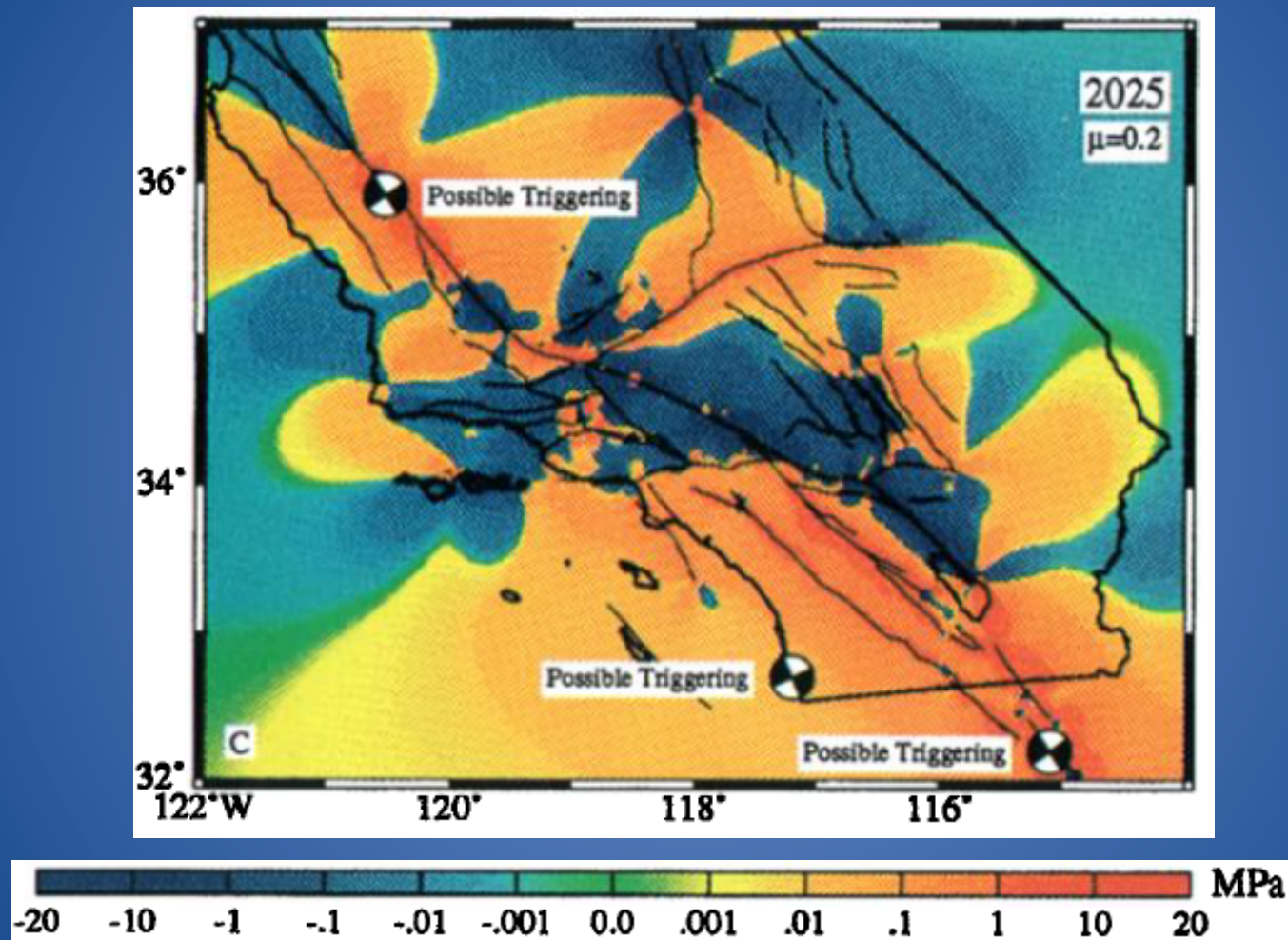


Southern California Static Stress Evolution since 1812



