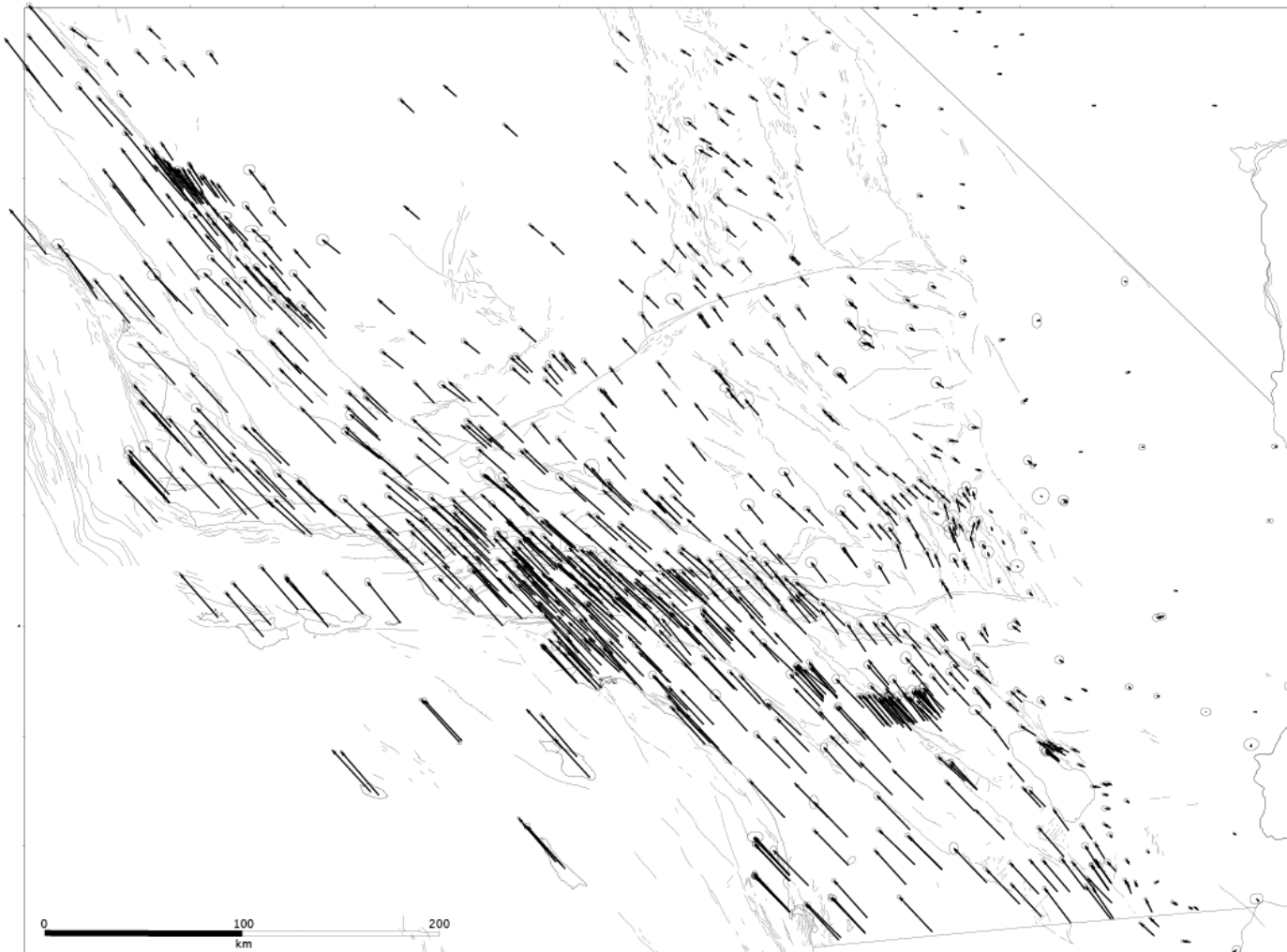


# Incorporating Geodetic Surface Deformation Data into UCERF3



# OVERVIEW

- Purpose: Assess scientific status of GPS/InSAR contribution to UCERF3
- 40 participant workshop
- Time: 1-2 April 2010
- Location: Kellogg West Center
- Co-Convenors: Kaj Johnson, Liz Hearn, Wayne Thatcher
- Budget: ~\$25K (request joint SCEC & UCERF3 support)
- Outcome: Report & Recommendations
- Short Article for EOS

