

A Deep-Learning-Based Seismic Hazard Assessment System from Geodetic Big Data

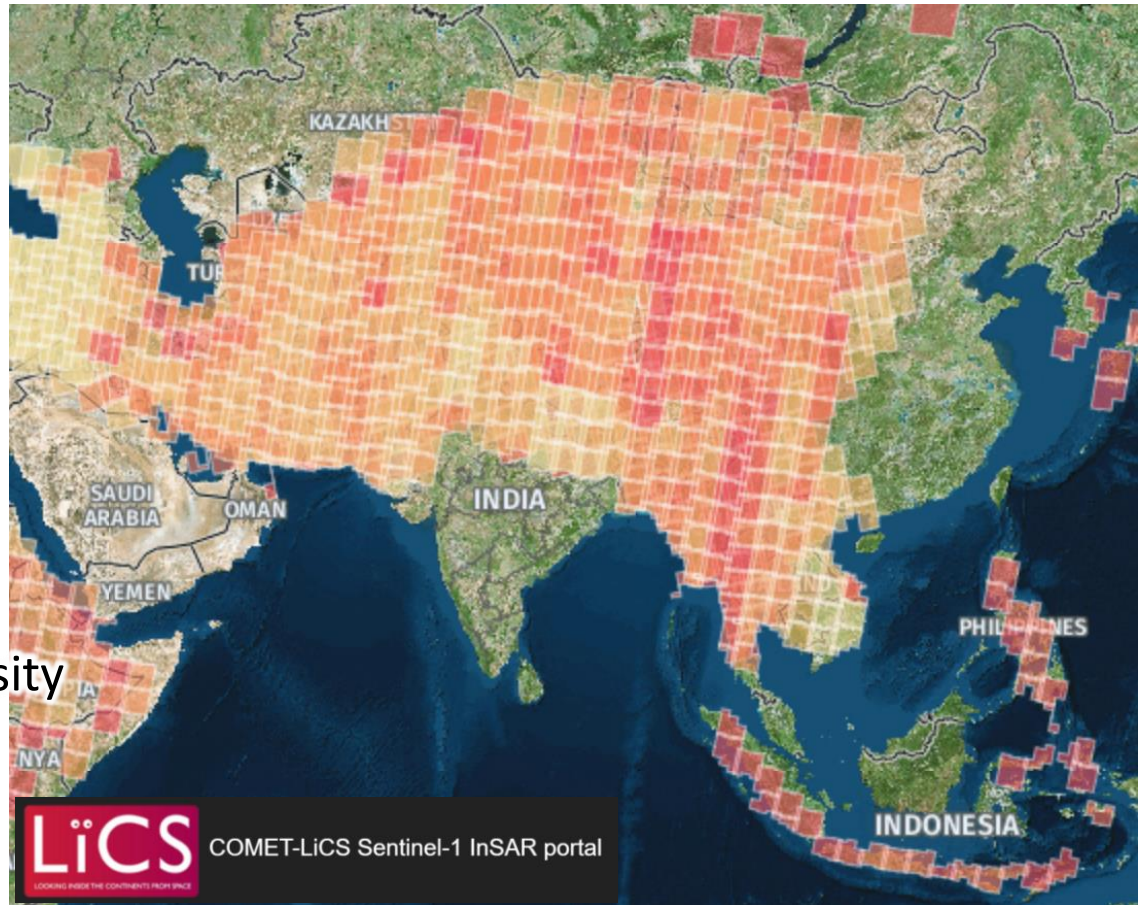
2018 MOST (Taiwan) – DST (India) Joint Research

González, PJ; Walters, RJ; Hatton, EL; Spaans, K;
McDougall, A; Hooper, AJ; Wright, TJ
LiCSAR: Tools for automated generation of Sentinel-1
frame interferograms
AGU Fall Meeting, 2016

Kuo-En Ching (景國恩)

Department of Geomatics

National Cheng Kung University



Recent Advances in InSAR Processing and Cloud Computing

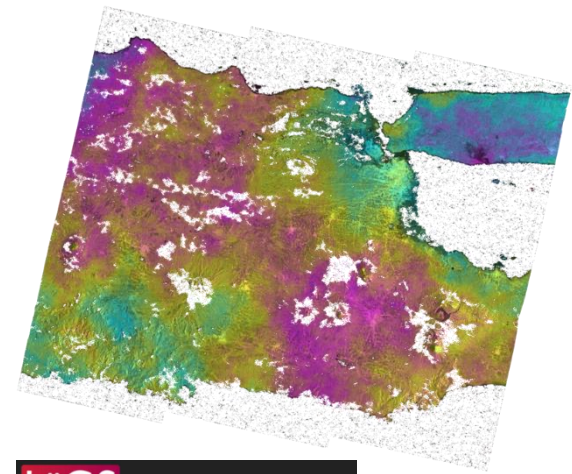
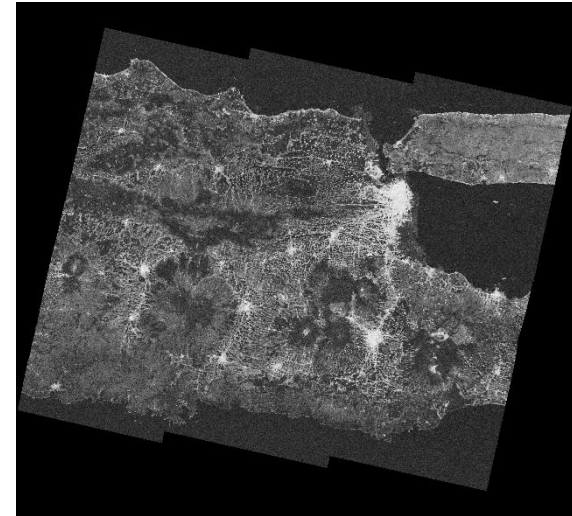
Overview

1. Multiple parallel Sentinel-1A/B processing pipelines
 - Forward “keep up” processing
 - Urgent response
 - Bulk (re)processing
 - On-demand analysis for custom datasets
2. Data quality screening with Machine Learning
3. Dataset-level analytics
4. Use AWS for analysis at large-scale, high-resiliency, & auto scaling

