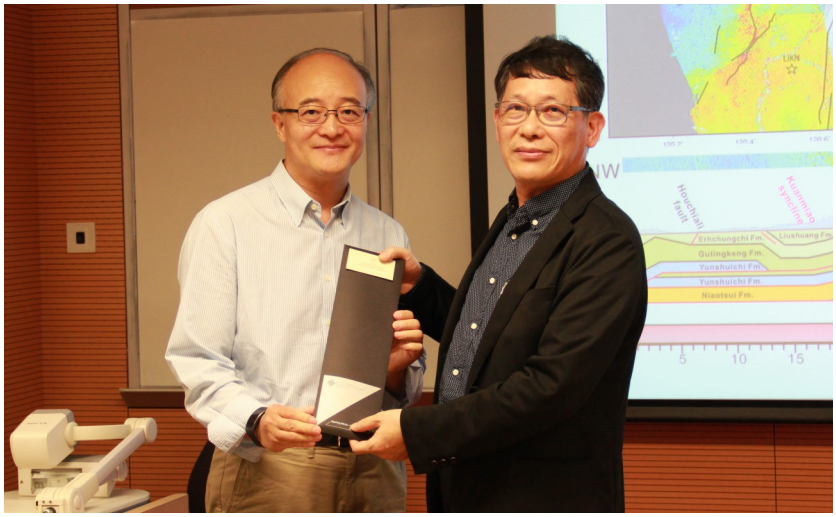
LSGI Distinguished Lecture Series

"High mobility of mud-core anticline responsible for anomalous high deformation rate in fold-and-thrust belt of south western Taiwan"

Overview

It was our pleasure to invite Prof. HU Jyr-Ching, Professor at the Department of Geosciences of the National Taiwan University, Taiwan, to deliver a seminar of the LSGI Distinguished Lecture Series on 10 April 2017.



Abstract

Anomalous high strain accommodation across the fold-and-thrust belt in SW Taiwan are revealed by the Continuous GPS, precise leveling and SAR interferometry. It is surprising to notice that the footwall of Longchuan reverse fault demonstrates a high uplift rate of ~20-30 mm/yr in interseismic period. This anomalous deformation rate might part be related with a ramp duplex located in the footwall of the Longchuan reverse fault and the triggered slip of moderate earthquake in nearby area. A clear evidence of multiple fault slip along a fold-and-thrust belt at 5-10 km depth was triggered by the 2016 Mw 6.4 Meinong earthquake at 15-20 km depth. We hypothesize that the surface coseismic deformation is mainly controlled by a structure related to the shallow detachment at around 5-10 km depth, which a proposed duplex in a region of high pressure and high interseismic uplift rate might be sensitive to stress perturbations induced by moderate lower crustal earthquake. In addition, the mechanical heterogeneity of mudstone in the Gutingkang formation might play a crucial role of anomalous deformation. Consequently, we use an Efficient Unstructured Finite Element method (DynearthSol2D) to simulate and discuss the contrast of viscosity in mudstone and sandstone contributed in deformation pattern and upward mobility. We also want to check the previous hypothesis of mud diapirism and incorporate a new mud-cored anticline model for mechanic explanation of anomalous interseismic deformation occurred in SW Taiwan. The numerical predicts an uplift rate of ~10 mm/yr of active folding related to ramp duplex in the footwall of the Longchuan reverse fault. The uplift rate could reach to ~20 mm/yr with incorporating the high pressure zone in the ramp duplex and a backthrust of the in the footwall of the Longchuan reverse fault, which is in good agreement with the uplift rate from precise leveling. Thus we conclude that the high mobility of mud-core anticline responsible for anomalous high deformation in SW Taiwan.

Prof. HU Jyr-Ching

Highlights of Research:

1. Acquisition of high rate GPS data to monitor the fault activity.
2. Combining InSAR and geodetic measurement for crustal deformation.
3. Developing 3-D distinct element for granular material for the analysis of landslide and fault behavior.
4. 3-D numerical simulations for permutations of stress in brittle tectonics

Affiliations:

Chinese Geophysical Society

Geological Society of China

American Geophysical Union

European Geosciences Union