# Some Science Issues for Incorporating GPS Results into UCERF3

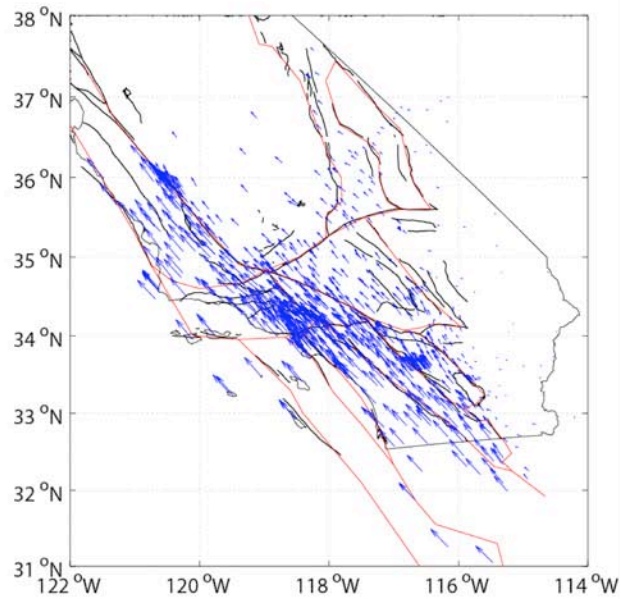
1. Complete & Unified California-wide GPS Velocity Field
2. Earthquake Cycle & Influence of Postseismic Transients
3. Strain Rate Map Methodologies & Issues
4. Block Models & GPS Fault Slip Rate Estimation
5. Reconciliation of Differing Strain Rate Maps  
& Disparate GPS Slip Rate Estimates
6. Eventually: Reconciliation of GPS & Geologic Slip Rates

# AGENDA

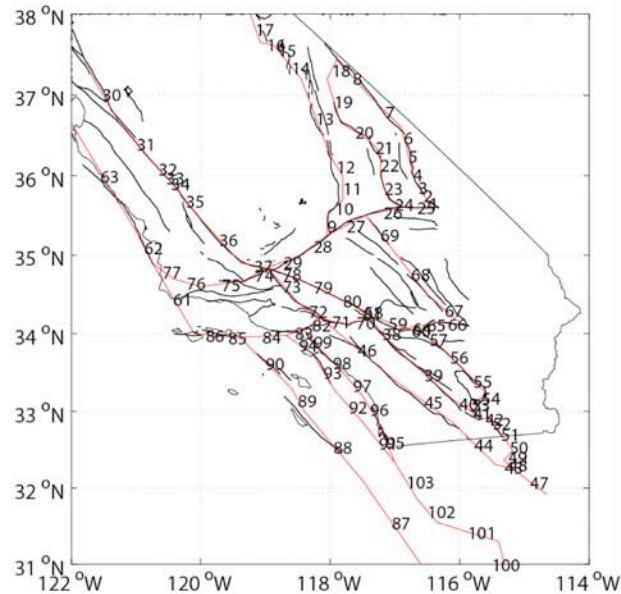
- Scientific Sessions
  1. Earthquake Cycle Deformation & Influence of Postseismic Transients
  2. Strain Rate Map Methodologies and Issues
  3. GPS Fault Slip Rate Estimation and Issues
- Small Number of Invited Talks
- Three Community Modeling Exercises  
(set, completed & evaluated before meeting)
- Breakouts for Small Group Discussion of Key Issues
- Web-based application process to select ~40 participants
- Include ~5-8 students/postdocs

# Example: Community Exercise For Block Modeling

(Test Case Set by Kaj Johnson)



b.