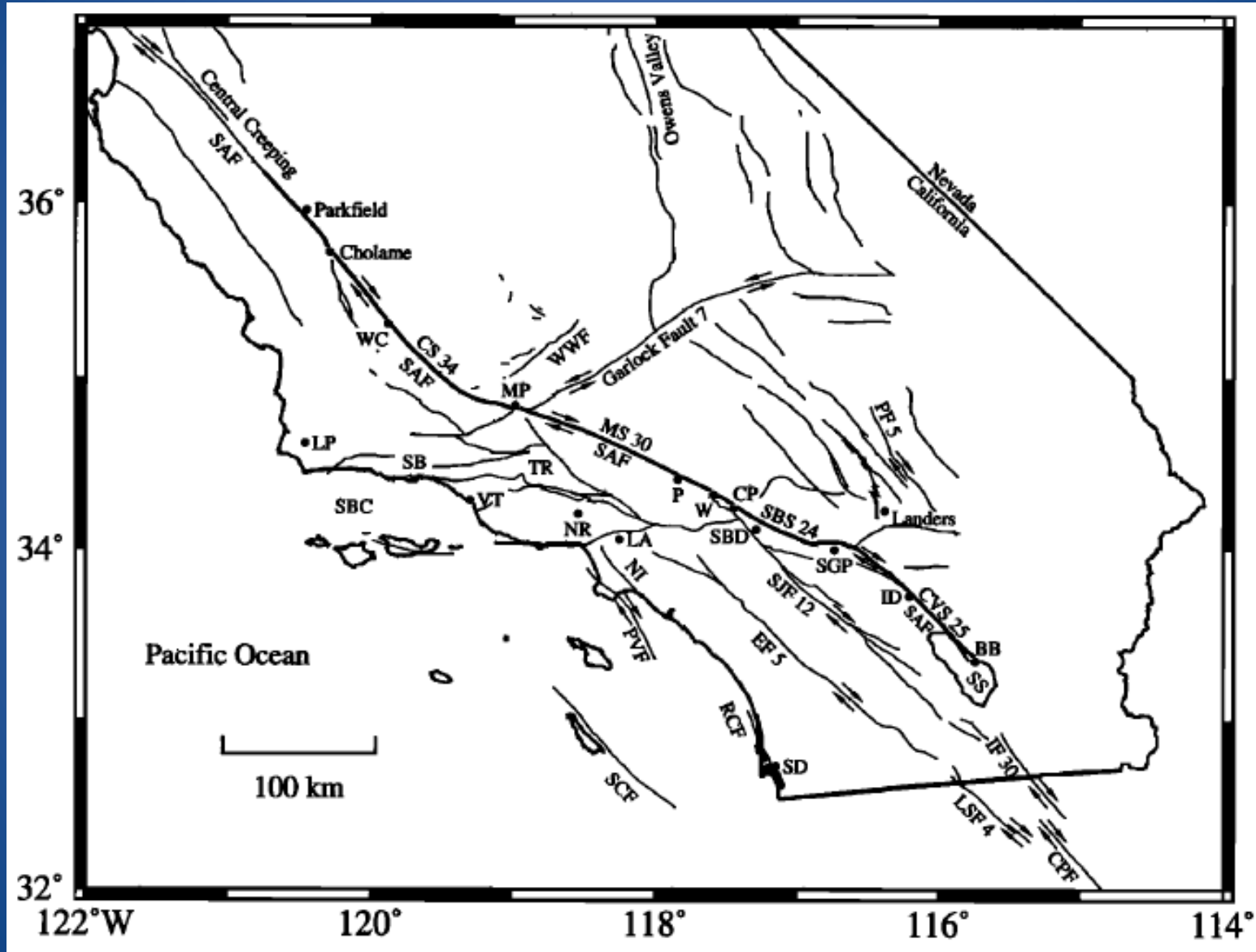
SCEC Community Stress Model Workshop, 8/15-8/16

