Japan Geoscience Union Meeting 2010
(May 23-28 2010 at Makuhari, Chiba, Japan)

STT072-P04 Room: Convention Hall Time: May 27 17:15-18:45

Estimate of fault geometry and slip distribution from InSAR geodetic data in 1997 Kagoshima North-west earthquake

kazuya Ishitsuka[1*], Takeshi Tsuji[1], Toshifumi Matsuoka[1], Yasuhiro Yamada[1]

[1]Kyoto University Engneering Geology lab

Interfetometric SAR (InSAR) has become a powerful tool to detect subtle deformation of the Earth 's surface. InSAR makes use of the phase information by subtracting the phase value in one SAR image from that of the other, and visualise surface deformation. In this study we try to develop an inversion method to reveal seismogenic fault geometry and its slip distribution from the surface deformation detected by InSAR.
Elastic dislocation theory quantitatively links between surface displacements and seismogenic slip along a fault plane. Therefore, it is possible to estimate seismogenic fault parameters from the surface deformation by inversion. In this study, we choose Okada source model (Okada, 1985) which is a relationship between surface displacement and a fault within isotropic, linear and elastic half-space. Because this inverse problem is nonlinear, we use Genetic Algorithms (GA) which guarantees against the problem of local minima.
When the fault geometry is known by GA inversion, surface displacement is lineally related to the slip along the fault. Therefore, using the estimated fault parameters defined by GA, we can estimate slip distribution by applying linear inversion technique. Here we divided the estimated fault plane into several small planes, and estimated the slip along the each small fault planes.
When defining slip distribution, we use two constraints. One is smoothing constraint; this constraint is possible to avoid oscillations in the fault slip by minimizing the two-dimensional second derivative of fault slip. As the other constrain, we assume that the fault slip in one fault plane do not have different direction. After all, we solve this problem using nonnegative linear least squares (NNLS).
We applied this inversion method to 26 March 1997 Kagoshima North-West earthquake (Geographical Survey Institute, 1998) and could estimate rupture fault geometry and slip distribution.

Acknowledgement: Geographical Survey Institute (GSI) provided the InSAR data of 1997 Kagoshima North-west Earthqauke.

Keywords: InSAR, Inverse theory, fault estimation, Surface deformation field, Genetic Algorithms, Non negative linear least square method