



應用地質研究所



Graduate Institute of Applied Geology

Seminar

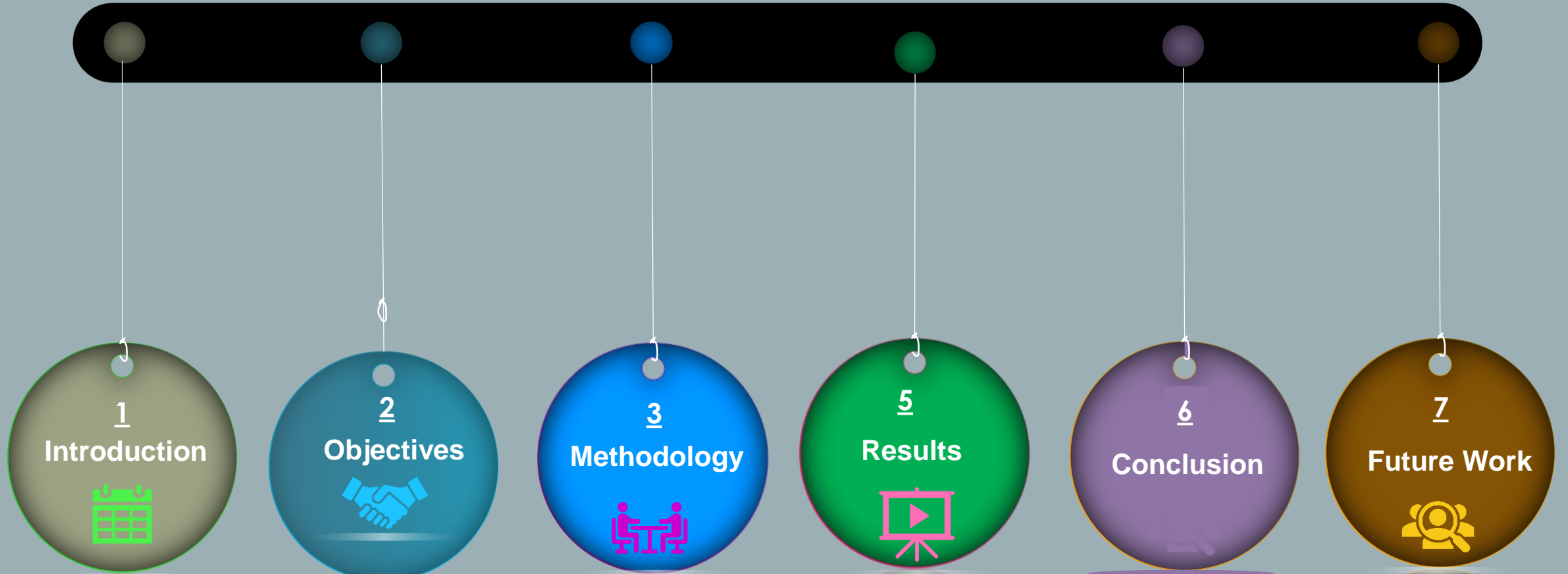
Structural analysis in the actively deforming Erhjen River Basin, southwestern Taiwan with insights on shale tectonics

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Advisor : Maryline Le Beon

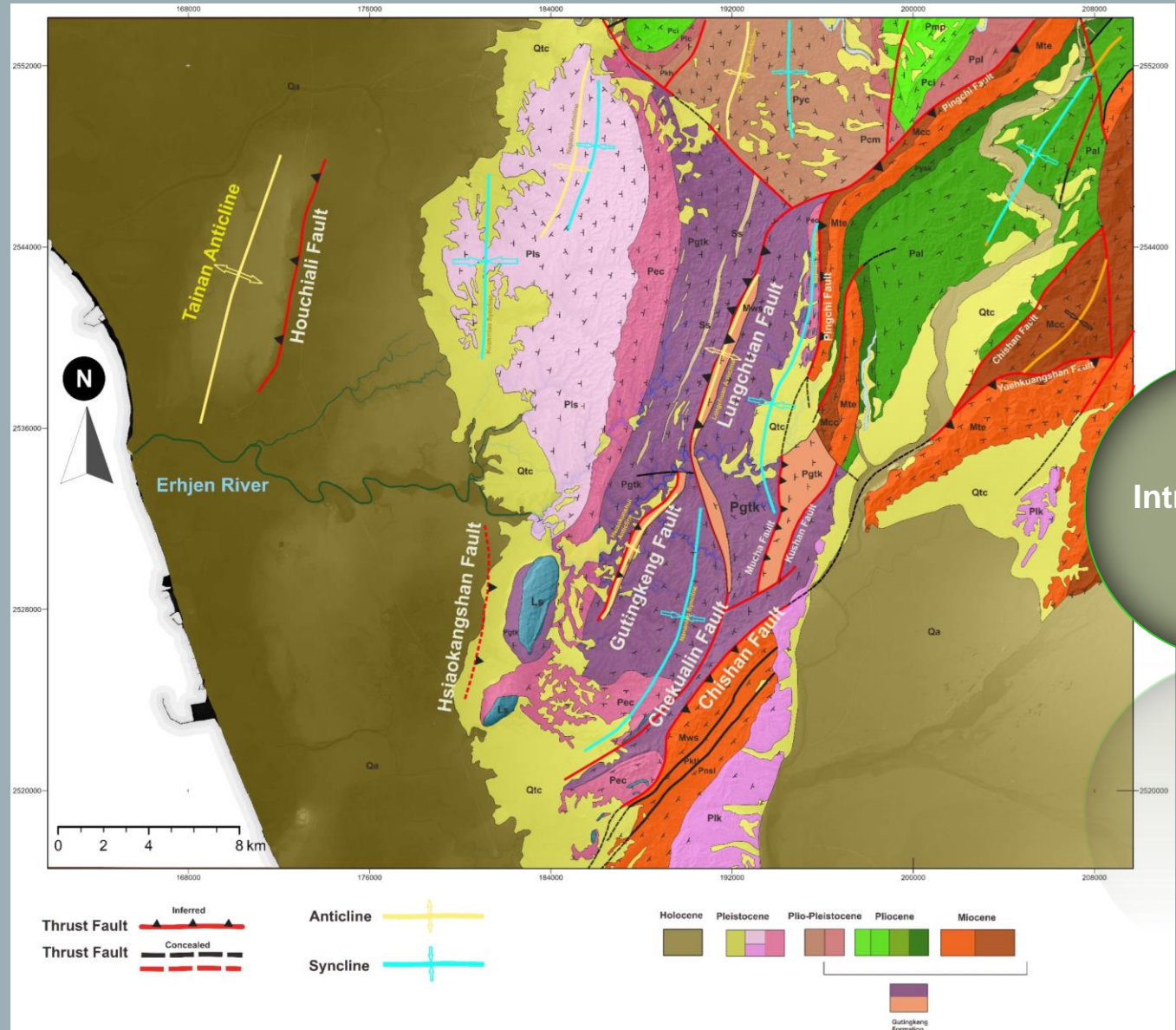
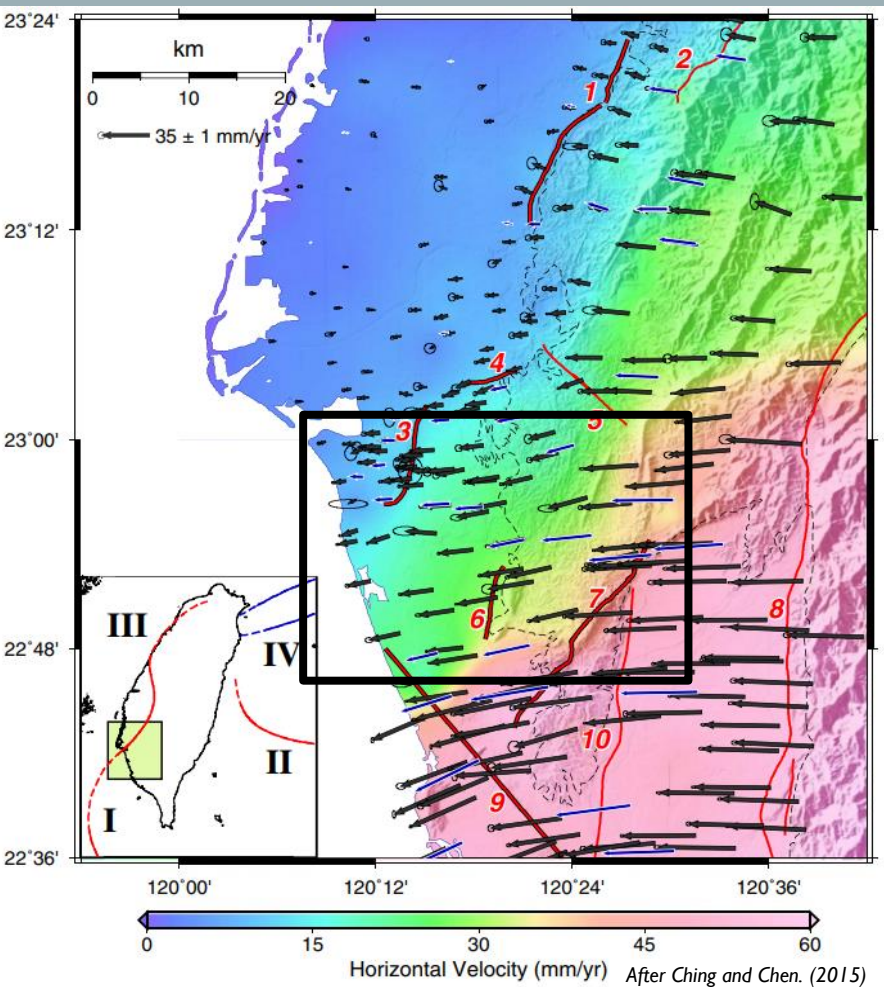
Date : 2023/03/03