By Anne Strader, Prof. David Jackson

Fault Displacement Sources

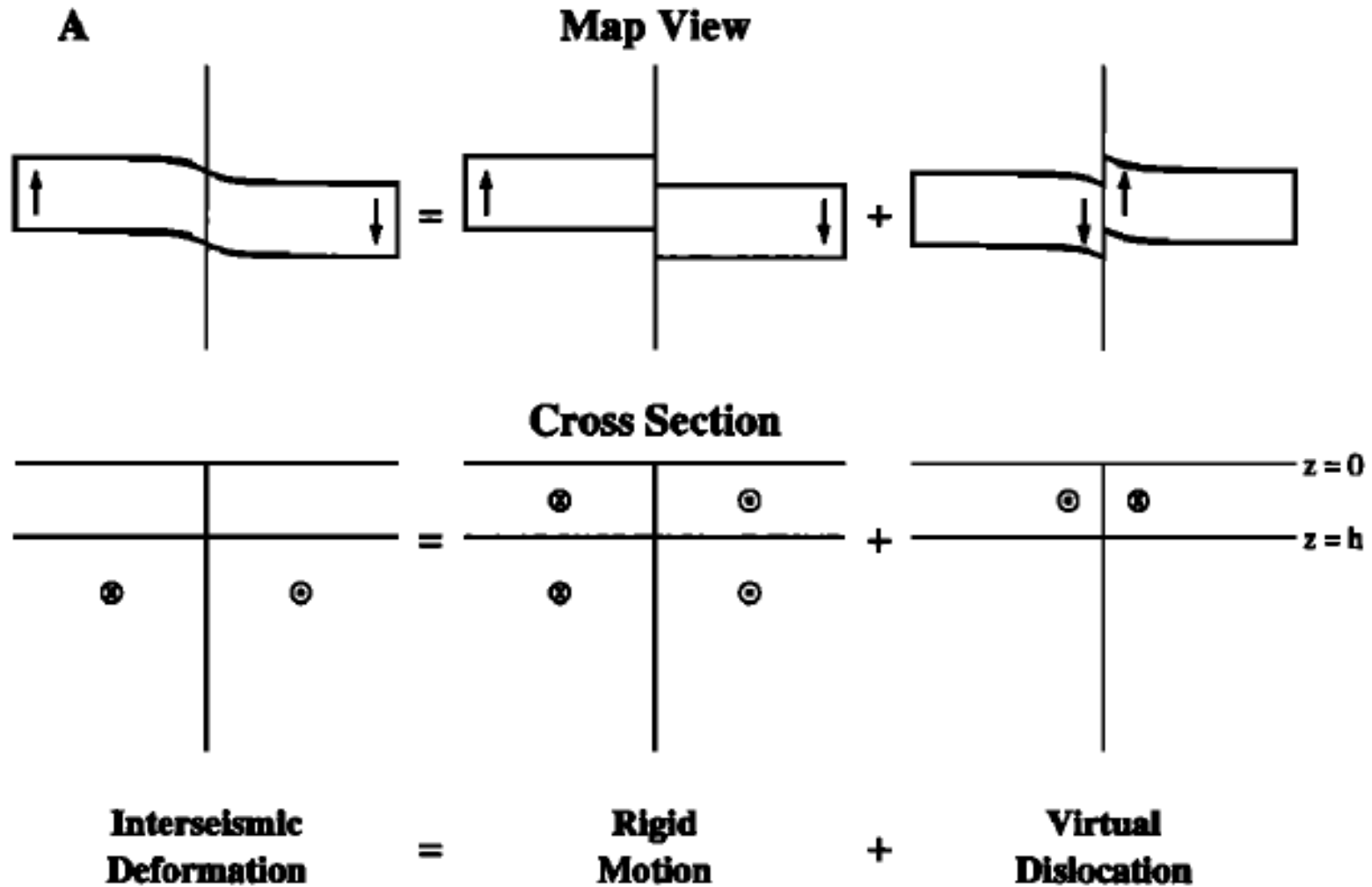
- 98 aseismic fault segments (Deng & Sykes, 1997)
 - Velocity fields calculated from elastic half-space model with similar results to geodetic data
 - Fault segments locked at the surface, with a virtual dislocation introduced to promote right-lateral fault rupturing
- 38 source earthquake rupture segments
 - 36 $M \geq 5$ events from 1812 Wrightwood earthquake to 1995 China Lake-Ridgecrest earthquakes (Deng & Sykes, 1997)
 - 1999 Hector Mine earthquake (Ji et al, 2000)
 - 2010 El Mayor Cucapah earthquake (Wei et al, 2011)

Aseismic Slip Sources



(Deng & Sykes, 1997)

