Stress modulation on the San Andreas fault by interseismic fault system interactions

Jack Loveless and Brendan Meade, *Geology*, 2011

A three step process:

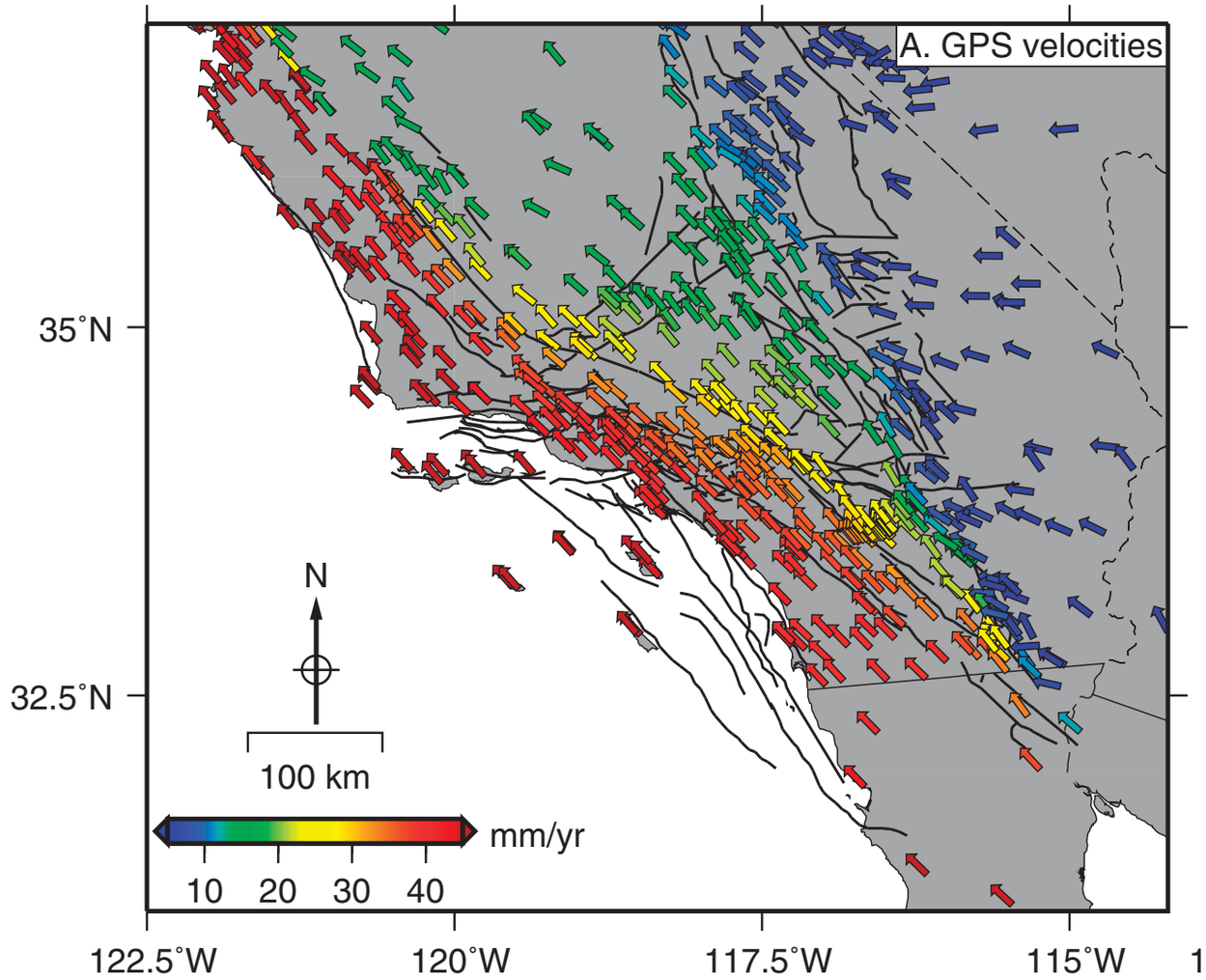
1 - Assimilate plate boundary wide GPS data into a Western North America block model with microplate geometries in southern California derived from the CFM-R.

