Simple fault models.zip

Simple_fault_long_term_1mm_yr.in

Poly3D input file for the long-term forward model to generate slip rates to apply within the interseismic forward models.

Simple_fault_interseismic10km_allSRT.in

Poly3D input file for the interseismic forward model that has a 10 km locking depth, excludes the horizontal basal crack, and queries the stressing-rate tensors at all locations necessary for the 60 different configurations. Results are included in *triinv_start_simple_assessment.mat* and inverted.

Simple_fault_interseismic15km_allSRT.in

Same as Simple_fault_interseismic10km_allSRT.in, but for a locking depth of 15 km.

Simple_fault_interseismic20km_allSRT.in

Same as Simple_fault_interseismic10km_allSRT.in, but for a locking depth of 20 km.

Simple_fault_interseismic15km_reg_spacing.in

Poly3D input file for the interseismic forward model that has a 15 km locking depth, excludes the horizontal basal crack, and queries stressing-rate tensors at the optimal regular spacing and surface velocities. Results are included in *triinv_start_simple_reg.mat* and inverted.

triinv_start_simple_assessment.mat

A MatLab workspace containing the necessary variables to invert the interseismic forward model stressing-rate tensors (all 60 configurations for 10, 15 and 20 km locking depths) using triinvx. Table 1 lists variable details.

Table 1.

Name	Details
all_**	Each cell contains the structure that is inverted. Each structure contains stressing-rate tensor locations (xs, ys, zs), full stressing-rate tensor components (s**), tensor component weighting/uncertainty (s**s), and variables that are required but not used in the inversions (x, y, z, *Vel, *Sig). ** = 10, 15, or 20 km locking depth.
beta	The smoothing parameter value.
dist	Structure containing the spacing information for each of the 60 configurations. Fault is the distance the tensors are from the fault, d1 and d2 provide the depths for each row of tensors (if d2 = NaN, configuration only has one row of tensors), and lat provides the along-strike spacing.
p	Structure containing the vertices (c), connectivity (v), and the number of elements (nEl) and vertices (nc) for each fault patch.
slipIn_**	The strike, dip, and tensile slip for each fault element from *Simple_fault_interseismic**km_allSRT.in* where ** = 10, 15, or 20 km locking depth.

triinv_start_simple_reg_spacing.mat

A MatLab workspace containing the necessary variables to invert the interseismic forward model stressing-rate tensors (optimal spacing for 15 km locking depth) and surface velocities using triinvx. The variable names are listed in Table 2.

Table 2.

Name	Details
beta	The smoothing parameter value.
dstress	Structure containing stressing-rate tensor locations (xs, ys, zs), deviatoric stressing-rate tensor components (s**), tensor component weighting/uncertainty (s**s), and variables that are required but not used in the inversions (x, y, z, *Vel, *Sig).
joint	Structure containing stress variables (*s, s**, s**s) and vels variables (x, y, z, *Vel, *Sig)
jointd	Structure containing dstress variables (*s, s**, s**s) and vels variables (x, y, z, *Vel, *Sig)
ndstress	Structure with the same variables as dstress but the tensor components are the normalized deviatoric stressing-rate tensor, not the deviatoric stressing-rate tensor.
p	Structure containing the vertices (c), connectivity (v), and the number of elements (nEl) and vertices (nc) for each fault patch.
slipIn	The strike, dip, and tensile slip for each fault element from *Simple_fault_interseismic15km_reg_spacing.in*
stress	Structure with the same variables as dstress but the tensor components are the full stressing-rate tensor, not the deviatoric stressing-rate tensor.
vels	Structure containing coordinates for the regularly spaced surface velocities (x,y,z), velocity components (*Vel), and velocity weighting/uncertainty (*Sig).