G33A-02

AGU 2017

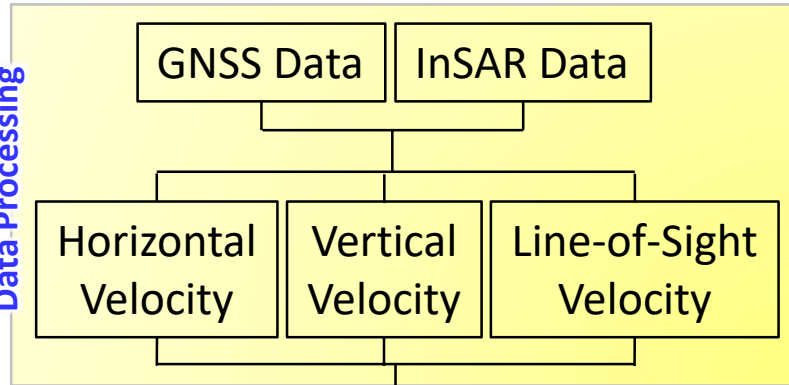
G33A-02, 2017 AGU Fall Meeting



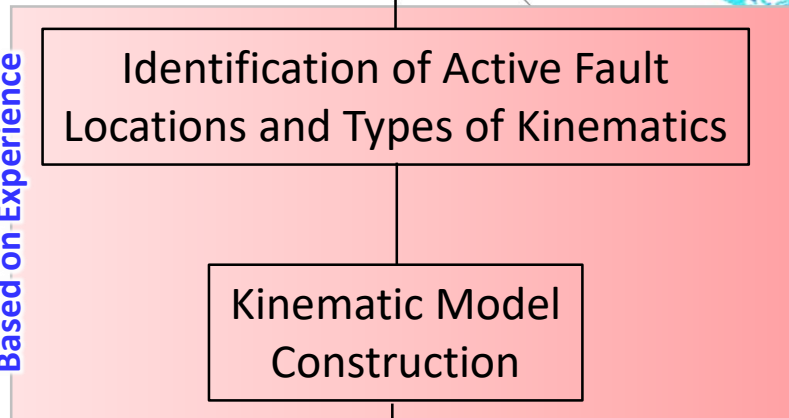
LiCS COMET-LiCS Sentinel-1 InSAR portal

Seismic Hazard Assessment from Geodetic Big Data

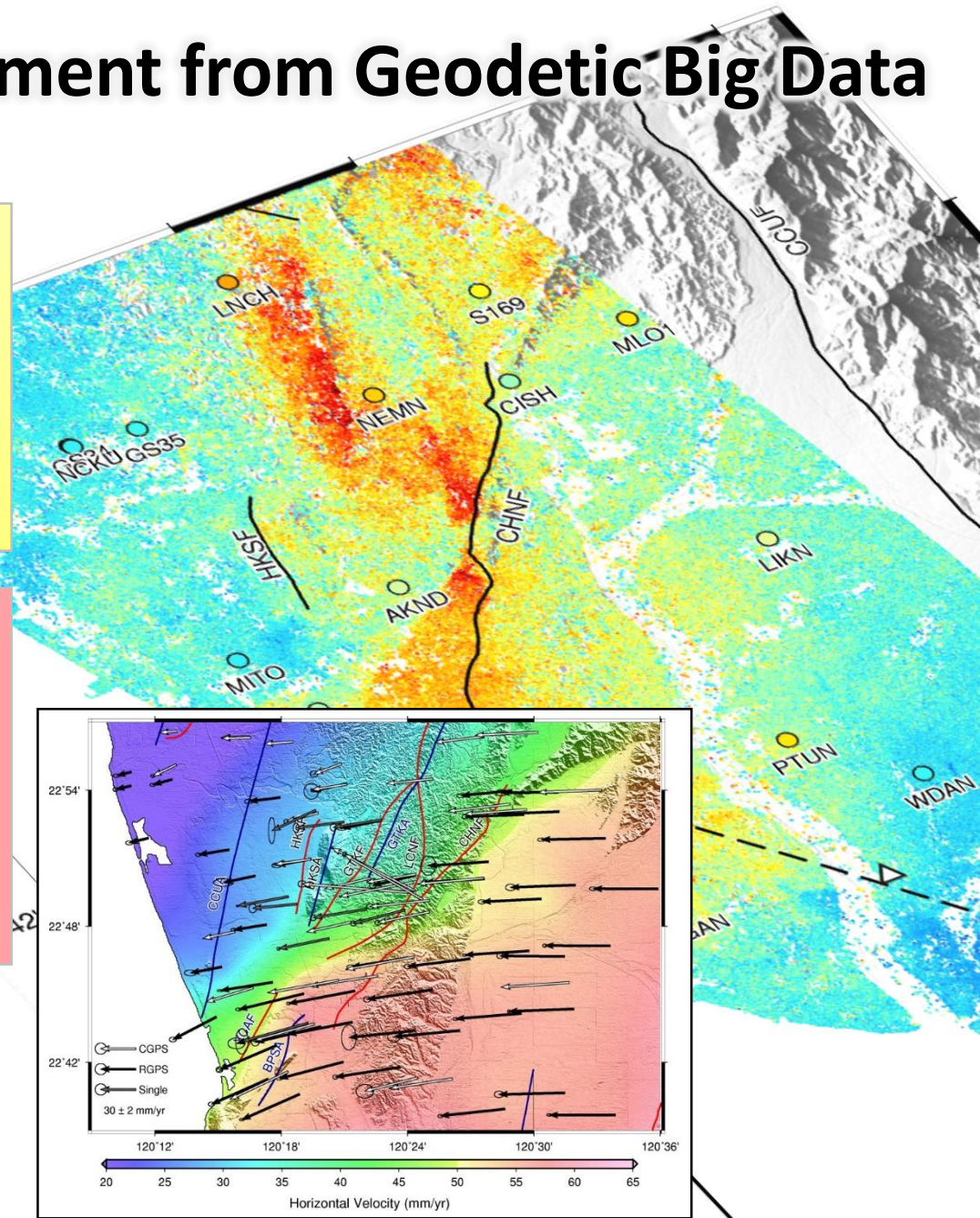