2 - Deconvolve the GPS velocity field into rotational and earthquake cycle components. Estimate fault slip rates independent of geologic estimates

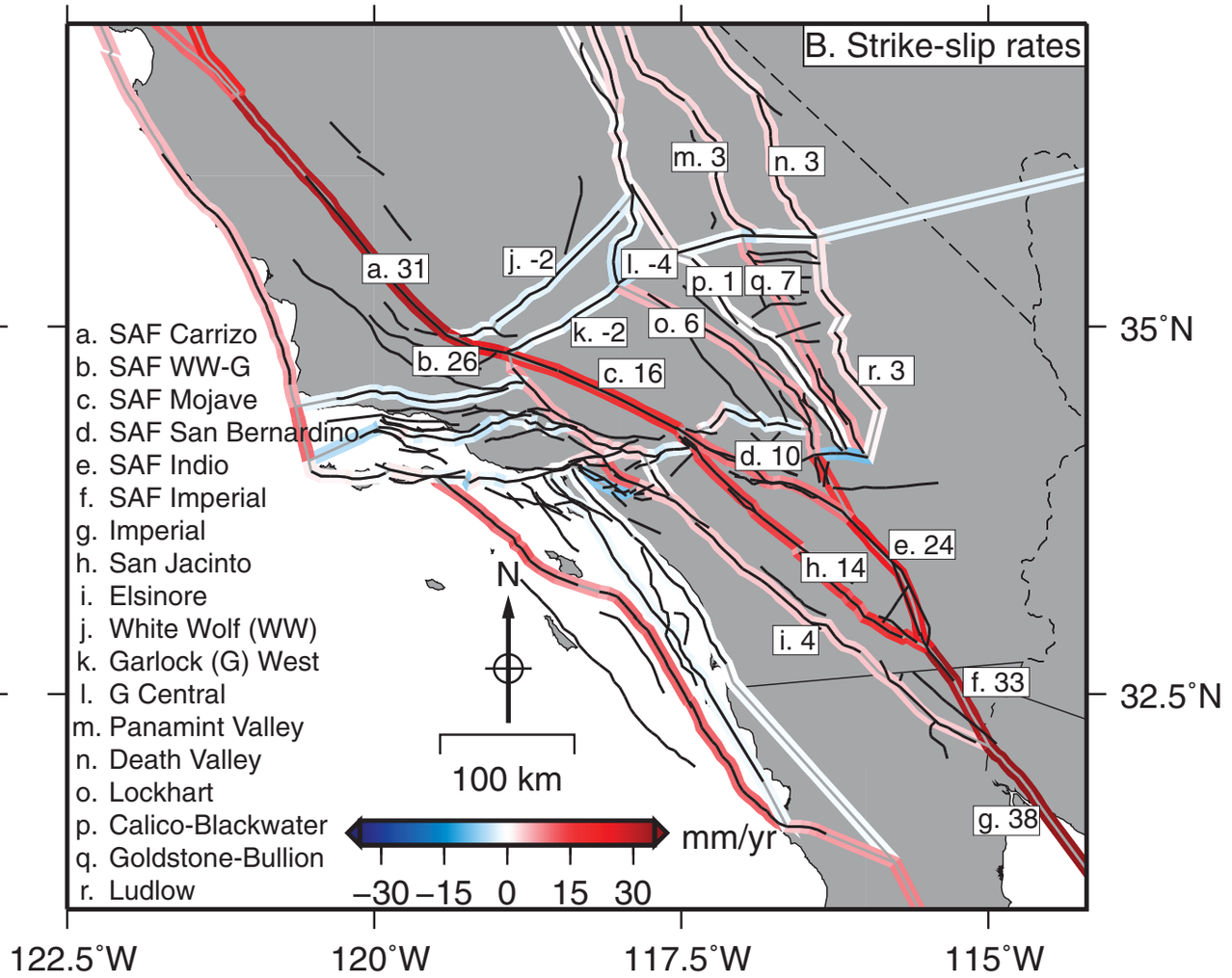
3 - Calculate full stress tensor at depth in response to slip deficit across the three-dimensional fault system. The equilibrium equations are automatically satisfied and fault interactions are explicitly included.