Aseismic Fault Segment Dislocation

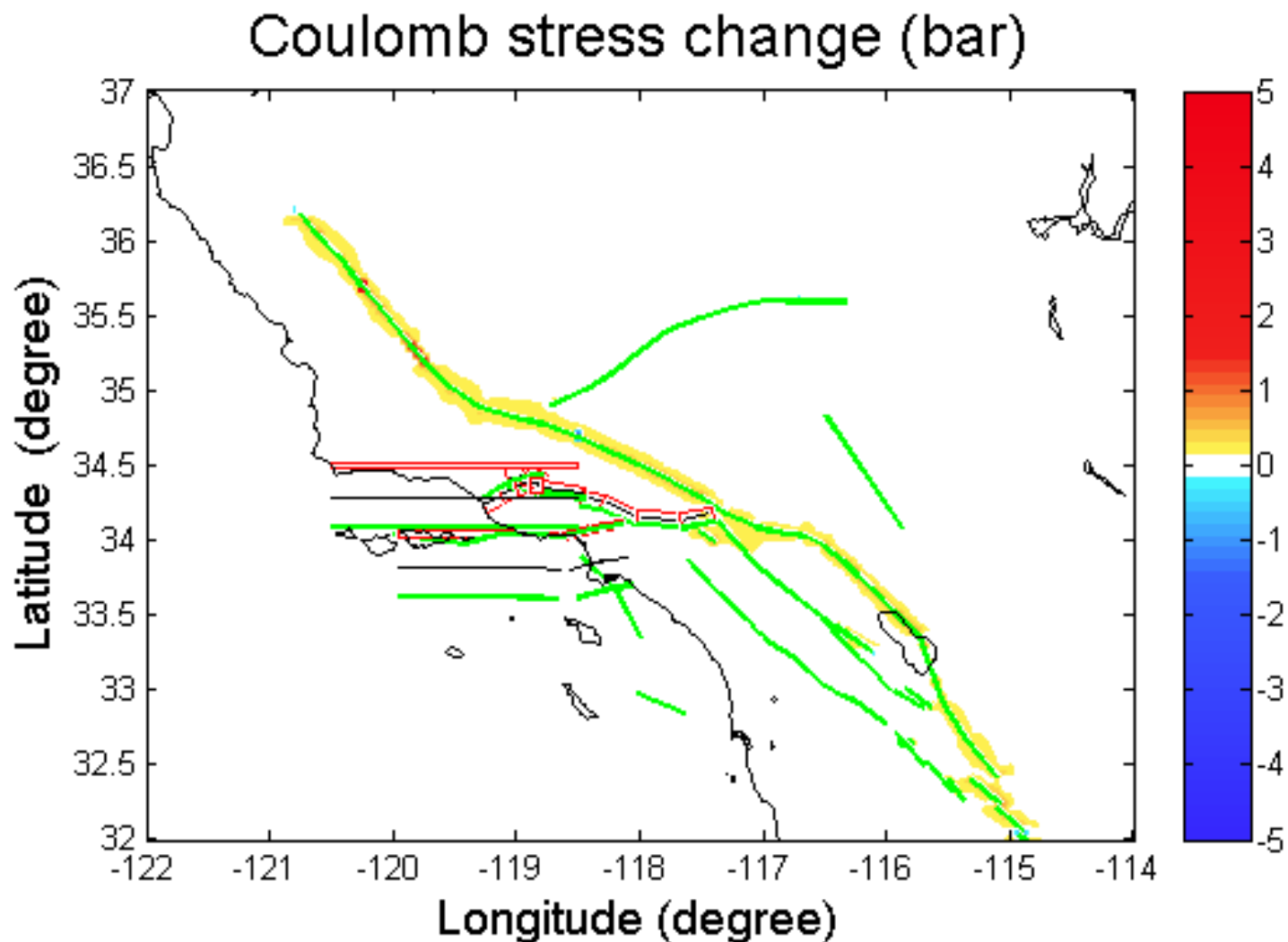


(Deng & Sykes, 1997)

Static Stress Model Assumptions

- Input parameters
 - Poisson's ratio = 0.25
 - Young's Modulus = 825000 bars
- Homogeneous, isotropic half-space
- Small magnitude earthquakes ($M < 5$) do not significantly contribute to the static stress field
- No stress relaxation after slip events (as would be expected from rate-and-state friction)
- Uniform slip on fault segments
- Static stress sources outside the southern California study area ($32\text{-}37^\circ$ latitude, -122 to -114° longitude) do not significantly impact the stress field