Data Processing



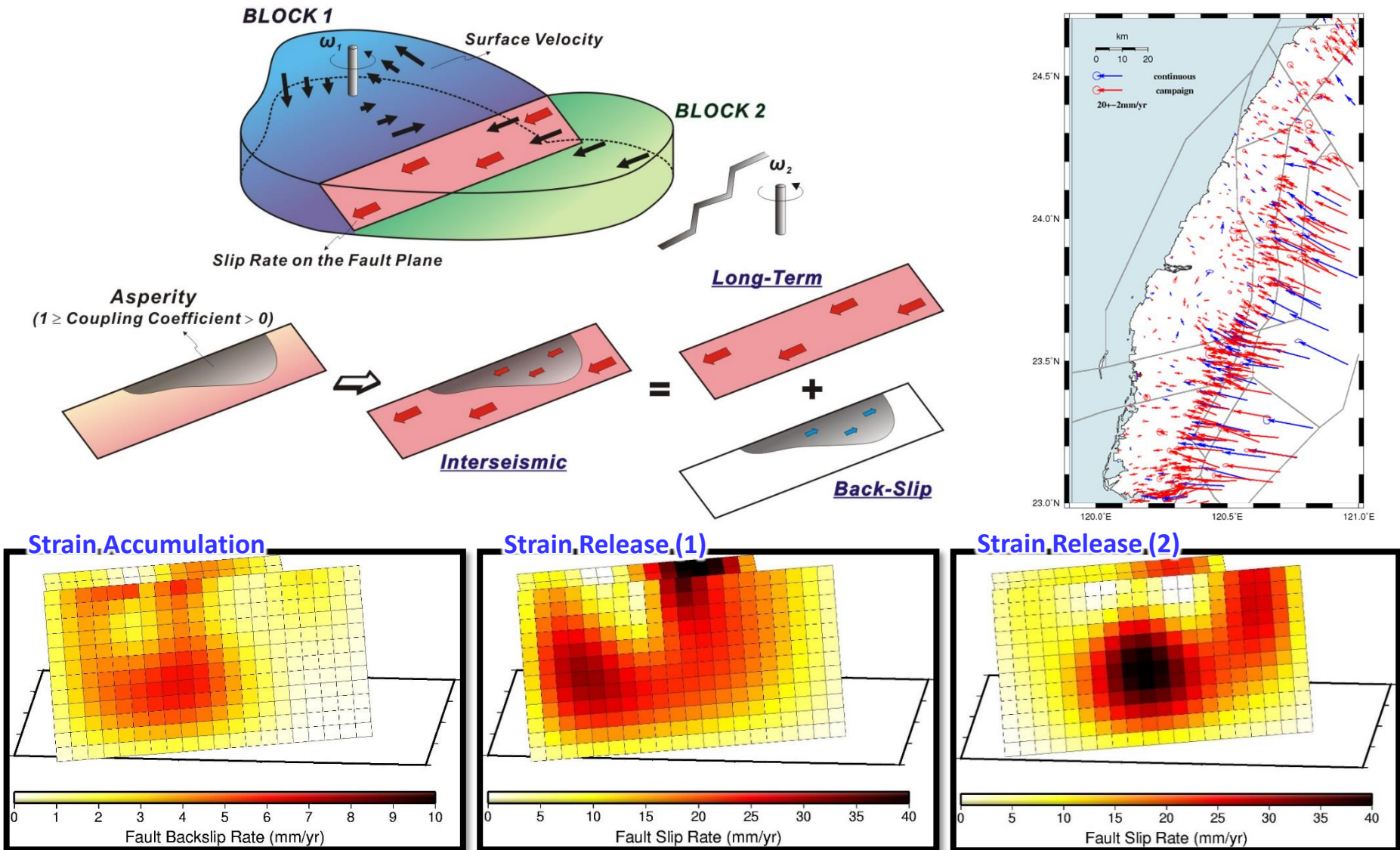
Based on Experience



Seismic Hazard Assessment

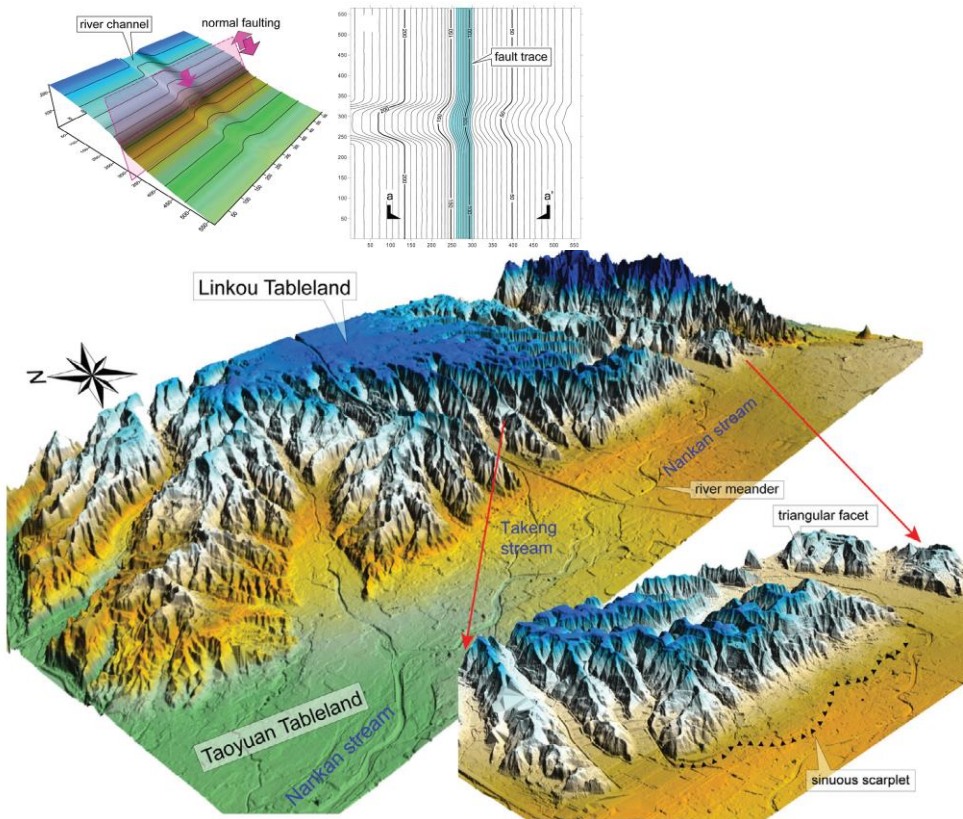


Kinematic Model Construction and Seismic Hazard Assessment from Geodetic Big Data