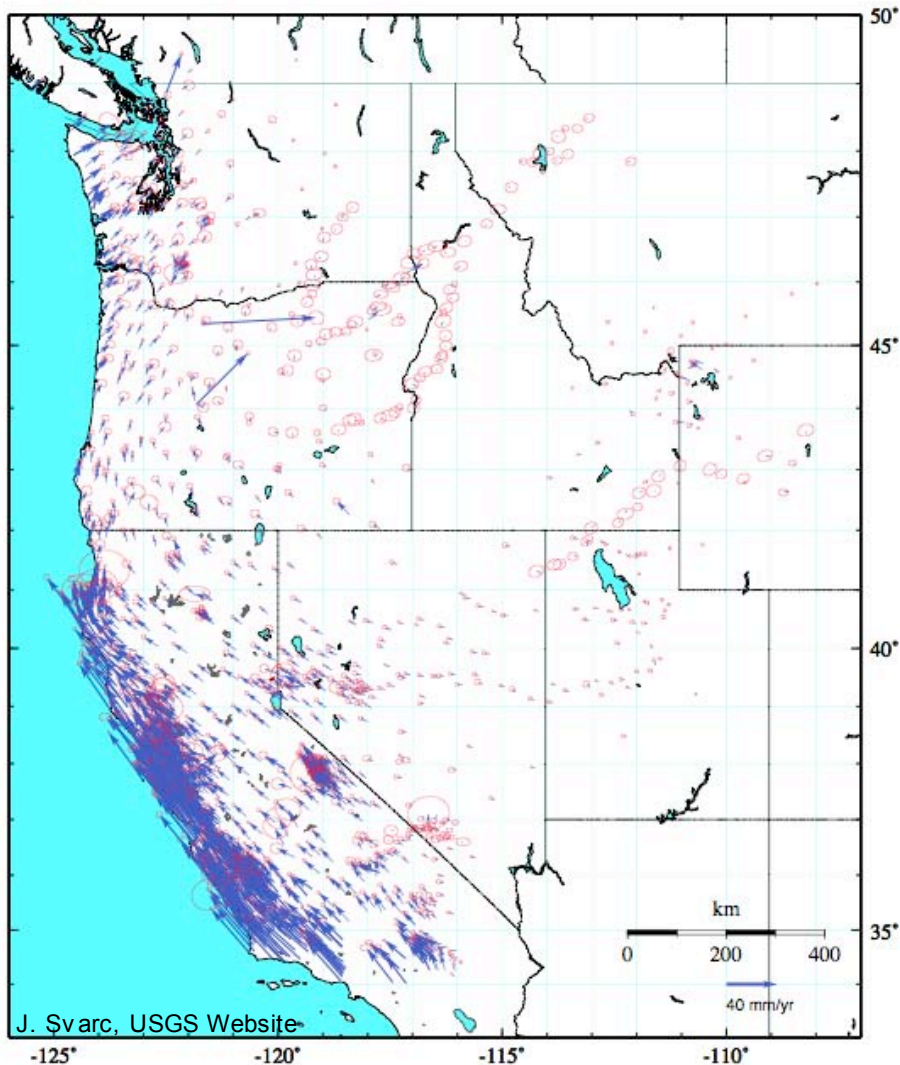
## ISSUES FOR MODELERS TO ADDRESS

1. Provide brief description of methodology
2. Provide slip rate estimates in standard format
3. Explain how you determine locking depth
4. Explain how you determine slip rate uncertainties

Comments & Suggestions are  
Very Welcome!

Contact Co-Convenors

# 1. Determination of Unified GPS Velocity Field



## Western US Velocity Field (UNAVCO Working Group)

- Tom Herring, chair
- First meeting, August 2009
- Version 1.0 available soon

## 2. Influence of Postseismic Transients on Presumed Steady-State Velocity Field

- Short-term transients (<5-10 years) can be removed to first order
- Long-term transient effects depend on poorly-constrained ductile lithosphere rheology
- Thus, effect of long-term transients (>50 years) is controversial



# 3. Use Strain Rate Maps or GPS Block Models & Fault Slip Rates?

- Continuum vs Microplate Controversy Still Rages
- Thus, Hybrid Solutions Should be Considered for UCERF3 & Other PSHA Applications

## 4. Obtaining Strain Rate Maps from GPS Velocity Fields

- GPS station distribution is irregular
- True strain rate field very spatially heterogeneous
- Determination of strain rate field is thus non-unique
- Different methodologies give somewhat different results

# 5. GPS Block Models & Fault Slip Rates

- Block choice is subjective
- Thus, different studies obtain somewhat different slip rates
  - e.g. McCaffrey 2005, Meade & Hager 2005, Becker et al. 2005
- Transient effects may bias slip rate estimates
  - e.g. Kaj Johnson et al. 2007, Johnson & Chuang (2009 SCEC meeting)
- Block structure questionable where tectonics complex
  - e.g. Big Bend region of San Andreas
- Where tectonics is complex, block models may not be useful

## 6. Reconciliation of GPS & Geologic Slip Rate Estimates

- Critically evaluate limitations of GPS estimates
- Critically evaluate limitations of geologic estimates
- Do fault slip rates change with time?  
(Last ~15 years versus last ~10,000 years)
- Working Group to forge consensus slip rates for UCERF3?