Aseismic Stress Rate/Year

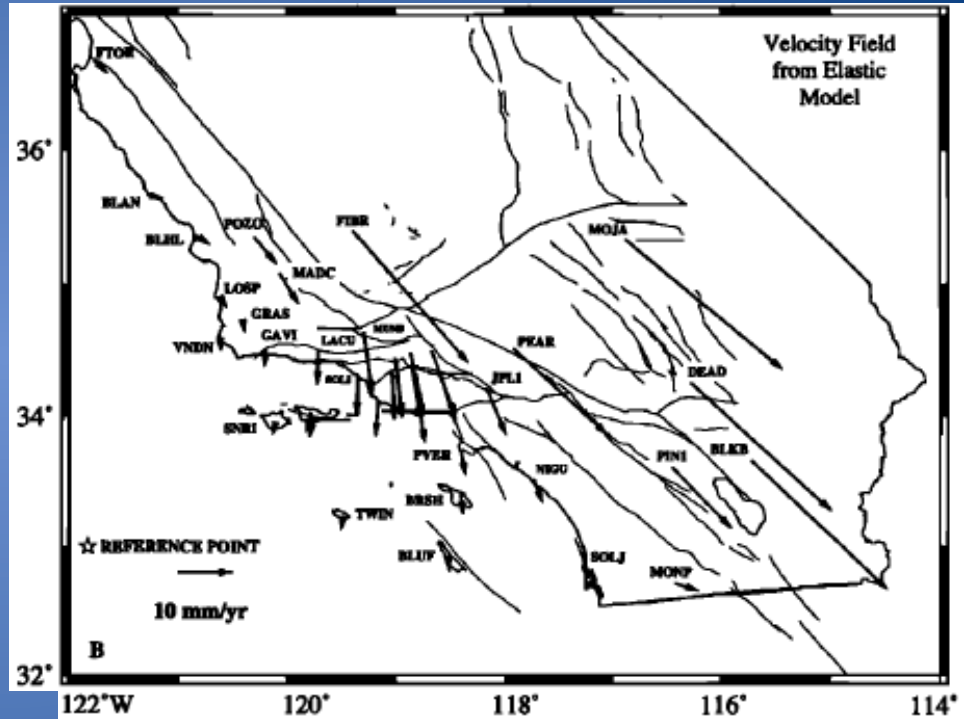
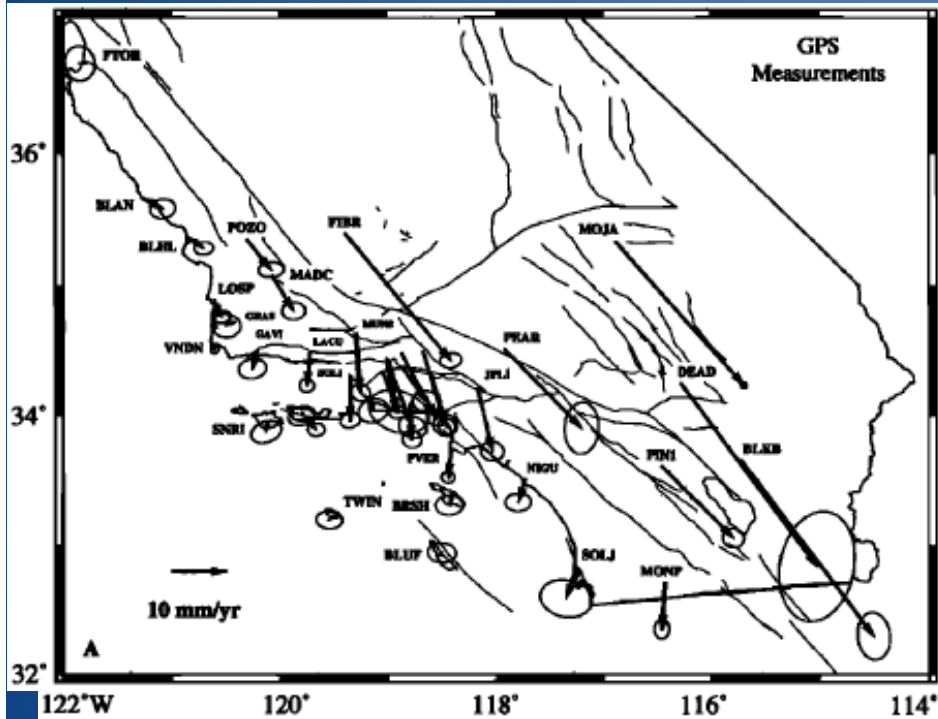


Coulomb 3.3.01 14-Oct-2012 20:58:33 Aseismic_1813.inp
Specified faults: 321/90/180 Depth: 8.00 km Friction: 0.60