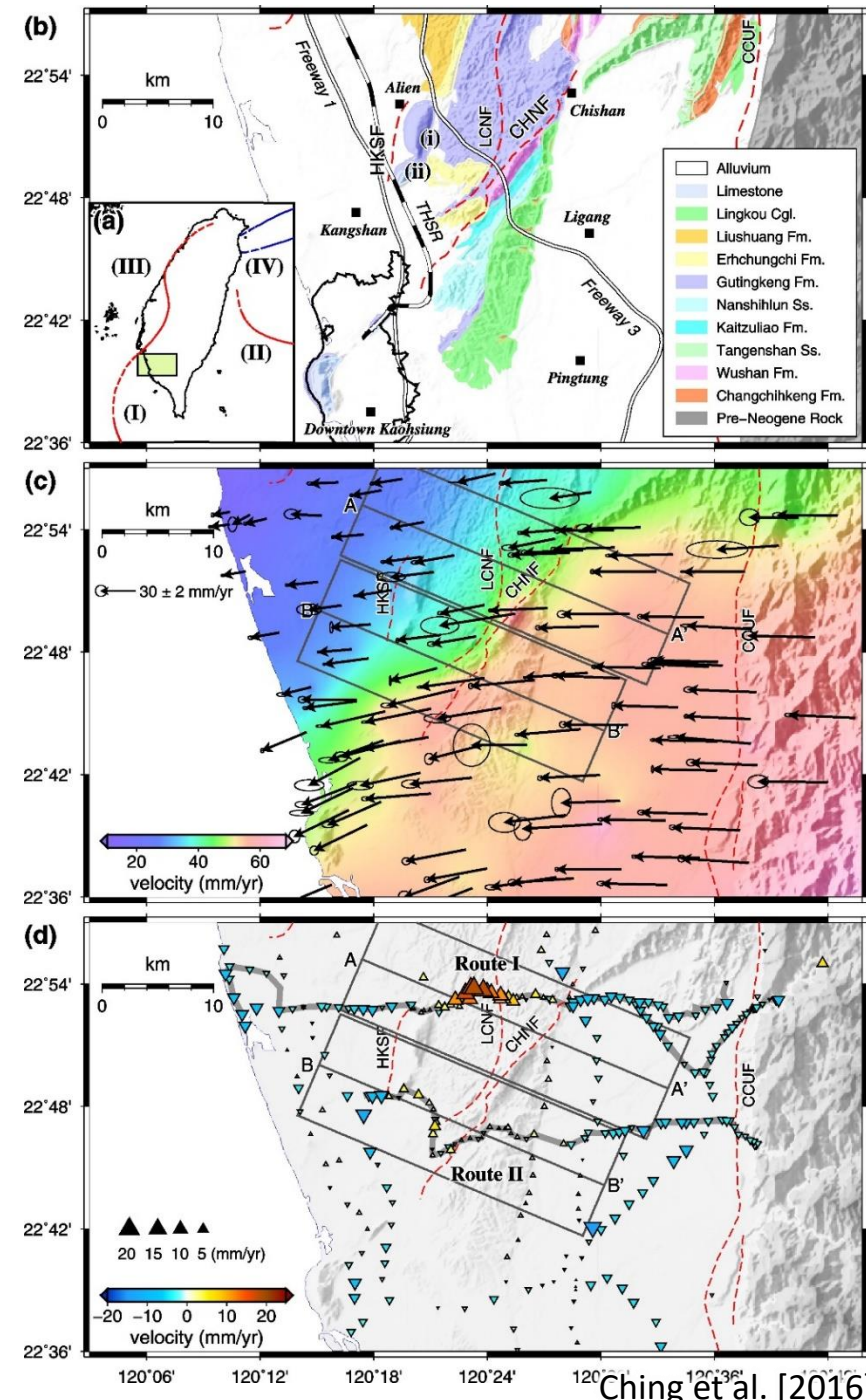


Identification of Active Fault Locations and Types of Kinematics

1. Geological Maps
2. Geomorphological Features
3. Patterns of Surface Deformation



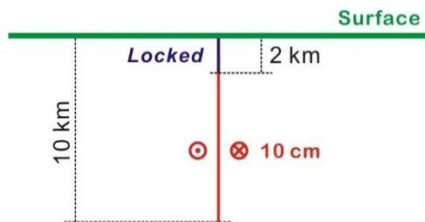
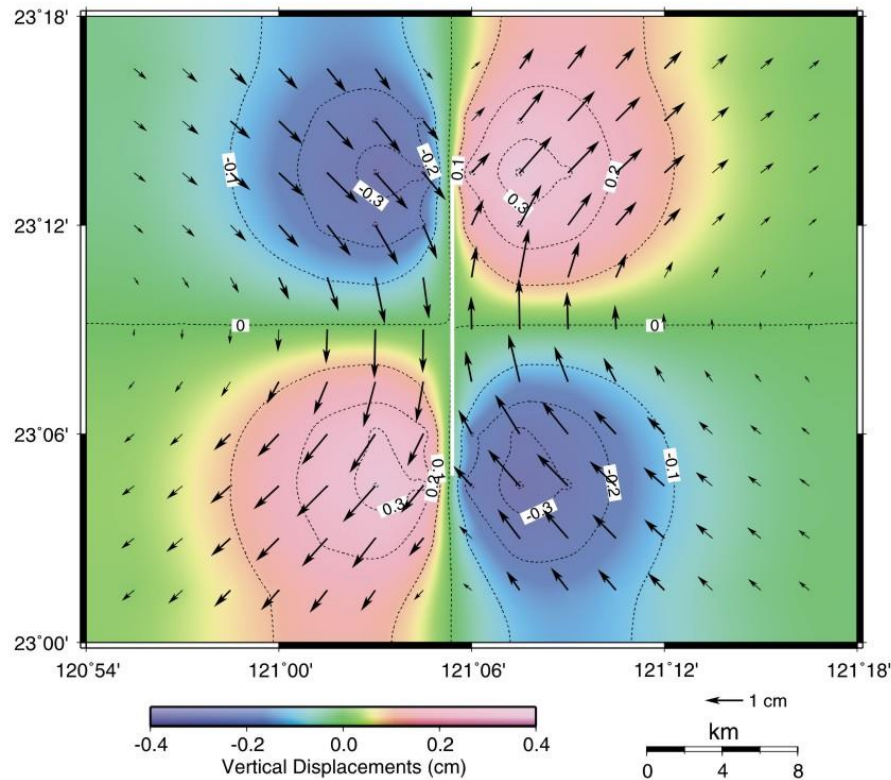
Chang et al. [2010]