Updating *Meade and Hager* (2005)

GPS velocities



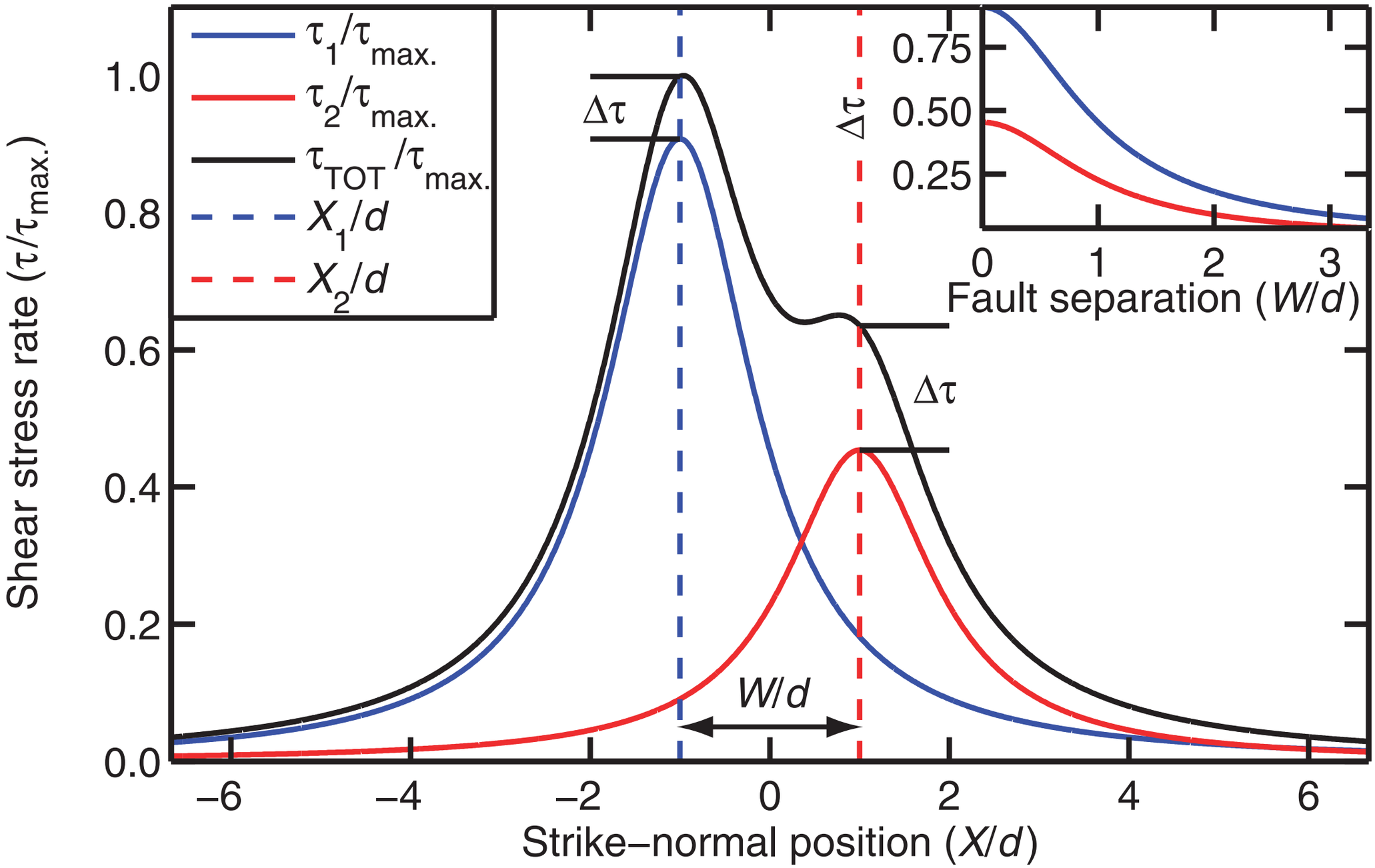
Estimated fault slip rates



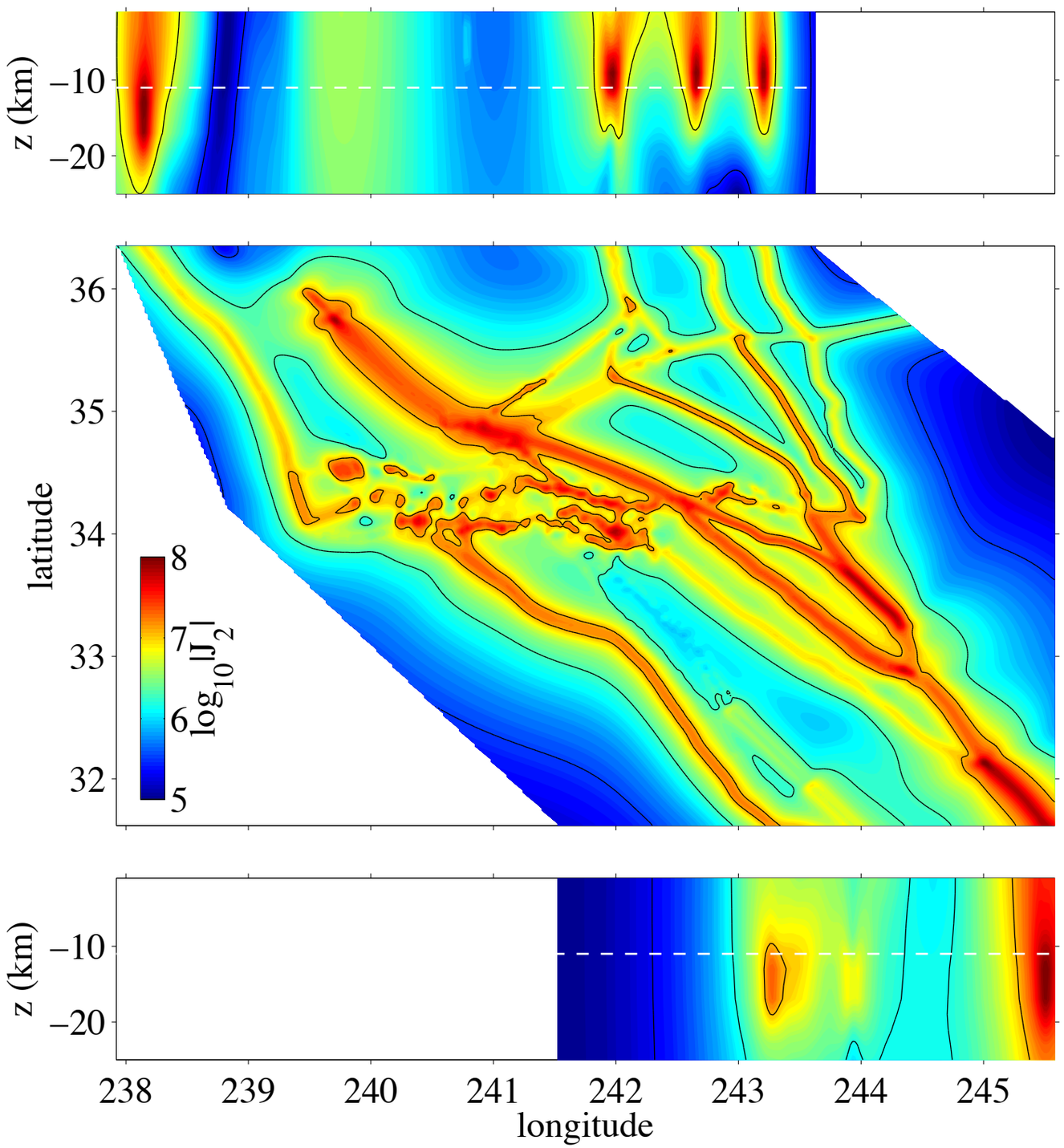
GPS data: *McClusky et al.* (2001); *Shen et al.* (2003); *Hammond and Thatcher* (2005); *Williams et al.* (2006); *McCaffrey et al*. (2007); Plate Boundary Observatory network

Fault system geometry: Rectilinear Community Fault Model (*Plesch et al*., 2007)