Complex fault models.zip

inactiveNP_long_term_322_42.in

Inactive northern pathway Poly3D input file for the long-term forward model to generate slip rates to apply within the interseismic forward models.

inactiveNP_w_base_interseismic20km_crustal_limited.in

Inactive northern pathway Poly3D input file for the interseismic forward model that has a 20 km locking depth, includes the horizontal basal crack, and queries the stressing-rate tensors at the 54 locations where enough focal mechanisms are nearby to estimate a robust stress state (crustal limited locations). Results are used to compare forward interseismic model maximum horizontal compression orientation to that estimated from the focal mechanism derived stress states.

inactiveNP_interseismic20km_crustal_limited.in

Inactive northern pathway Poly3D input file for the interseismic forward model that has a 20 km locking depth, excludes the horizontal basal crack, and queries the stressing-rate tensors and surface velocities at the crustal limited locations. Results are included in *triinv_start_complex.mat* and inverted onto the active northern pathway geometry.

inactiveNP_interseismic20km_reg_spacing.in

Inactive northern pathway Poly3D input file for the interseismic forward model that has a 20 km locking depth, excludes the horizontal basal crack, and queries the stressing-rate tensors and surface velocities at regularly spaced locations. Results are included in *triinv_start_complex.mat* and inverted onto the active northern pathway geometry.

triinv_use.m

A MatLab script containing the commands used to run the complex fault inversions as well as the simple fault inversions using optimal stressing rate tensor spacing.

triinv_start_complex.mat

A MatLab workspace containing the necessary variables to invert the inactive northern pathway interseismic forward model stressing-rate tensors and surface velocities onto the active northern pathway geometry using triinvx. The variable names are listed in Table 3.

Table 3.

Name	Details
beta	Smoothing parameter value
dstress	Structure containing coordinates for the regularly spaced stressing-rate tensor locations (xs, ys, zs), deviatoric stressing-rate tensor components (s**), tensor component weighting/uncertainty (s**s), and variables that are required but not used in the inversions (x, y, z, *Vel, *Sig).
dstress54	Structure with the same variables as dstress but only for the 54 crustal limited locations.
fwdSlipINP	The strike, dip, and tensile slip for each fault element from *inactiveNP_interseismic20km_crustal_limited.in*
fwdSlipINPonANP	The strike, dip, and tensile slip for each fault element from *inactiveNP_interseismic20km_crustal_limited.in* mapped onto the active northern pathway geometry.
joint54	Structure containing stress54 variables (*s, s**, s**s) and velwus variables (x, y, z, *Vel, *Sig)
joint54d	Structure containing dstress54 variables (*s, s**, s**s) and velwus variables (x, y, z, *Vel, *Sig)
jointdg	Structure containing dstress variables (*s, s**, s**s) and velgrid variables (x, y, z, *Vel, *Sig)
jointg	Structure containing stress variables (*s, s**, s**s) and velgrid variables (x, y, z, *Vel, *Sig)
panp	Structure containing the vertices (c), connectivity (v), and the number of elements (nEl) and vertices (nc) for each fault patch for the active northern pathway geometry.
pinp	Structure containing the vertices (c), connectivity (v), and the number of elements (nEl) and vertices (nc) for each fault patch for the inactive northern pathway geometry.
slipFilesANP	The names of each patch for panp.
slipFilesINP	The names of each patch for pinp.
stress	Structure with the same variables as dstress but the tensor components are the full stressing-rate tensor, not the deviatoric stressing-rate tensor.
stress54	Structure with the same variables as stress but only for the 54 crustal limited locations.
velgrid	Structure containing coordinates for the regularly spaced surface velocities (x,y,z), velocity components (*Vel), and velocity weighting/uncertainty (*Sig).
velwus	Structure with the same variables as velgrid but at locations of GNSS stations.

Focal mechanisms

SoCal_focal_mechanisms.mat

A MatLab workspace containing the original, post-completeness assessment, and declustered focal mechanism catalogs as well as the clusters of focal mechanisms we use to derive stress states with MSATSI. The variable names are listed in Table 4.

Table 4.

Name	Details
fm_bkgd	The focal mechanisms after assessing completeness and declustering.
fm_complete	The focal mechanisms after assessing completeness and reducing the area to the region of interest.
fm_orig	The focal mechanisms from Hauksson et al., 2012 and Yang et al., 2012 as well as updates to the catalog through 2020.
grade_bkgd	The letter grade for focal mechanisms in fm_bkgd.
grade_complete	The letter grade for focal mechanisms in fm_complete.
grade_orig	The letter grade for focal mechanisms in fm_orig.
header	Description of variable in each column of the fm_* variables.
loc54	A logical array indicating which focal mechanisms are in each of the 54 clusters that we invert using MSATSI to estimate the crustal stress state.