Ching et al. [2016]

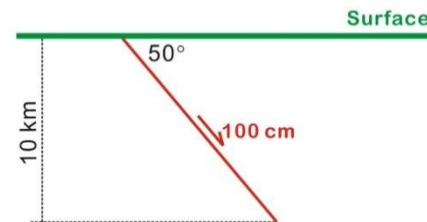
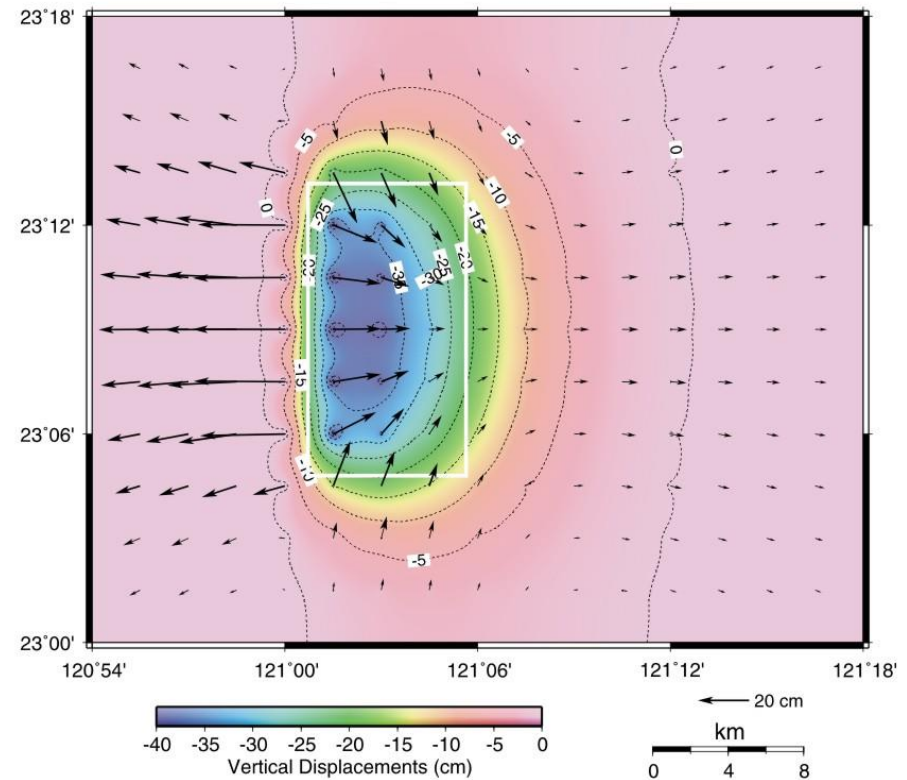
Surface Deformation Patterns Caused by Faults

Strike-slip fault



Sinistral Strike-Slip Fault

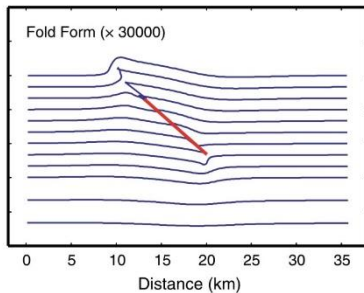
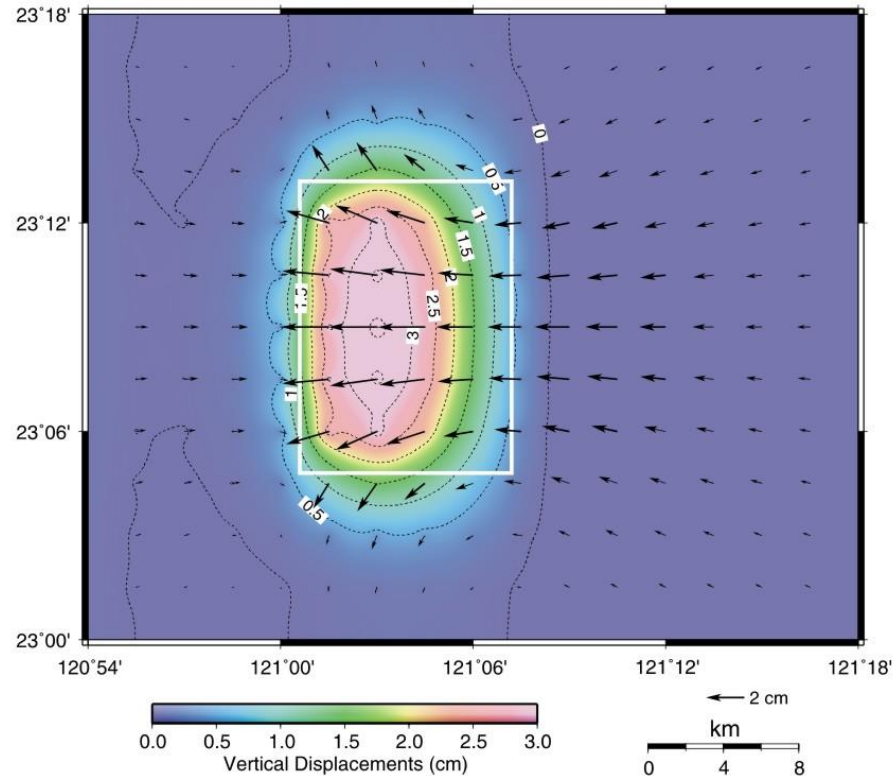
Normal fault