Uncertainties

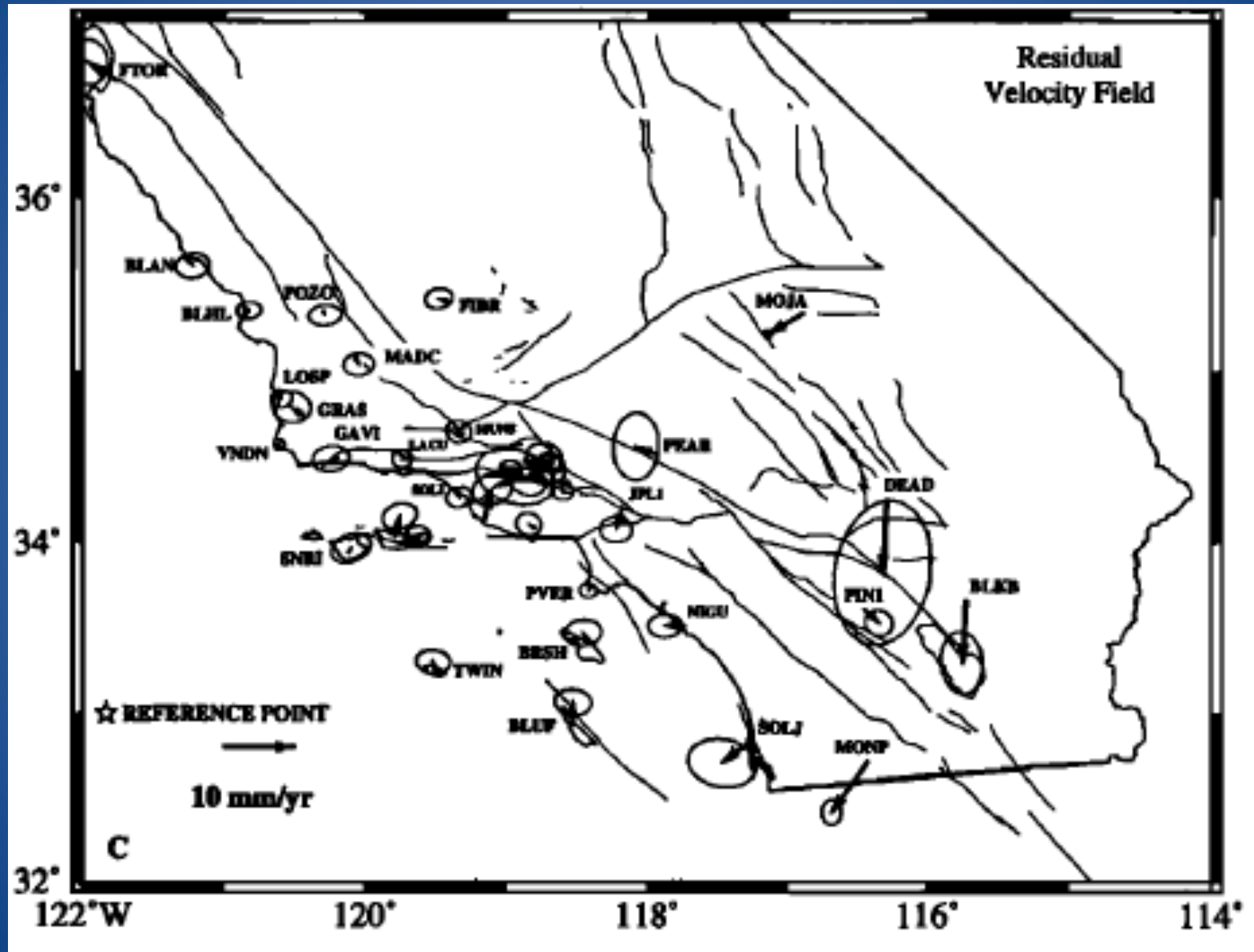
- Static stress singularities at the ends of fault segments
- Variations in lithologic properties
- Aseismic velocity field
 - Residual velocity field (difference between elastic model, geodetic data) within 95% confidence interval of elastic velocity field
- Fault slip distribution of earliest earthquakes
 - Tradeoff between resolution, stress singularities

Slip Velocity Measurements



(Deng & Sykes, 1997)

Residual Velocity Field



(Deng & Sykes, 1997)