

Simple slip models from differential InSAR images

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A general method based on the QuakeSim Simplex application is presented which allows rapid inversion of unwrapped phase images from repeat-pass InSAR, producing a simple fault slip model. Simplex uses the downhill simplex method (optionally with simulated annealing) to estimate motion of a set of uniformly slipping rectangular fault patches in a homogeneous half space, based on geodetic measurements. Development of Simplex for repeat-pass InSAR required adaptation to a number of challenging features of the data. A preprocessing system allows local selection and downsampling of the data, reducing a typical UAVSAR image from 120,000,000 pixels (too many for fast inversion) to tens of thousands. The geometry of the observing path is taken into account, associating the line of sight direction with each data pixel for use in the forward model. Dates for each pass are automatically compared to avoid sign error in the estimated slip. An arbitrary constant phase term is accounted by computing chi squared as the deviations from the average phase change. Inversion examples include the California UAVSAR image of the El Mayor-Cucapah earthquake and post-seismic slip.