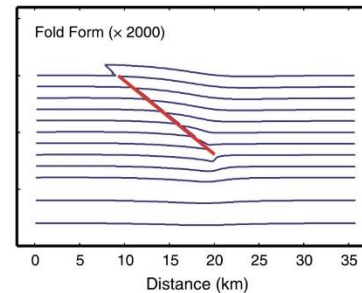
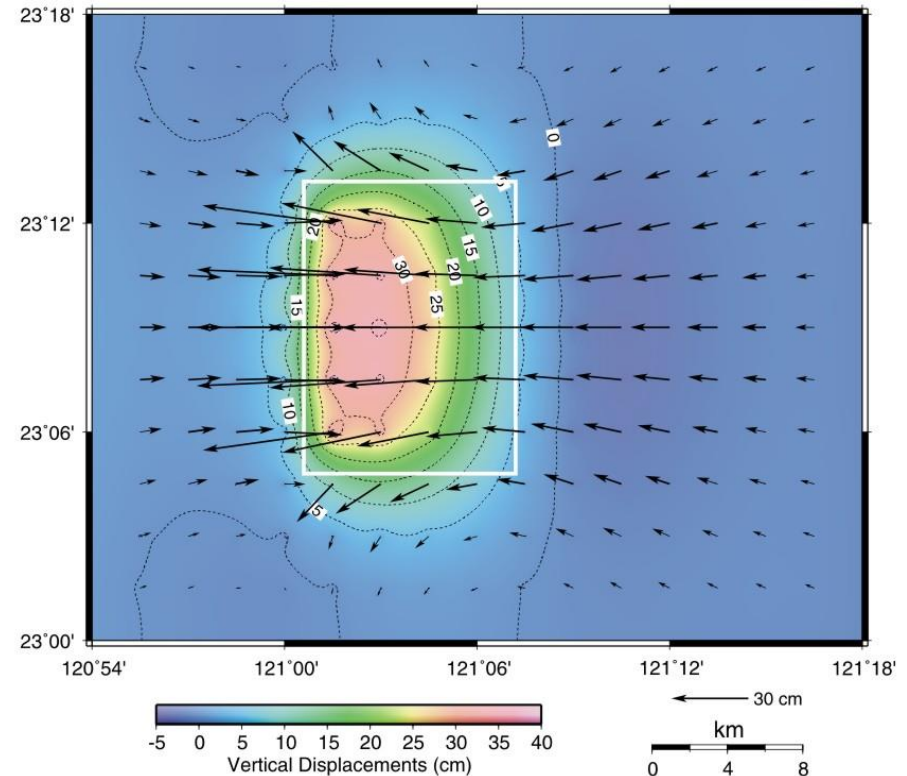
Normal Fault

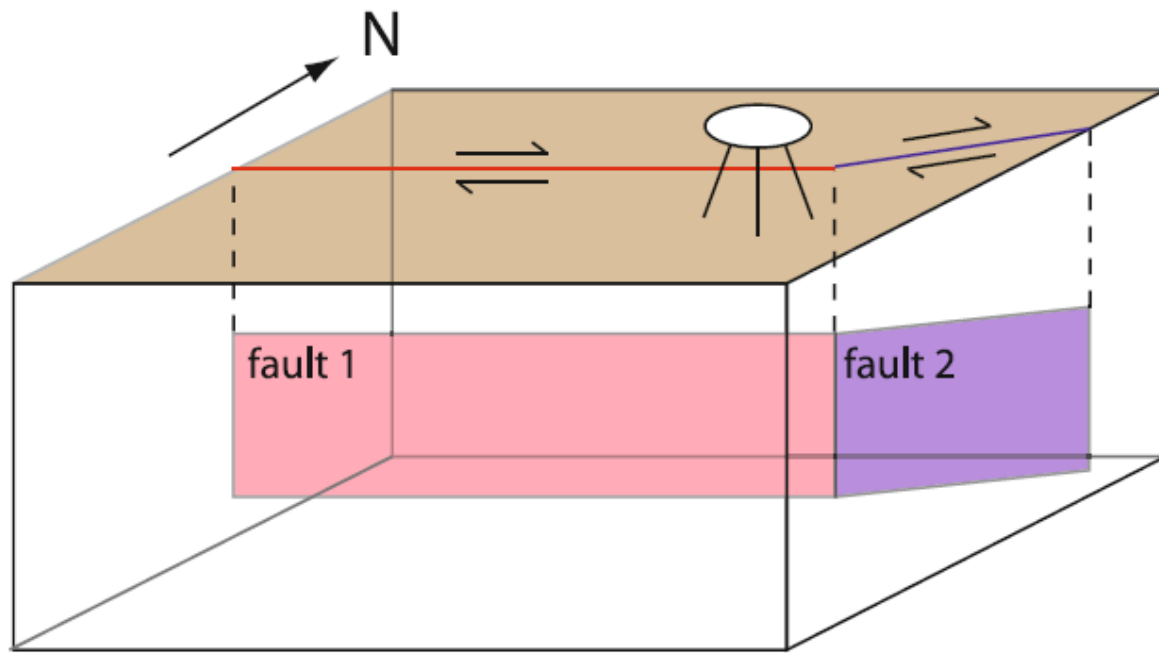
Surface Deformation Patterns Caused by Faults