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Regional Setting

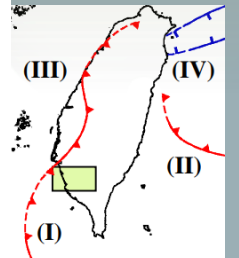
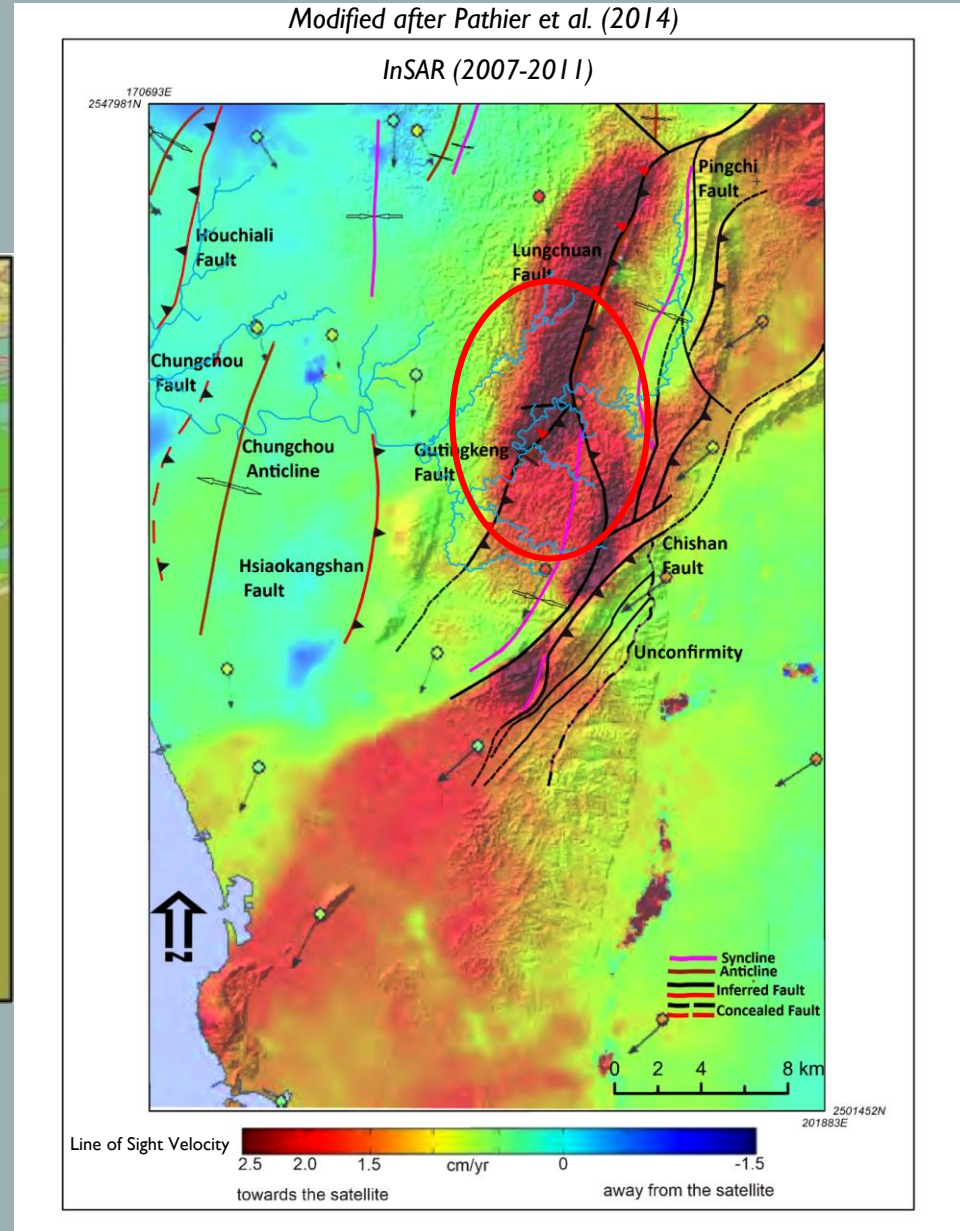
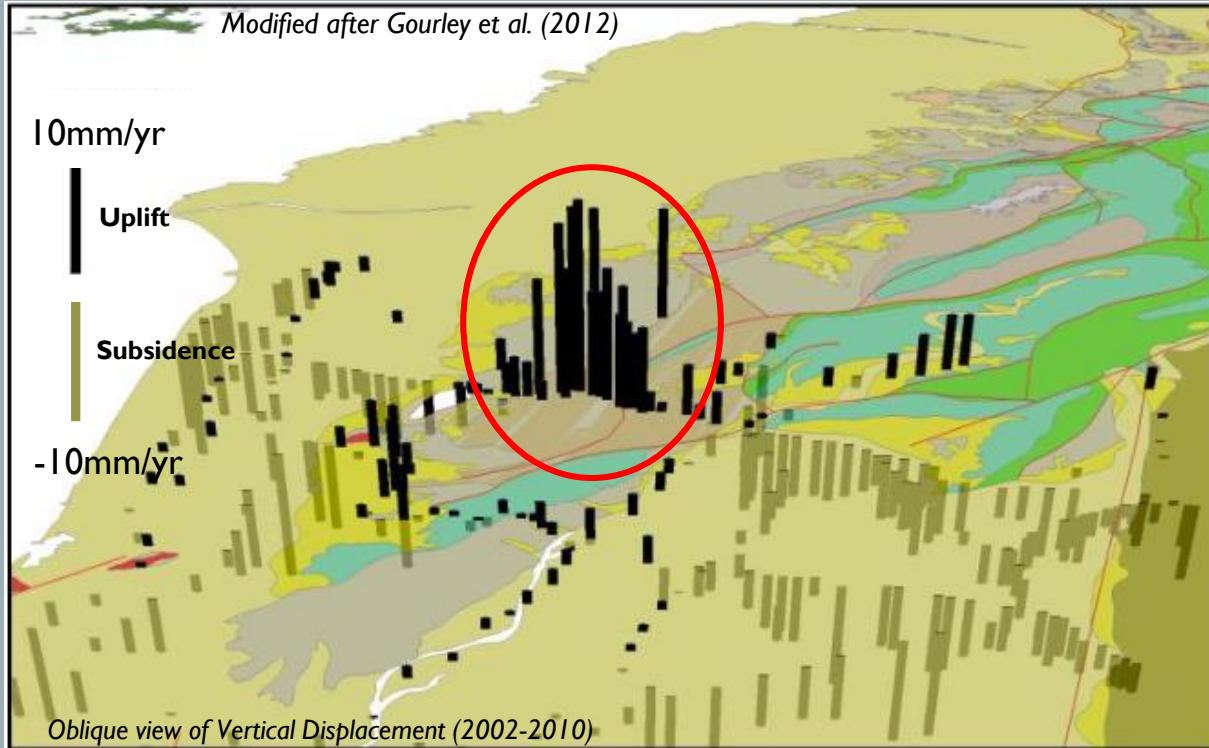
- East of Chishan Fault: 50 mm/yr
- West of Hsiaokangshan Fault: 20 mm/yr
- Area between CHNF and HKSF is absorbing compression of ~30mm/yr = 3cm/yr



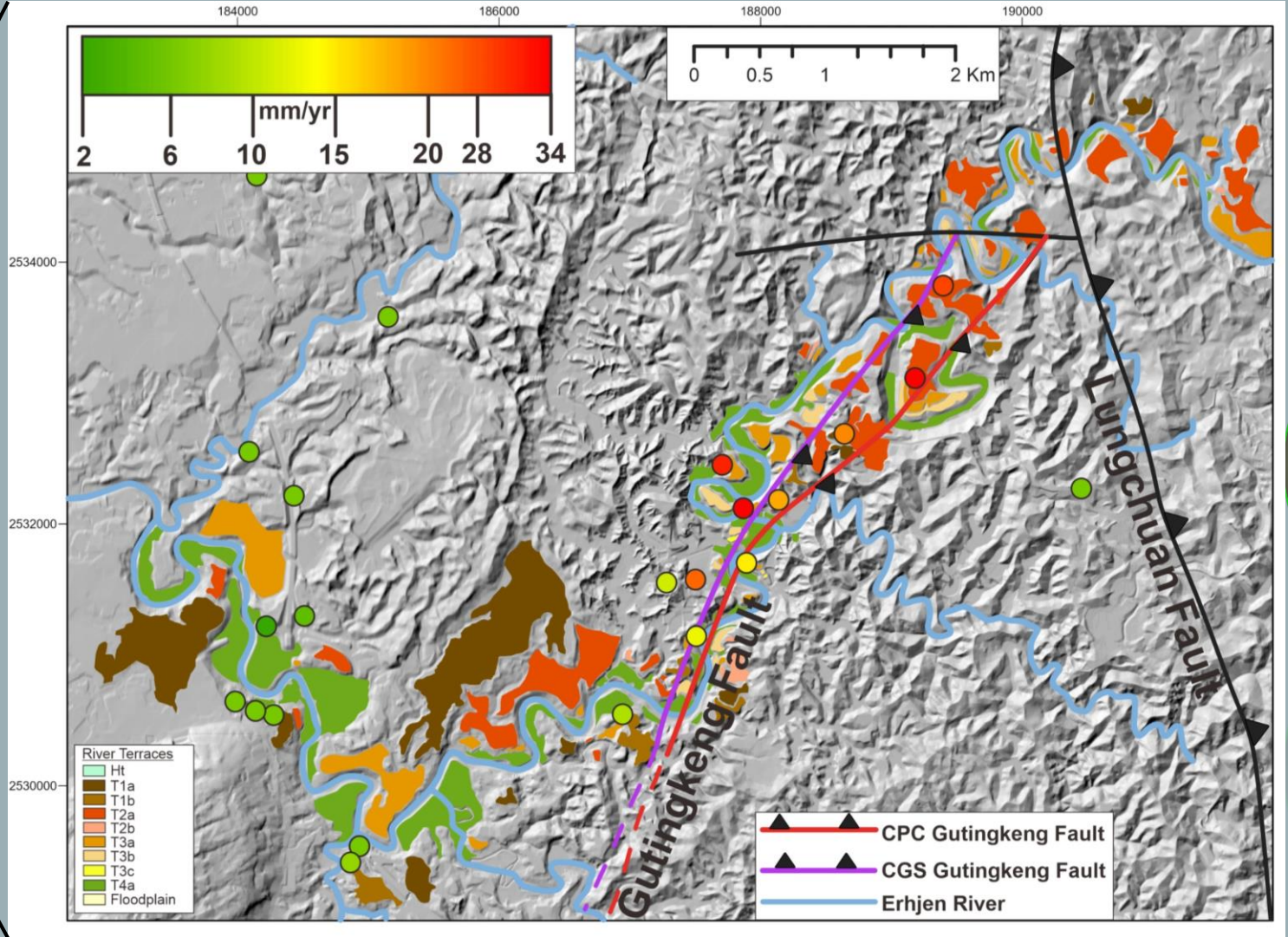
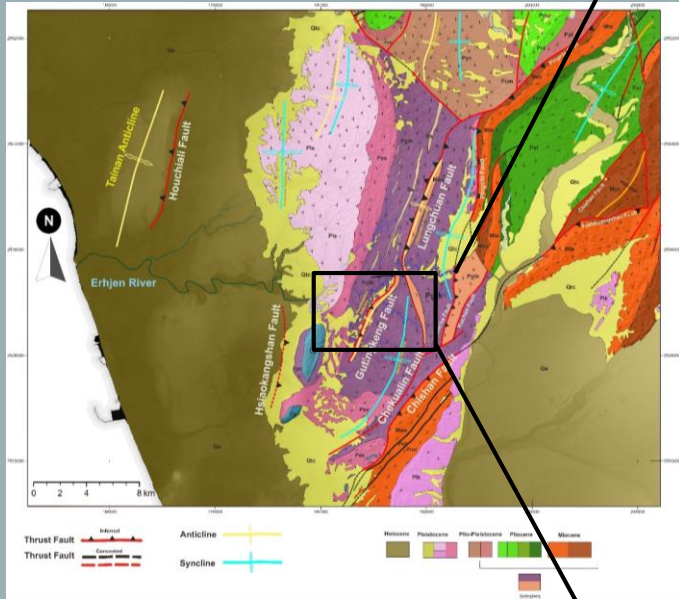
1 Introduction