Local fault stressing rates are affected by all faults



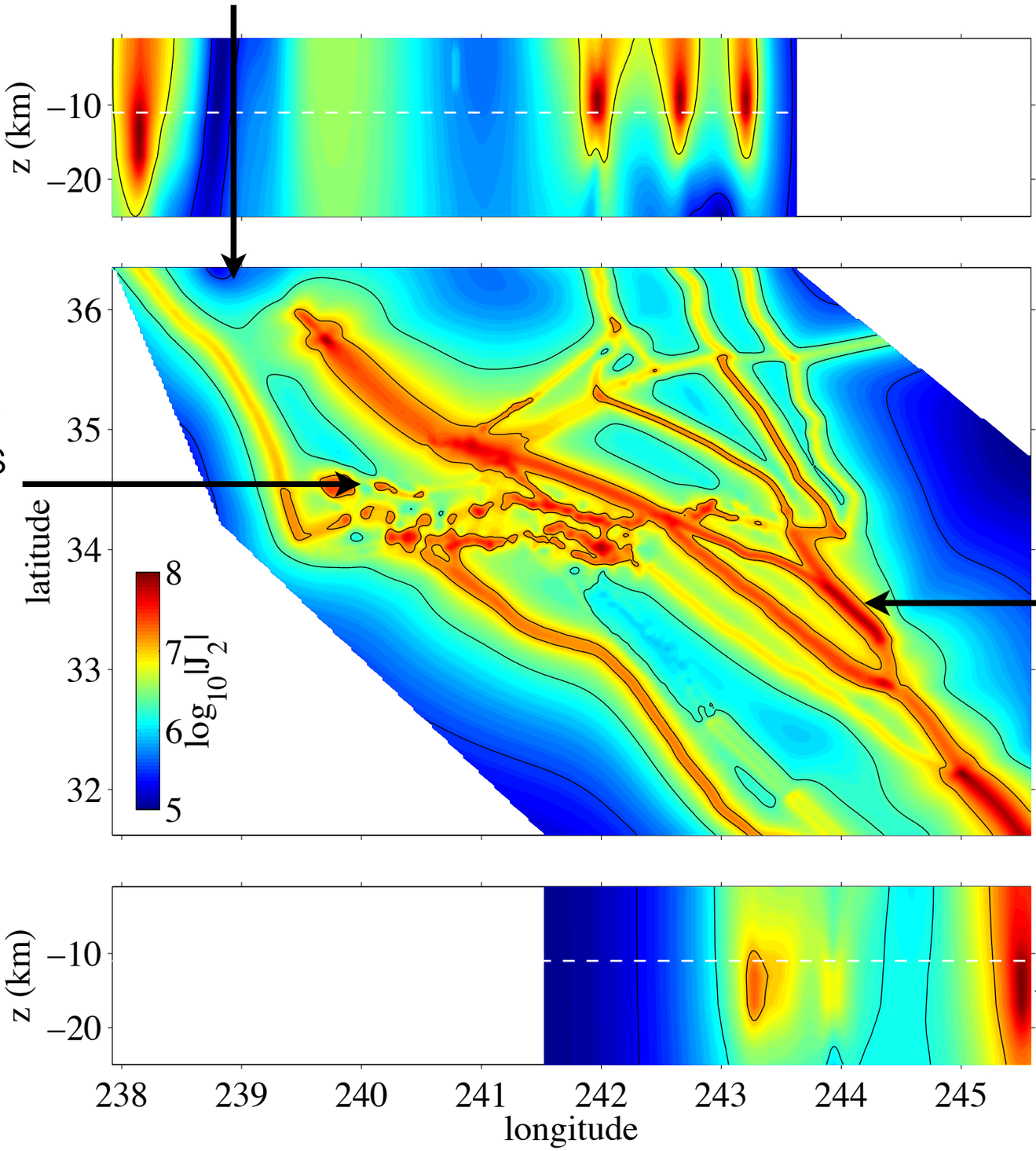
J_2 at 11 km depth



J_2 at 11 km depth

Negligible stressing on SAF north of Parkfield due to fact that it is creeping. Strain rate gradients are still high here.

Patchy local maxima due to discontinuous representations of dipping faults



Stressing rates localized along SAF and SJF. Locking depth variations matter.

Maximum stresses at locking depth and decreasing toward surface