Reverse fault (no rupture to the surface)

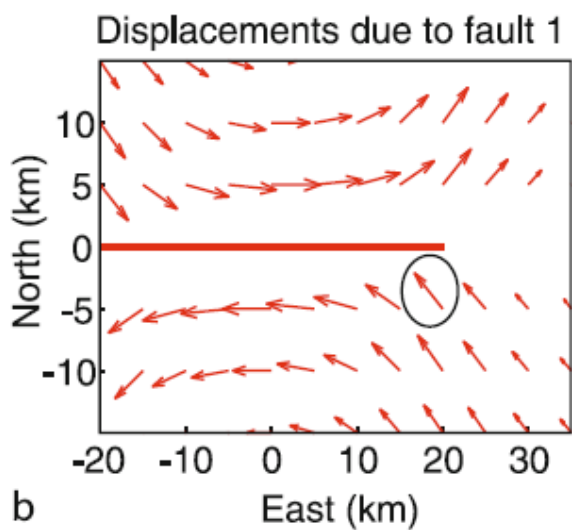


Reverse fault (rupture to the surface)

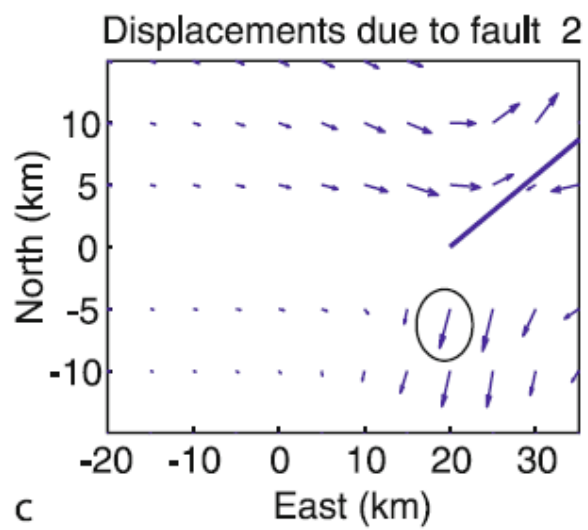




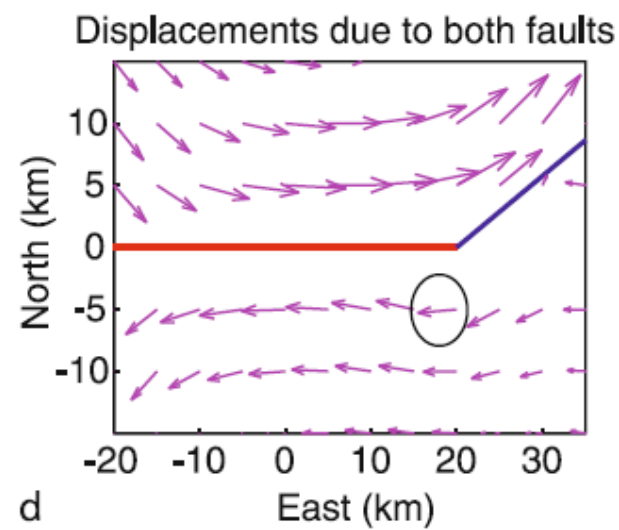
a



b

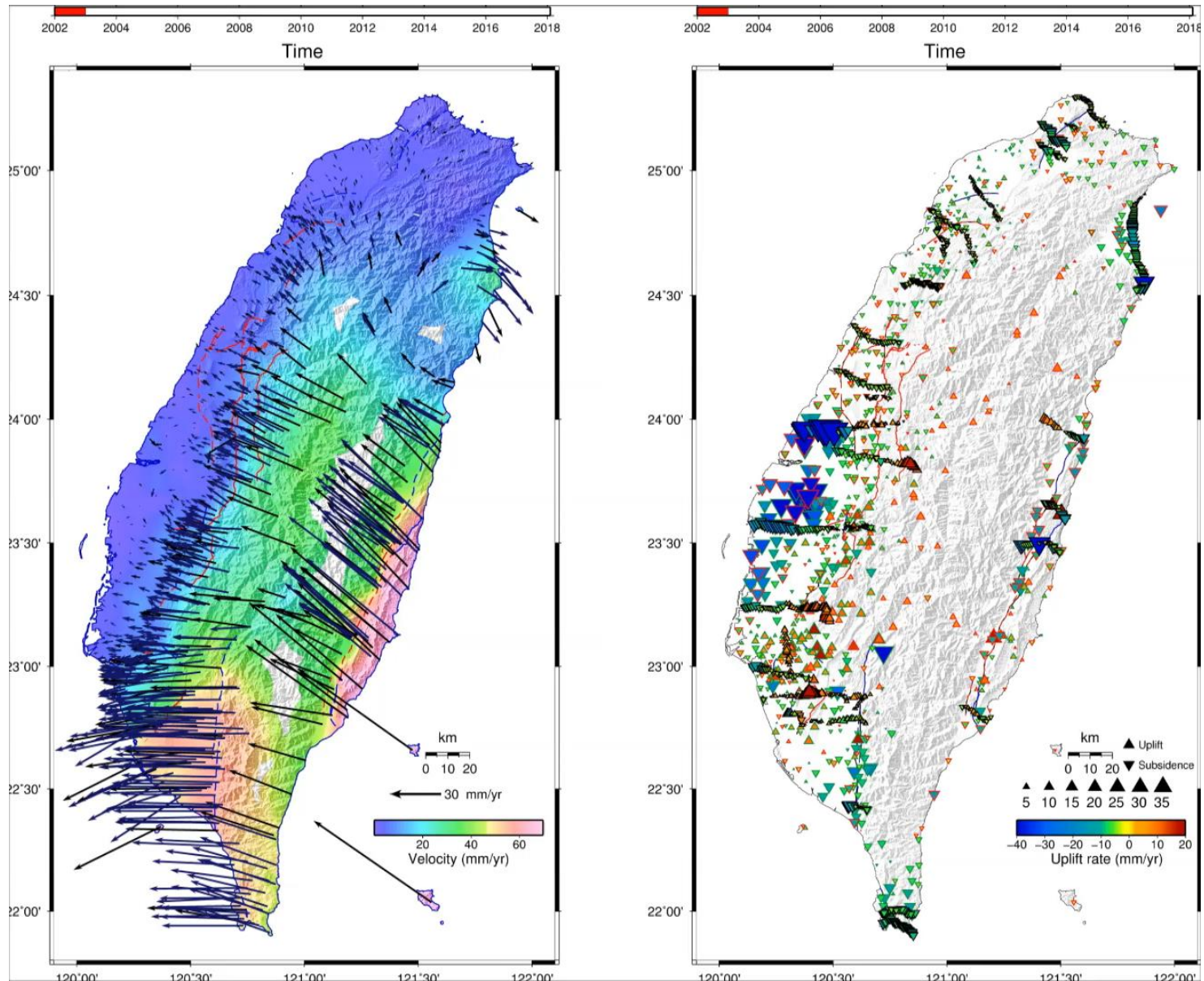


c

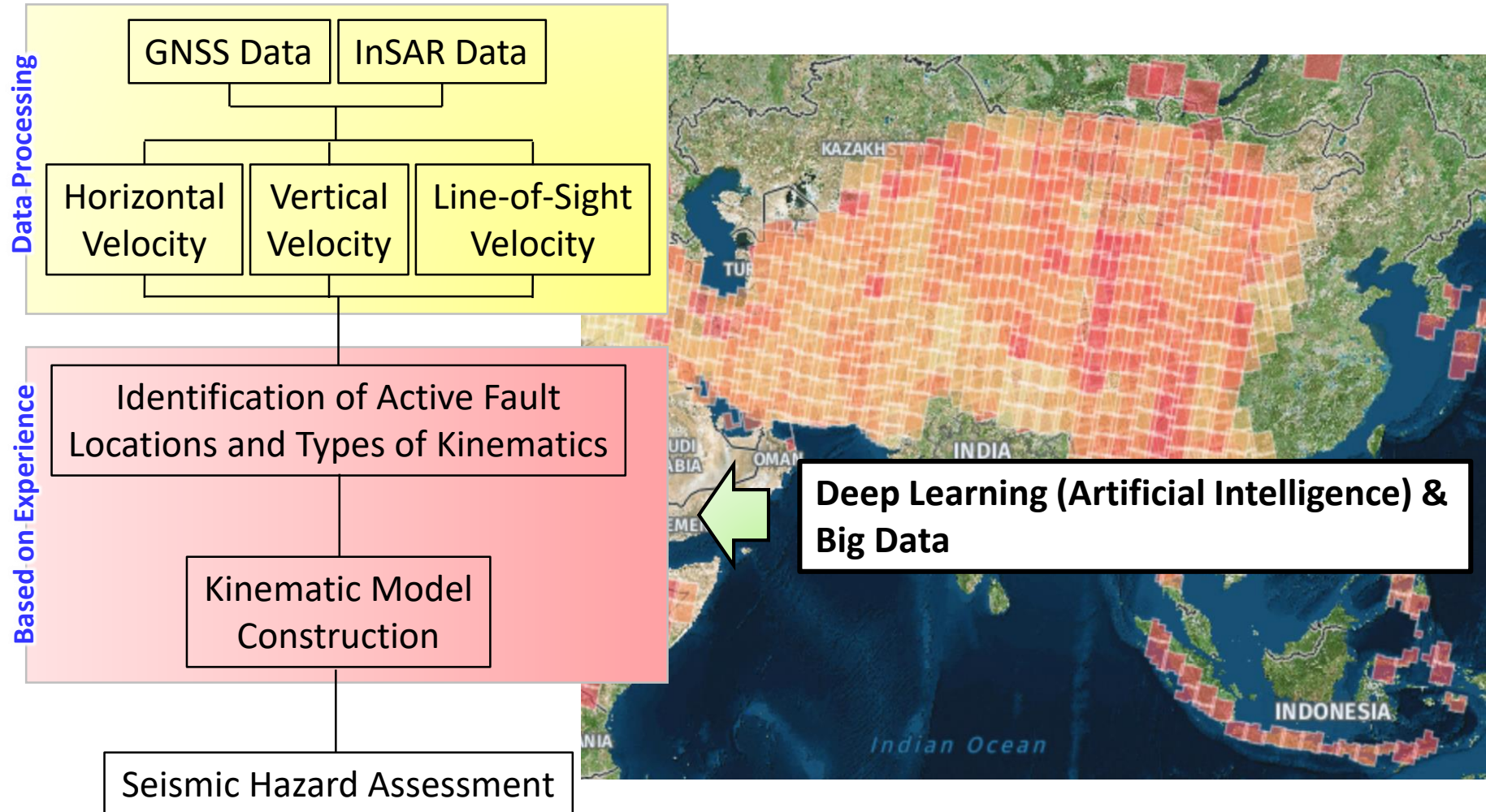


d

Surface Velocity Field in Taiwan 2002-2017



Seismic Hazard Assessment from Geodetic Big Data



Proposed Methods/Procedures

Learning: Synthetic Cases

Deformation pattern identification from InSAR and other geodetic observations

Caused by different types of single faults

Caused by the combination of different fault types

Including the deformation patterns caused by the deep-seated landslides

Linear pattern identification from DEM

Applications: Case Studies

Case Study in Taiwan – Test

Case Study in Indian Himalaya and other areas – Application

Future Works: Time-Dependent Studies

Advances of Engineering Geodesy and Artificial Intelligence in Monitoring of Movements and Deformations of Natural and Man-Made Structures

G. Retscher, G. Mentes, and A. Reiterer

C. Rizos and P. Willis (eds.), *Earth on the Edge: Science for a Sustainable Planet*, International Association of Geodesy Symposia 139, DOI 10.1007/978-3-642-37222-3_64, © Springer-Verlag Berlin Heidelberg 2014