InSAR and Levelling data

- What are the structures associated with these high uplift rates?



Holocene Deformation



- **Understand the geometry of structures in the study area, regionally**
- **Determine the structures responsible for high deformation in the footwall side**
- **Account for ideas regarding shale tectonics**

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Objectives



Completed

Holocene Deformation

Erhjen River Terraces

Field work-charcoal sample collection
Samples dating and calibration of previous dates
Estimating Incision Rate
Incision Rates throughout the Erjhen River Basin

On-Going

Geometry

Geological Cross-Section

Regional

Field survey in area of high incision and vertical uplift rates

Surface Geology

Holocene Incision rates & vertical uplift rates

Local

Attitude data, Nanno-stratigraphy, borehole data, seismic data, gravity data
Constructing a geological cross-section

Future

Shale Tectonics

Deformation Mechanism

We will try to gain more comprehension on shale tectonics



Geometry

Geological Cross-Section

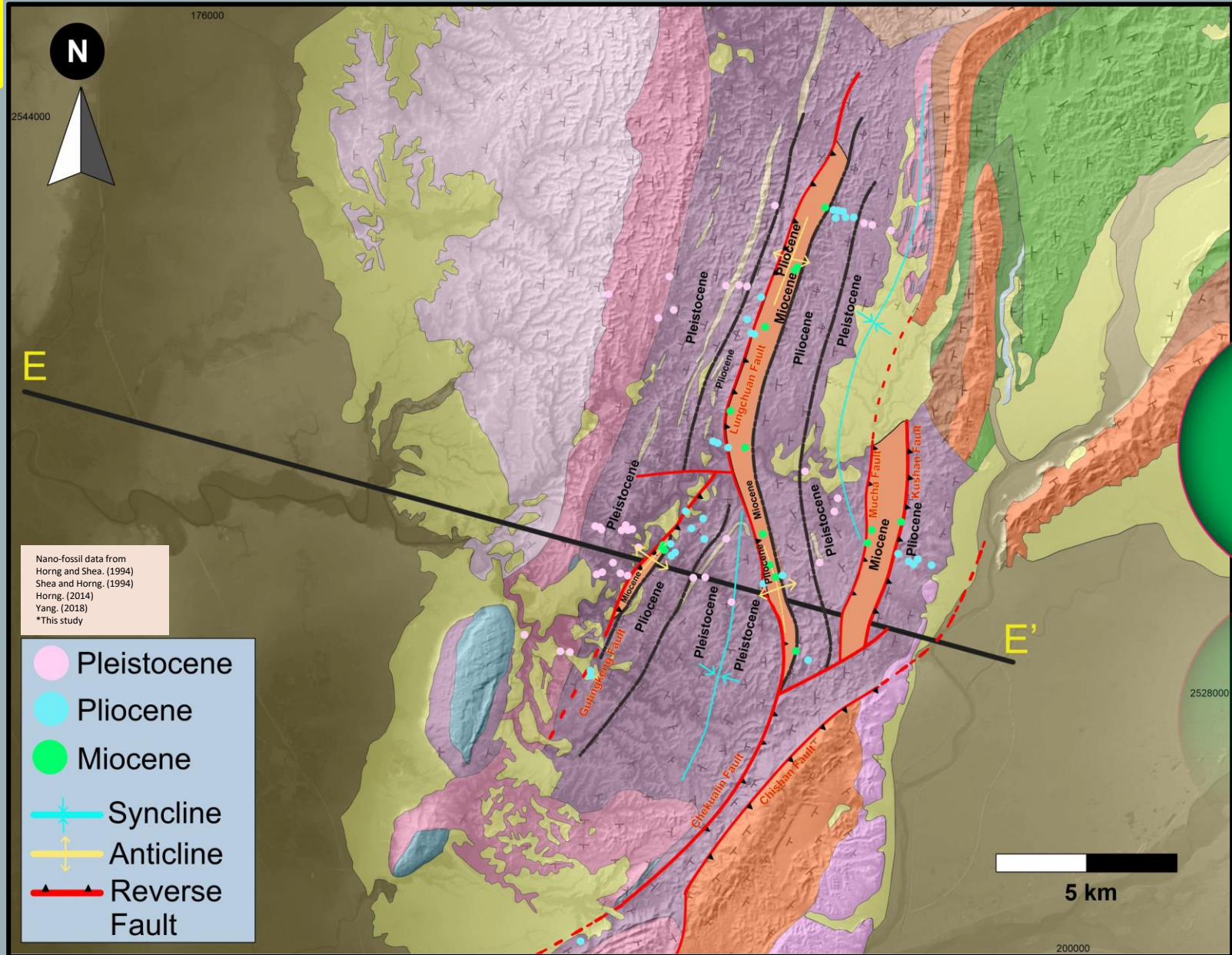
Nanno stratigraphy

A very crucial constraint for Understanding structures in Gutingkeng Formation and drawing a geological cross-section

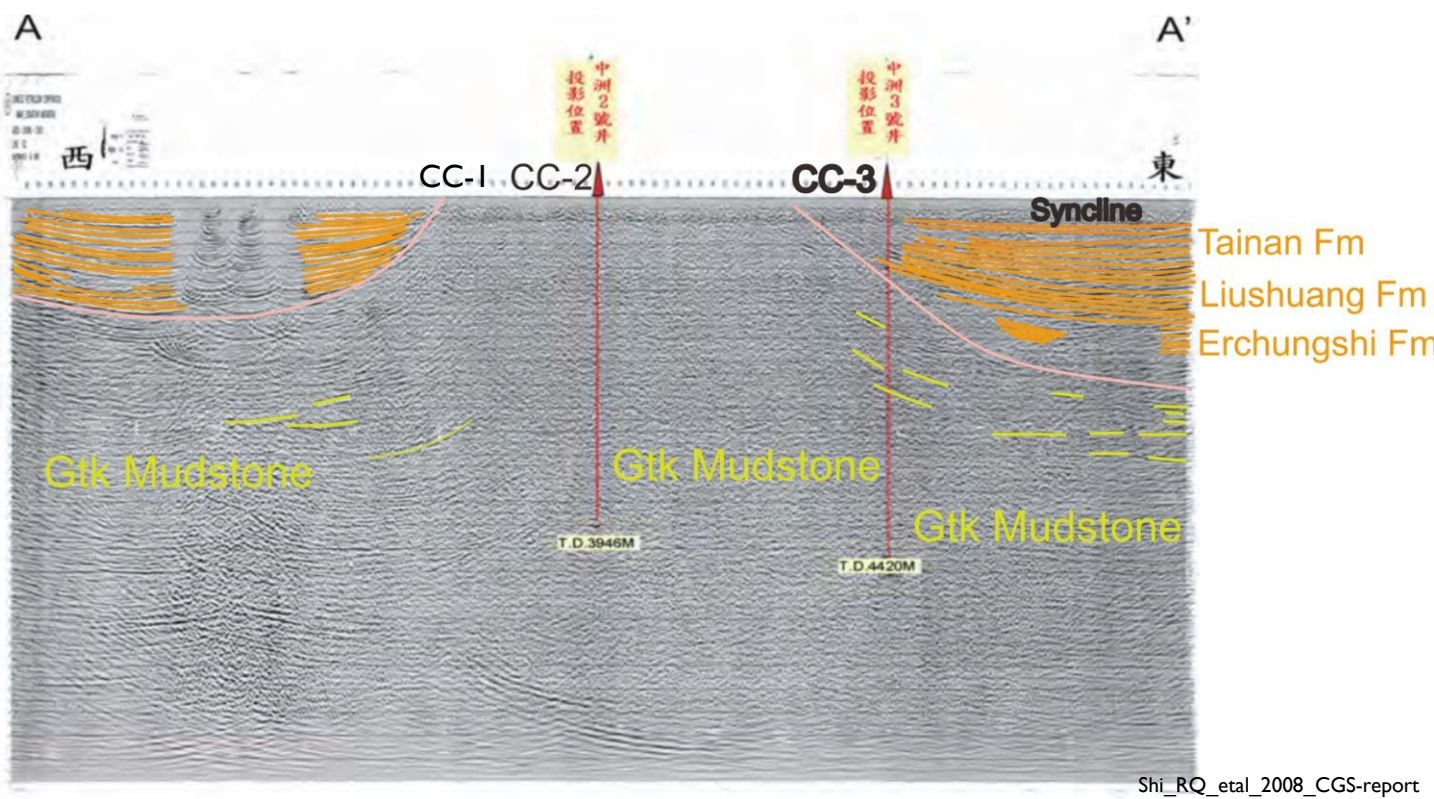
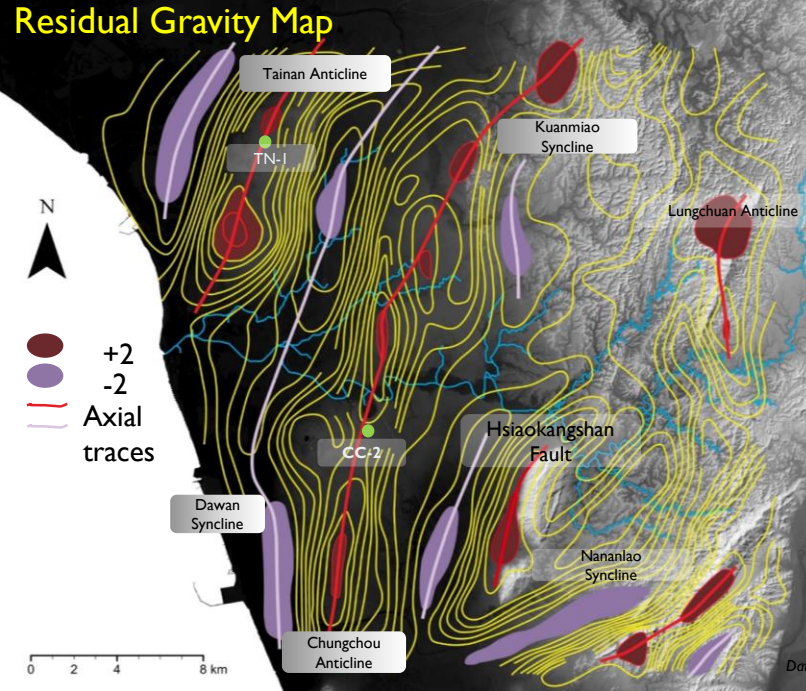
Early Pleistocene	NN 19
— 2.58 Ma	
Late Pliocene	NN 18 NN 17 NN 16
Early Pliocene	NN 15 NN 14 NN 13
— 5.33 Ma	NN 12
Late Miocene	NN 11

