Institut für Photogrammetrie
und GeoInformation

Leibniz Universität Hannover

Institut für Photogrammetrie und GeoInformation,
Nienburger Straße 1, 30167 Hannover

Nienburger Straße 1, 30167 Hannover
Fakultät für Bauingenieurwesen und Geodäsie

Institut für Photogrammetrie und GeoInformation

Prof. Dr.-habil. Christian Heipke

Dr. Ing. Sanaz Vajedian

Tel.+49 511 762-2567
Fax +49 511 762-2483
E-Mail:
vajedian@ipi.uni-hannover.de

12. December 2019

Coseismic deformation monitoring to estimate the earthquake source parameters

Proposal for a Master thesis topic (EN)

Monitoring the crustal deformation caused by earthquakes provides invaluable kinematic coseismic information to a better understanding of tectonics processes. SAR interferometry is a popular technique to remotely detect large coverage of Earth's surface deformation associated with various phenomena including earthquakes, volcanic activity, and landslide movements. Geodetic observations such as satellite Interferometric SAR (InSAR) data or GNSS measurement allow us to determine the geometry of the causative faults of earthquakes but, in general, a number of non-unique solutions are consistent with the observations, given our limitation to model the real seismicity occurrence. Using InSAR observation alone retrieves one component of the surface deformation along the line of sight (LOS) direction. Simultaneously use of different geometries of ascending and descending could reduce the uncertainty of the inferred parameters. However in the presence of large deformation, in the near-field area, InSAR observations get complex and noisy due to image misregistration. Retrieving near field displacement may be more of interest however, as they allow to improve constraints on fault geometry and slip distribution especially within the shallowest crust.

Here is the list of the processing steps that are required to run during the thesis:

1- Interferometric analysis to produce deformation maps along LOS

2- Implementation of the orientation correlation method to derive pixel wise offset caused by large deformation in the near field area.

3- Downsampling the displacement observations using R-based method in order to reduce the computational cost.

4- Applying joint inversion of all the observations based on Bayesian algorithm in order to solve the fault geometry

5- Splitting fault plane to a number of dislocation patches and estimate slip over the fault plane.

There is no limitation for the study area; any earthquake with a large deformation can be selected.

Sanaz Vajedian will supervise this thesis.

Besucheradresse:
Nienburger Straße 1
30167 Hannover
www.ipi.uni-hannover.de