Based on Horng and Shea. (1994)

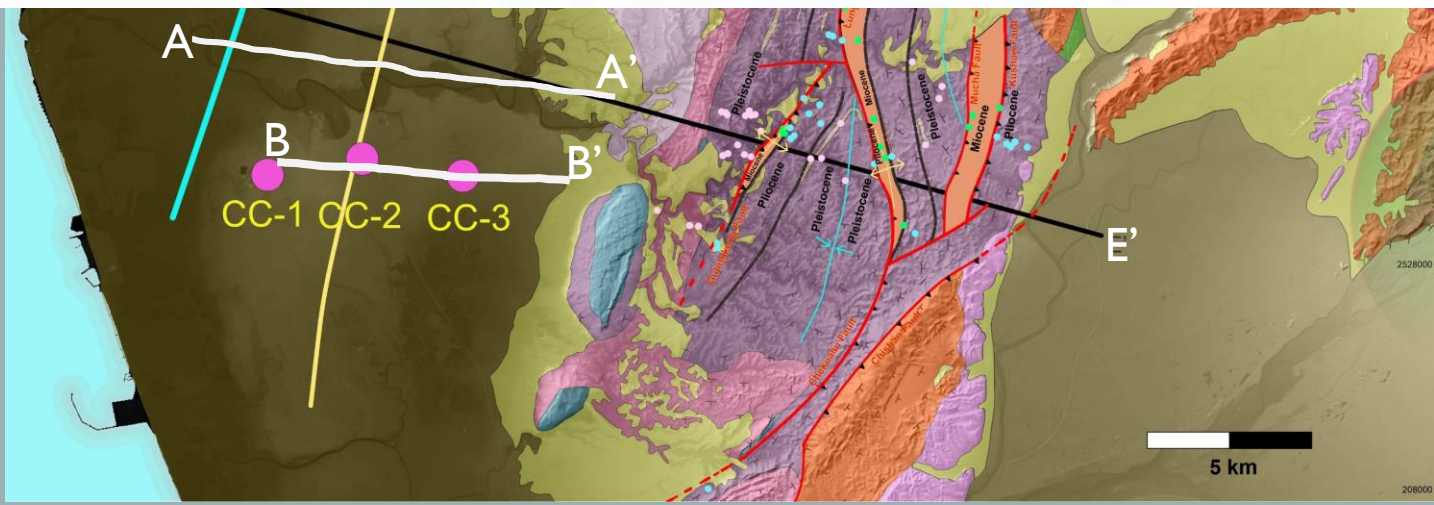
Gutingkeng Formation Age:
Early Miocene- Late Pleistocene



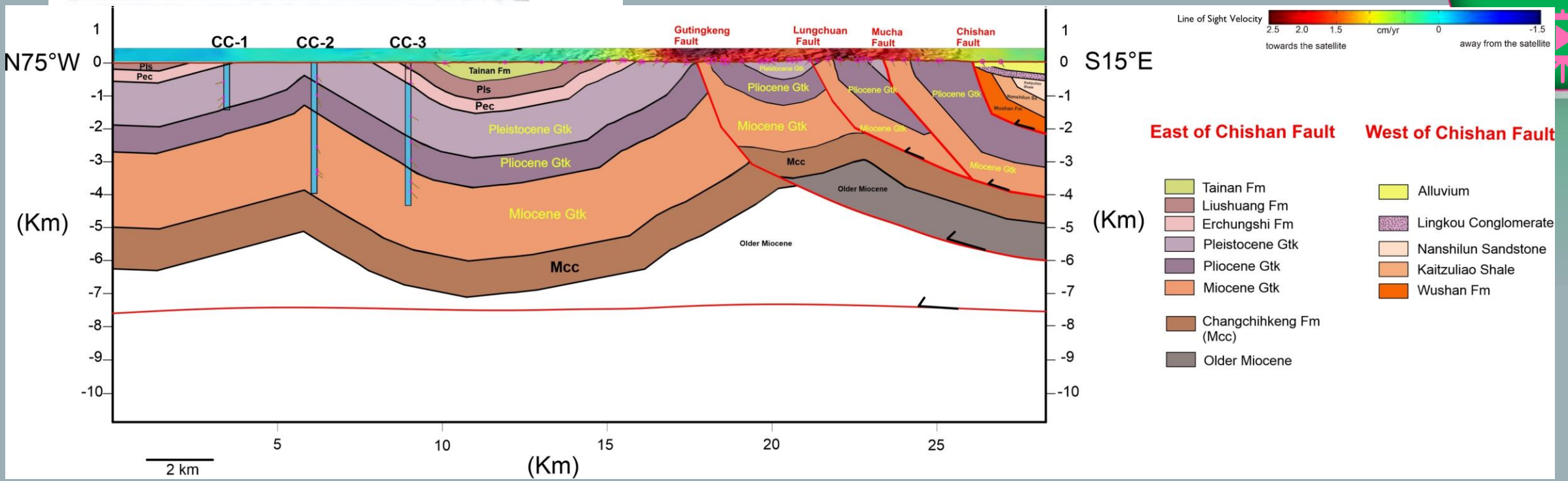
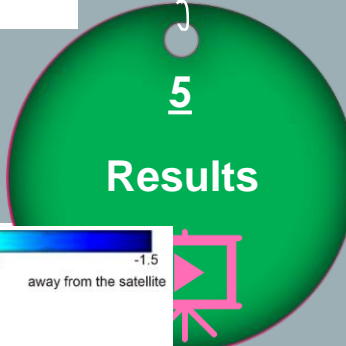
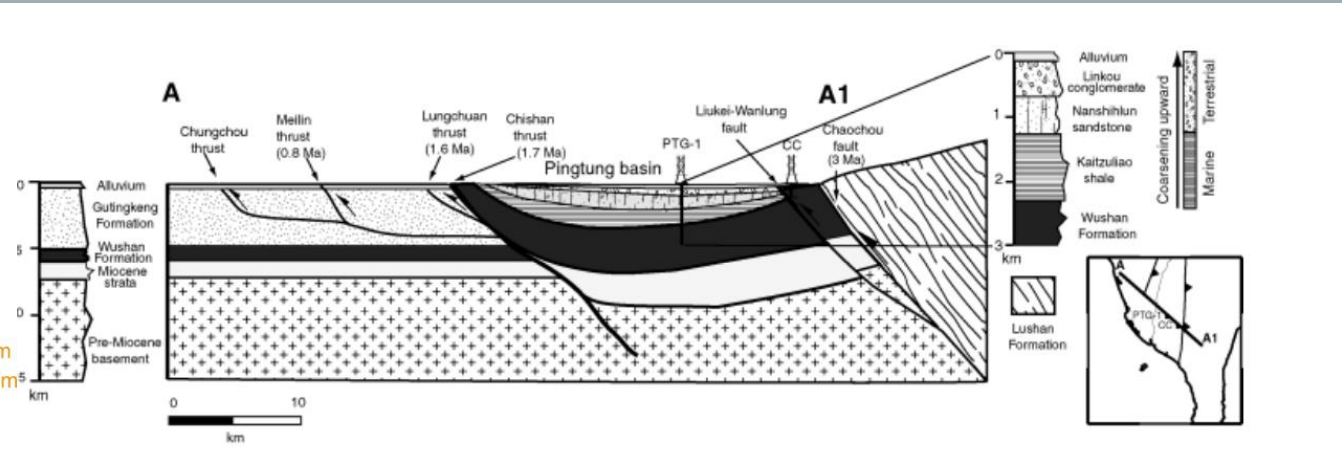
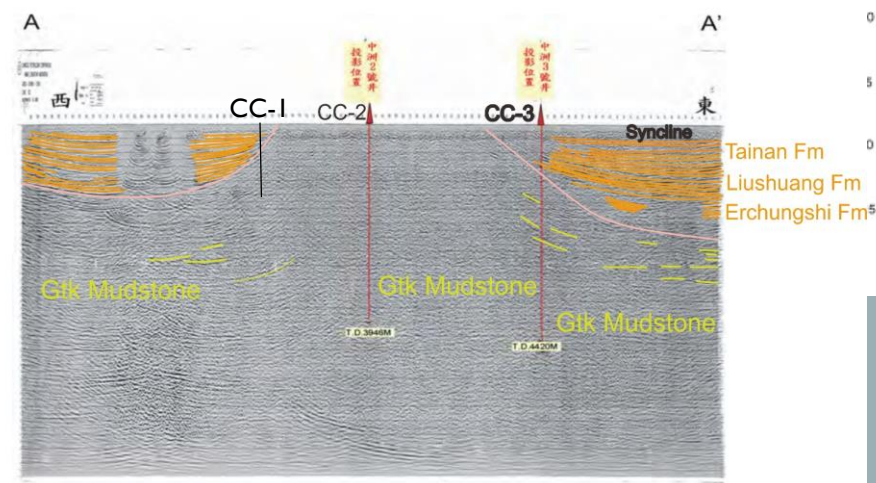
Residual Gravity Map



Shi_RQ_etal_2008_CGS-report

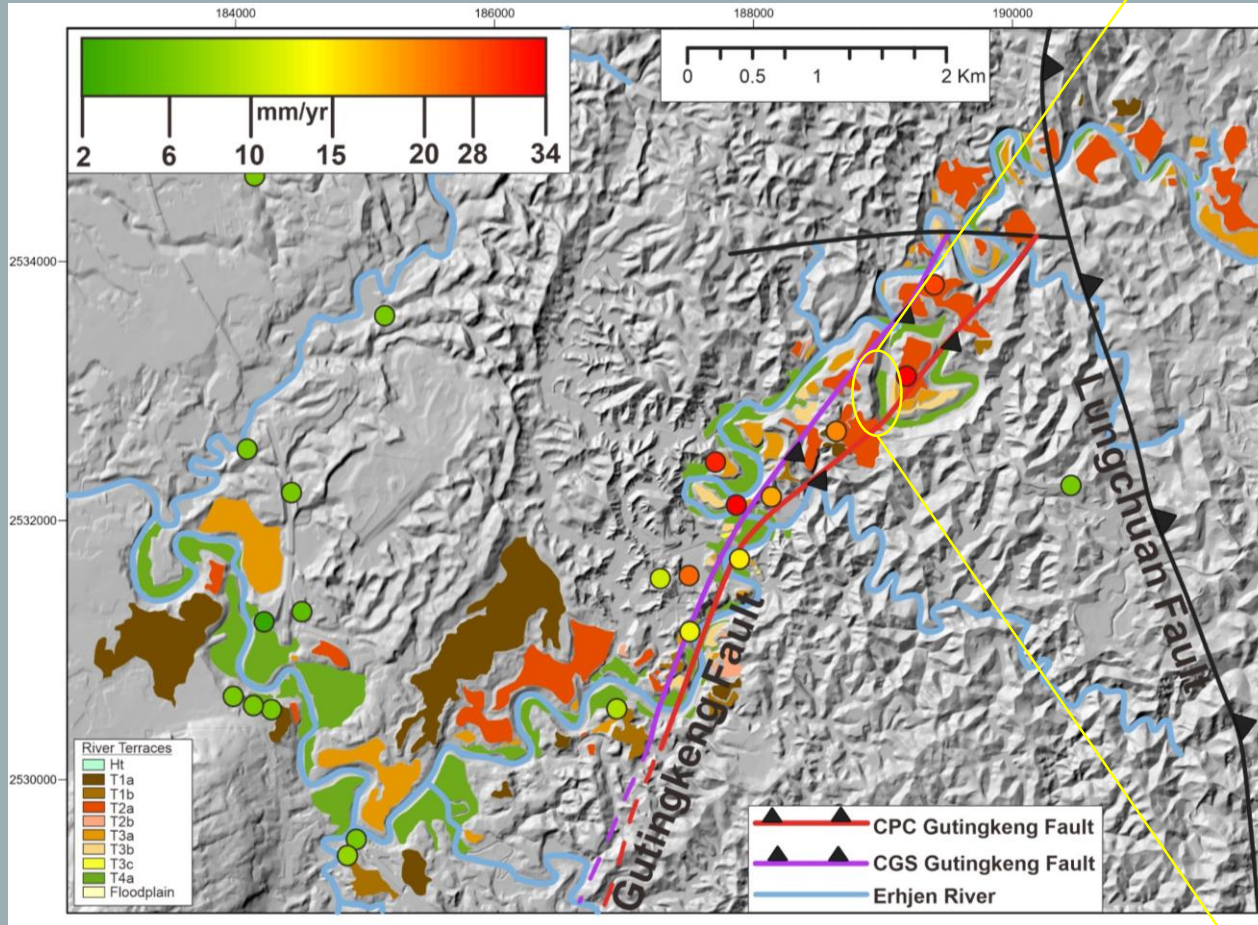


Geological Cross-Section

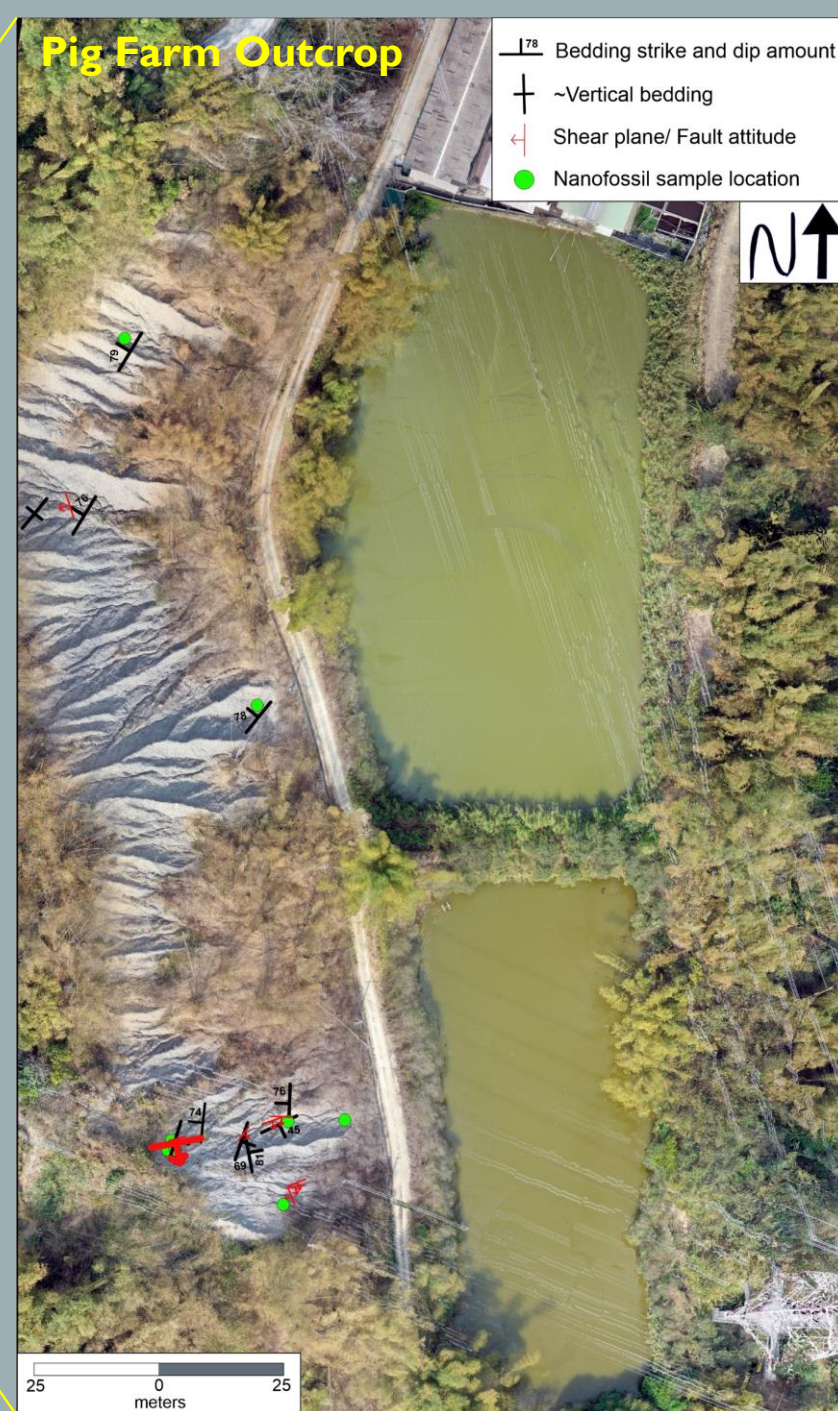


Surface Geology

Holocene Incision rates & uplift rates



Pig Farm Outcrop



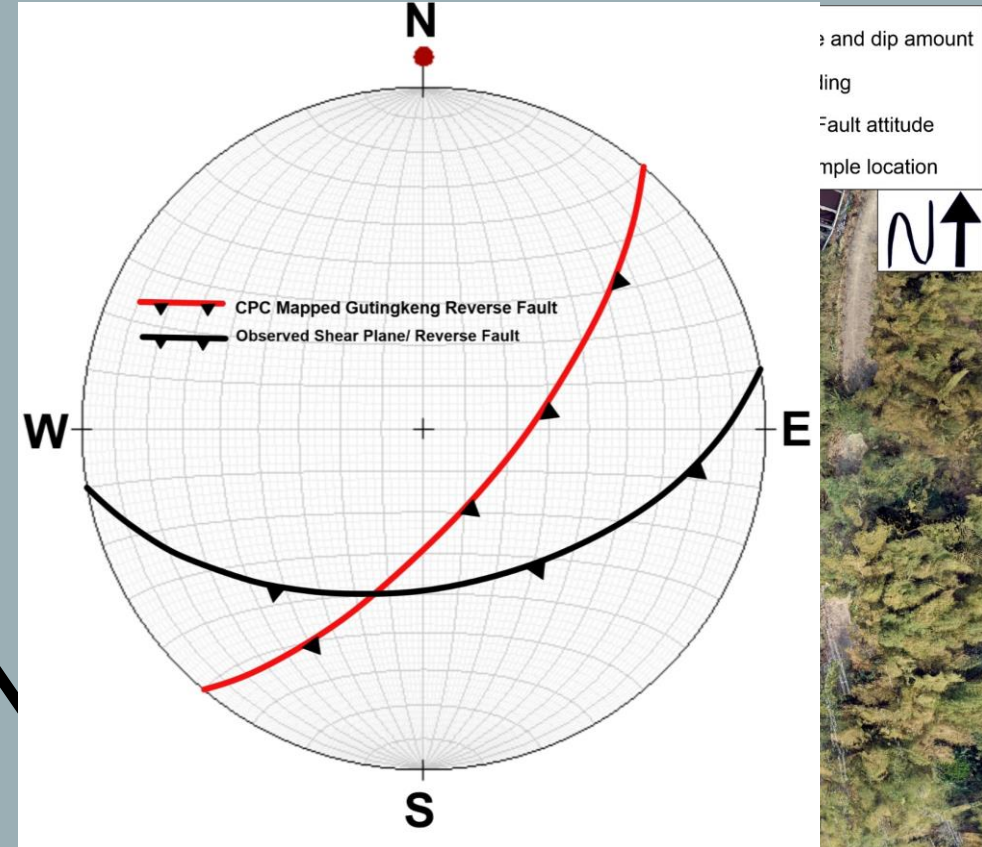
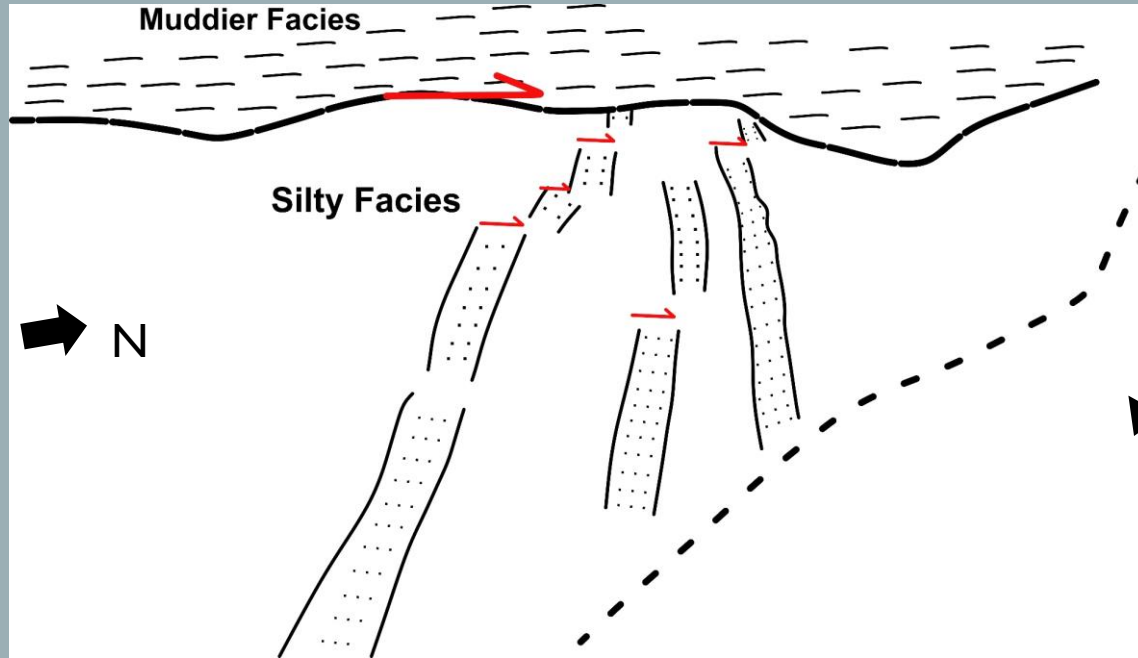
5

Results

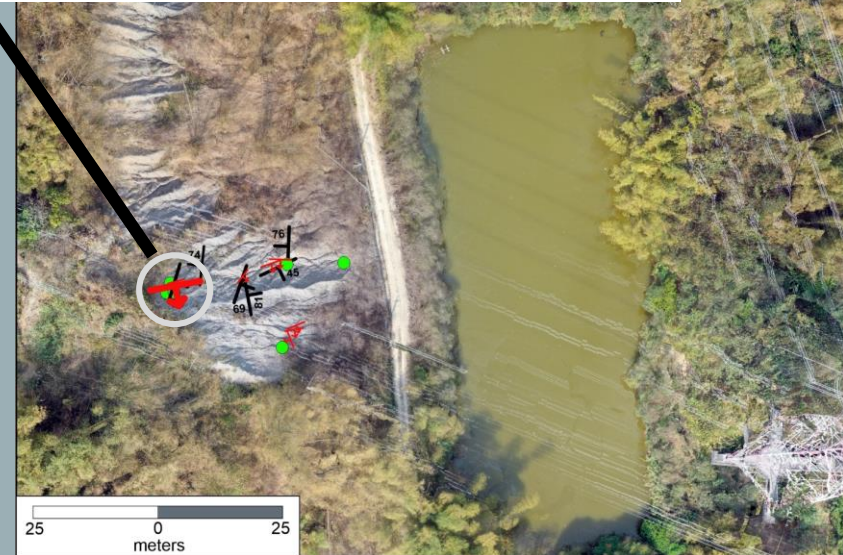


Surface Geology

Holocene Incision rates & uplift rates



- ❑ 10s of meters of displacement
- ❑ Reverse Fault possibly branching from Gutingkeng Fault



5 Results

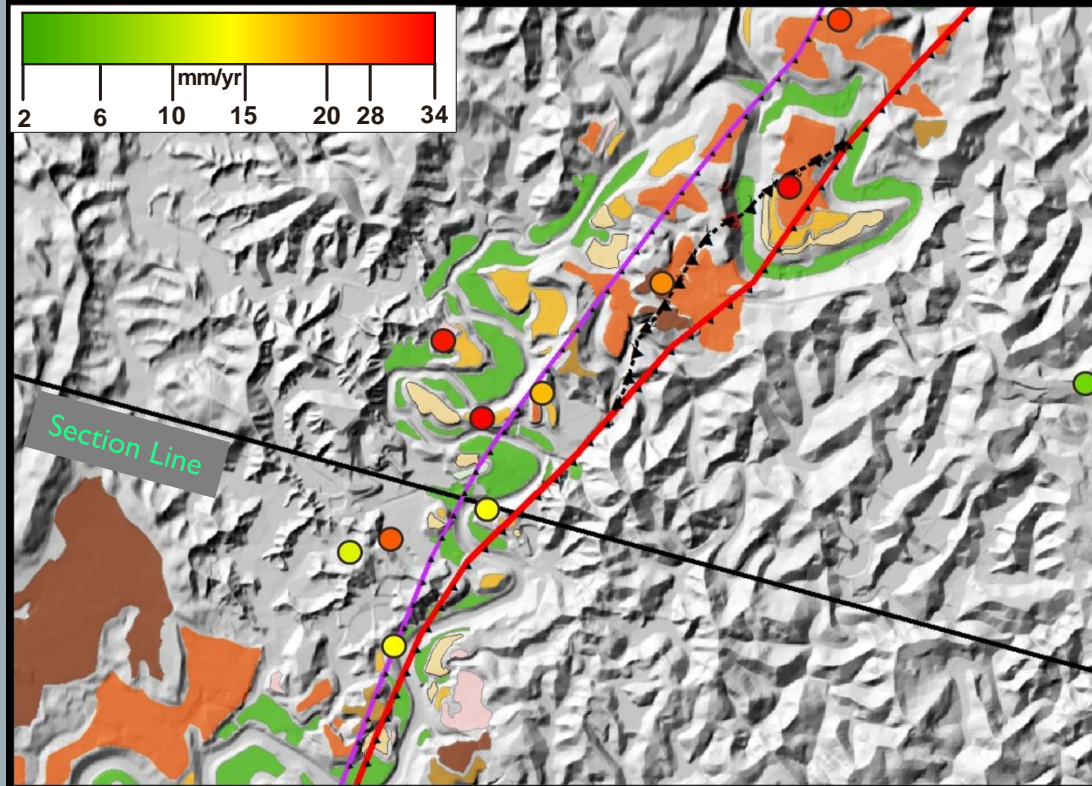
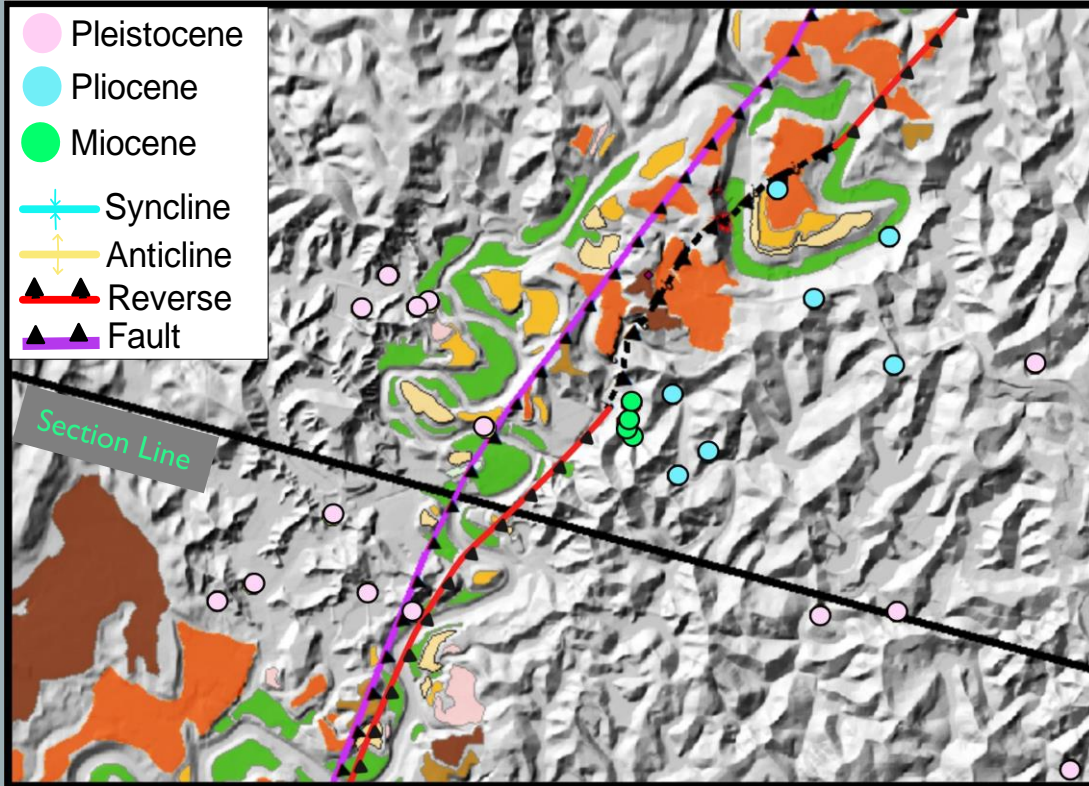
Holocene Incision rates & uplift rates

inferred reverse fault:



Nannofossils age map

Incision rate map



5 Results

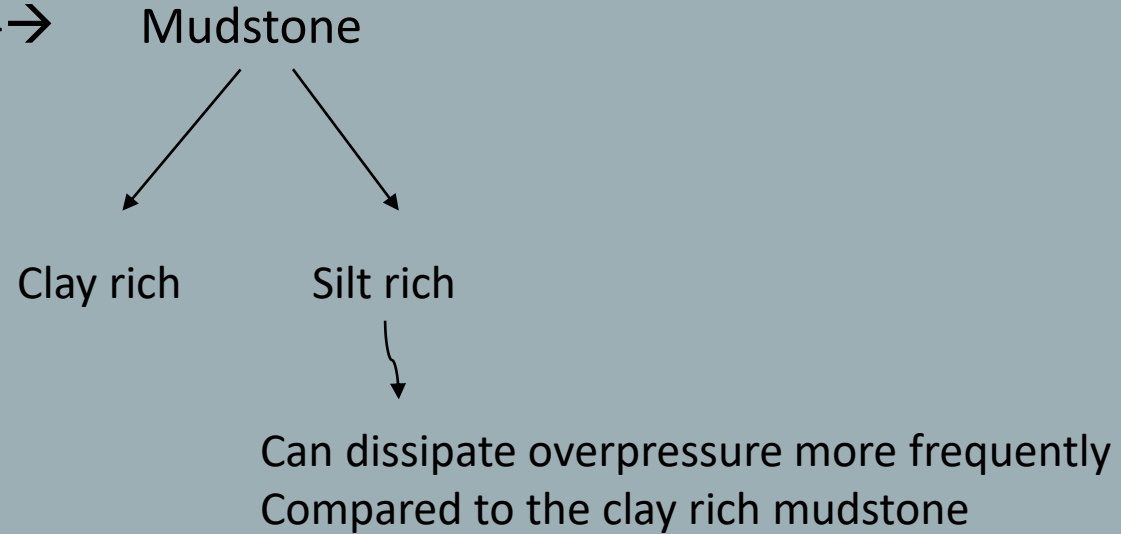
☐ Might be a continuation of Gutingkeng Fault

☐ Reverse Fault possibly branching from Gutingkeng Fault

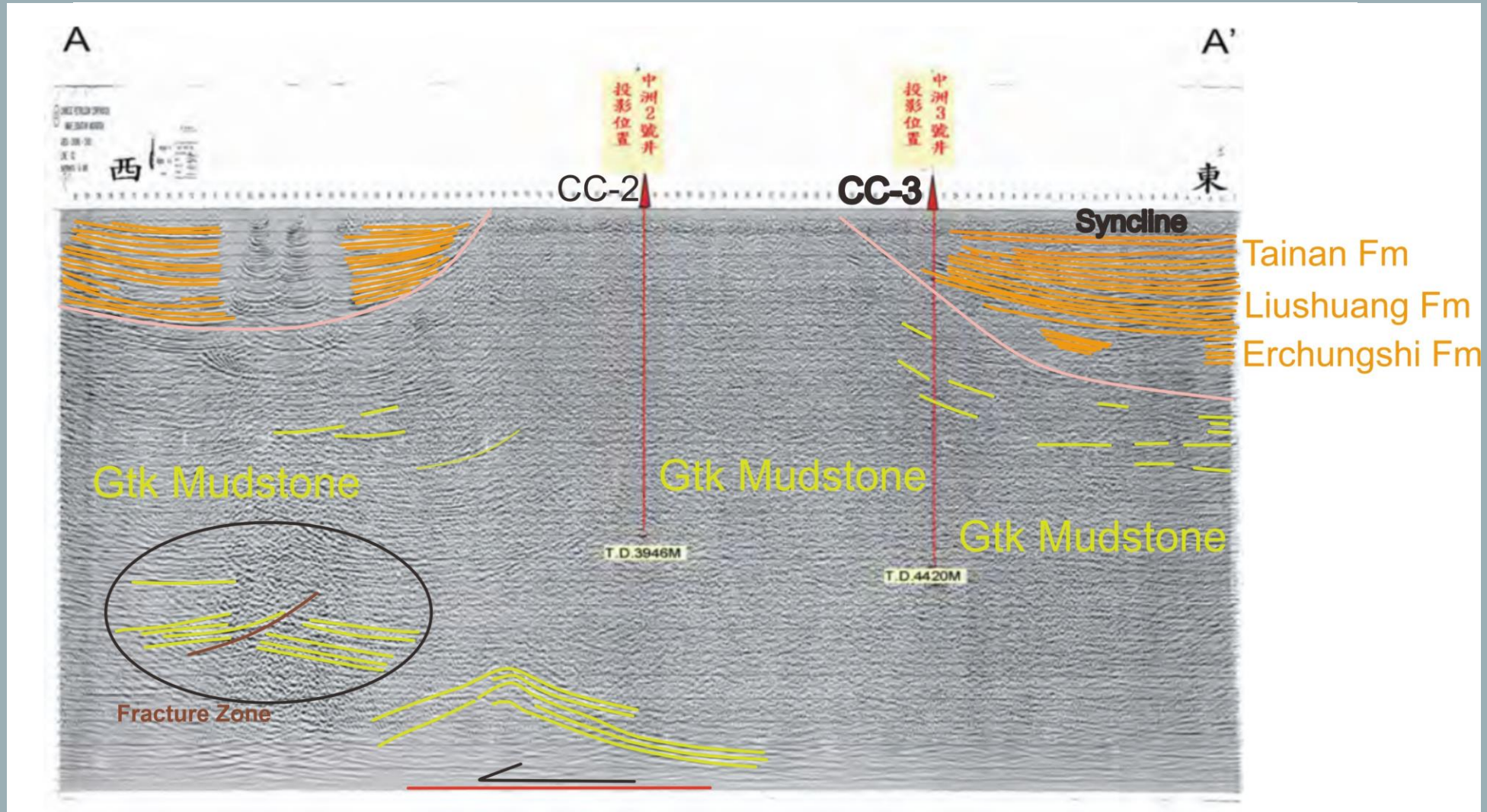
Deformation Mechanism

Requirements

- i) Compressional Tectonics
- ii) Rapid burial/ High sedimentation rates
- iii) Fine grained sediments ---→



Deformation Mechanism



5

Results



We propose the presence of an active thrust fault possibly branching from the Main Gutingkeng Fault or it might be the continuation of the Gutingkeng Fault

Our approach using nanno-stratigraphy for constructing the geological cross-section is useful in better understanding of the structural geometries in Gutingkeng Formation

Mucha Fault could be a bedding-parallel fault as it connects to Pingchi fault in the North which is a bedding-parallel fault

Gutinskeng Fault thrusts from ~6 km deep detachment

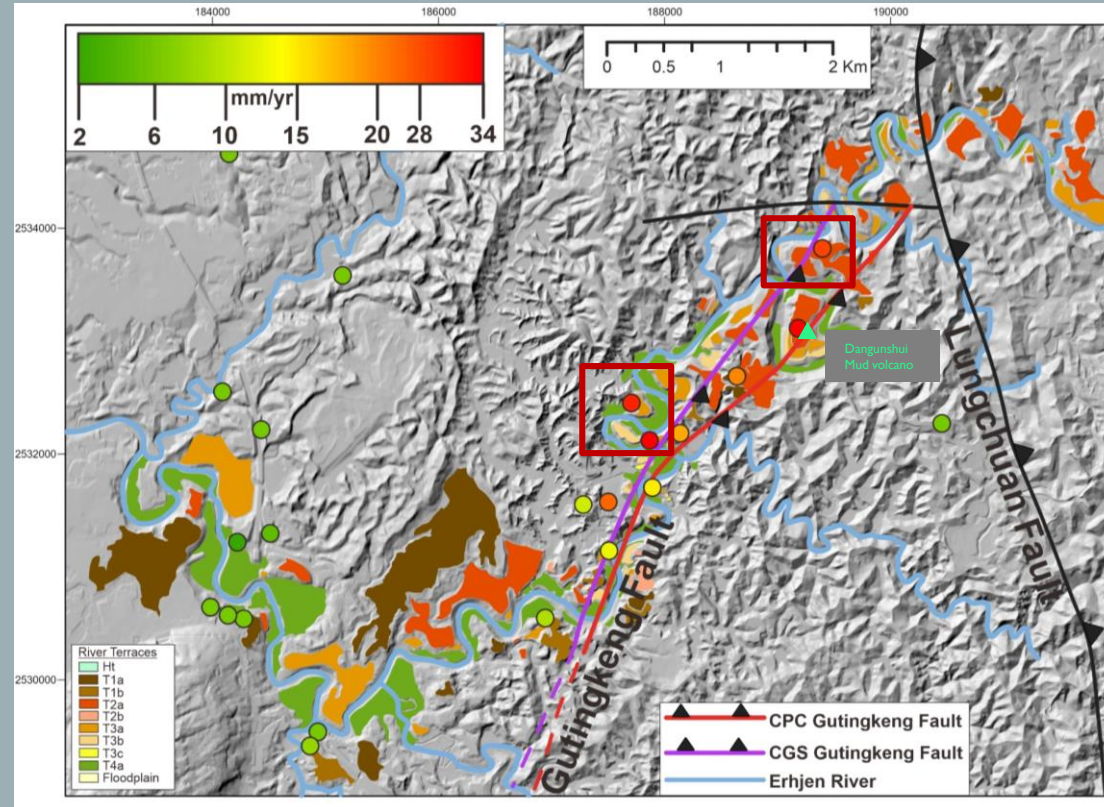
Mucha Fault and Lungchuan Fault lie on the Same detachment ~4 km deep



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Conclusion

- Obtain ages of Nano fossils collected in the pig farm outcrop and validate our interpretation
- Improve Geological Cross-Section and fine tune parts of section in coastal plain using available seismic data
- Conduct further field survey in the other areas of active uplift and high incision rate
- How deformation associated with mobile shale can be comprehended for the case of southwestern Taiwan



Z

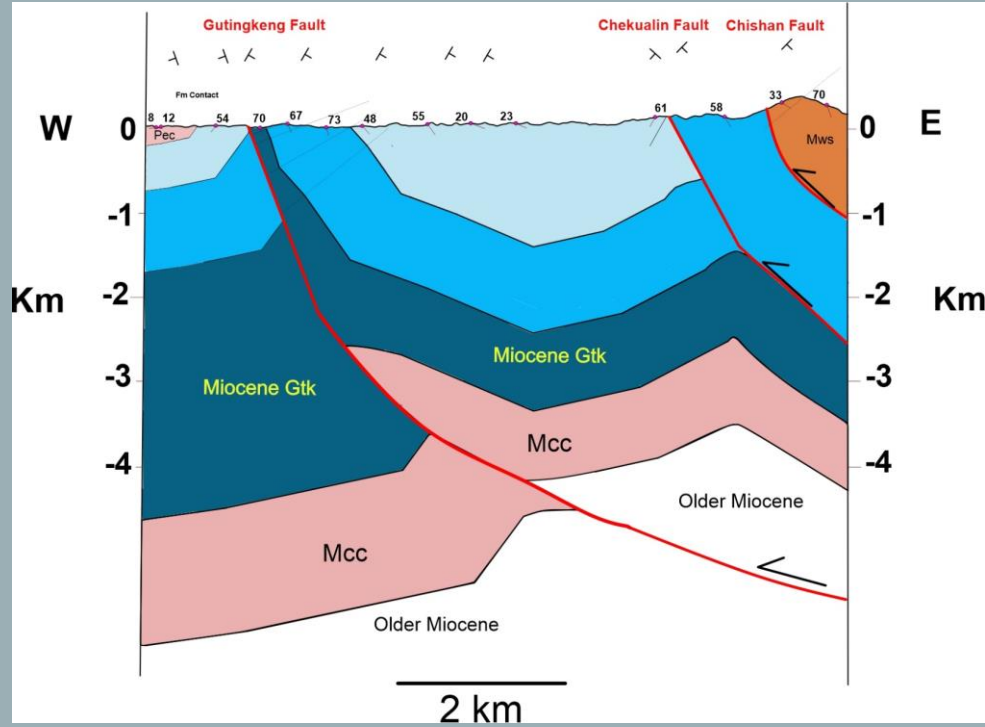
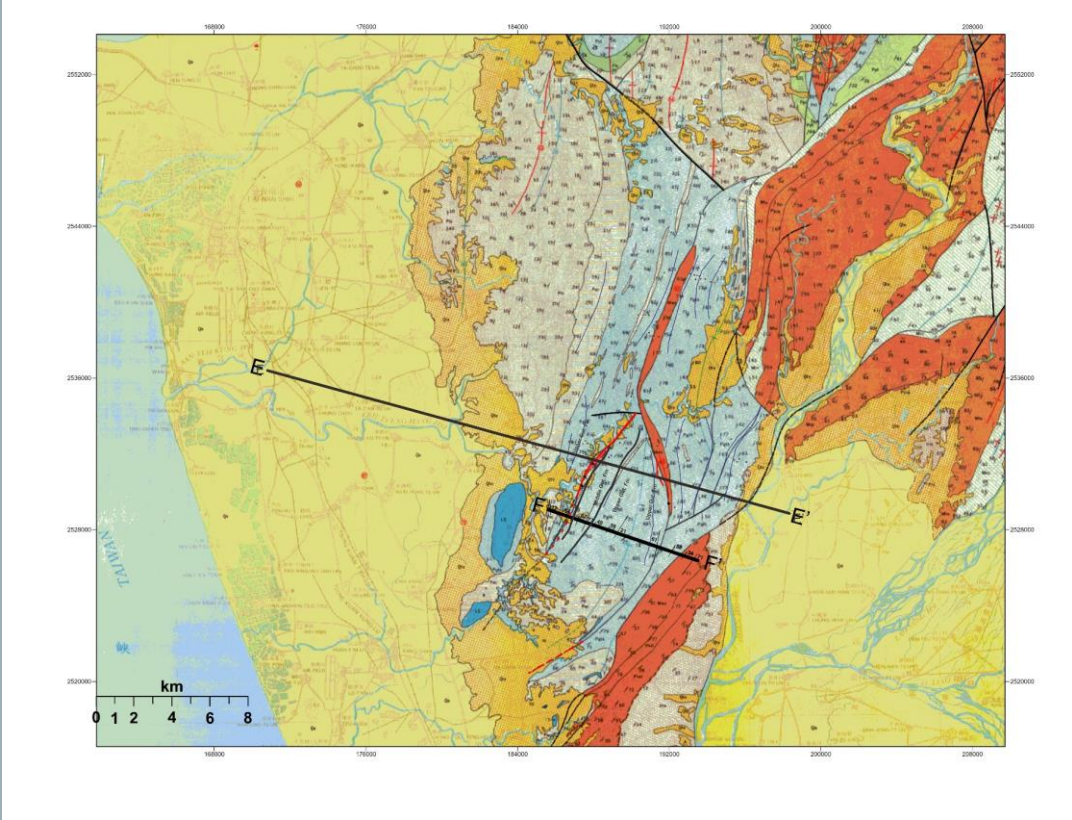
Future Work

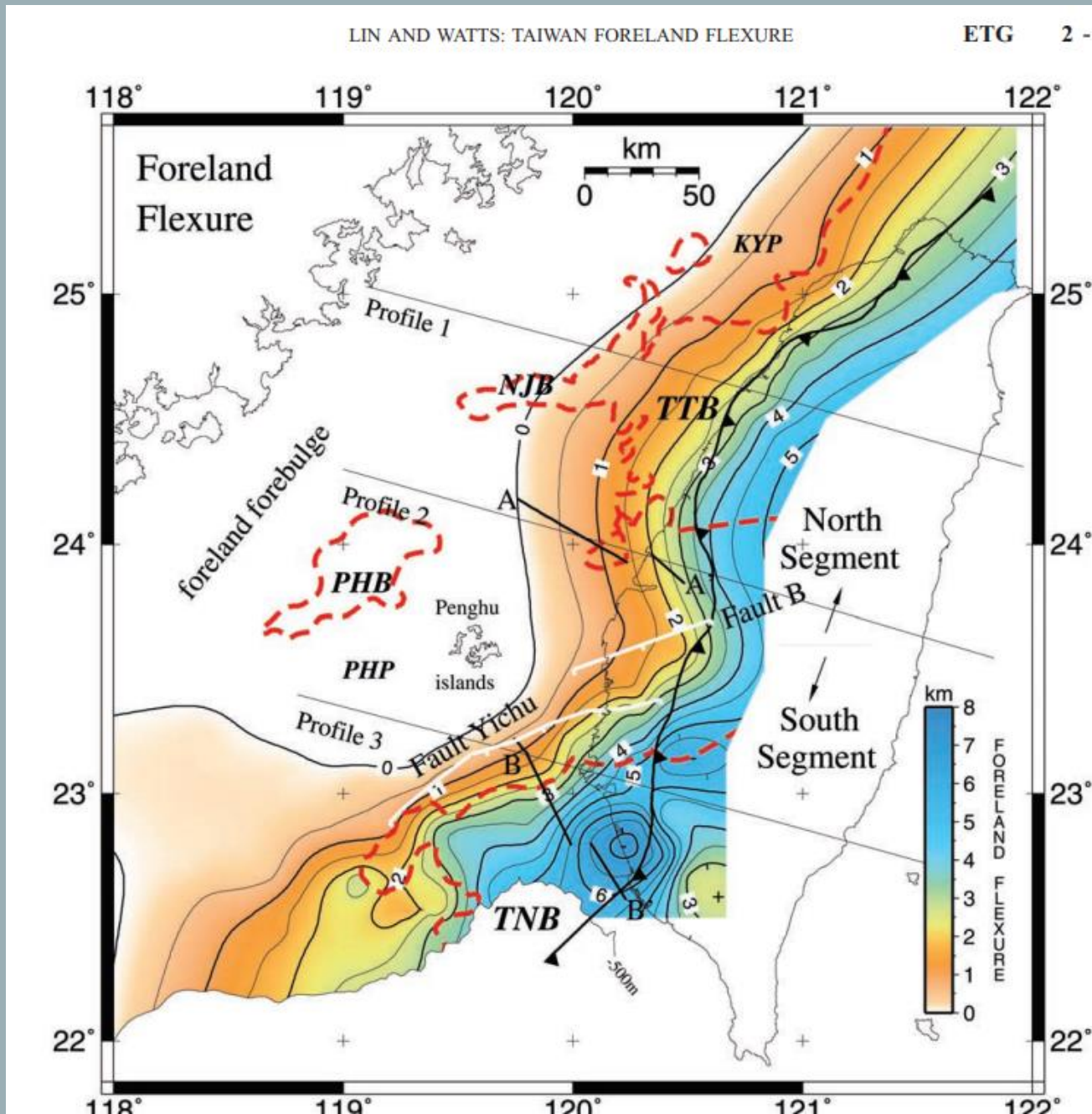


Thank You
For Your Attention!

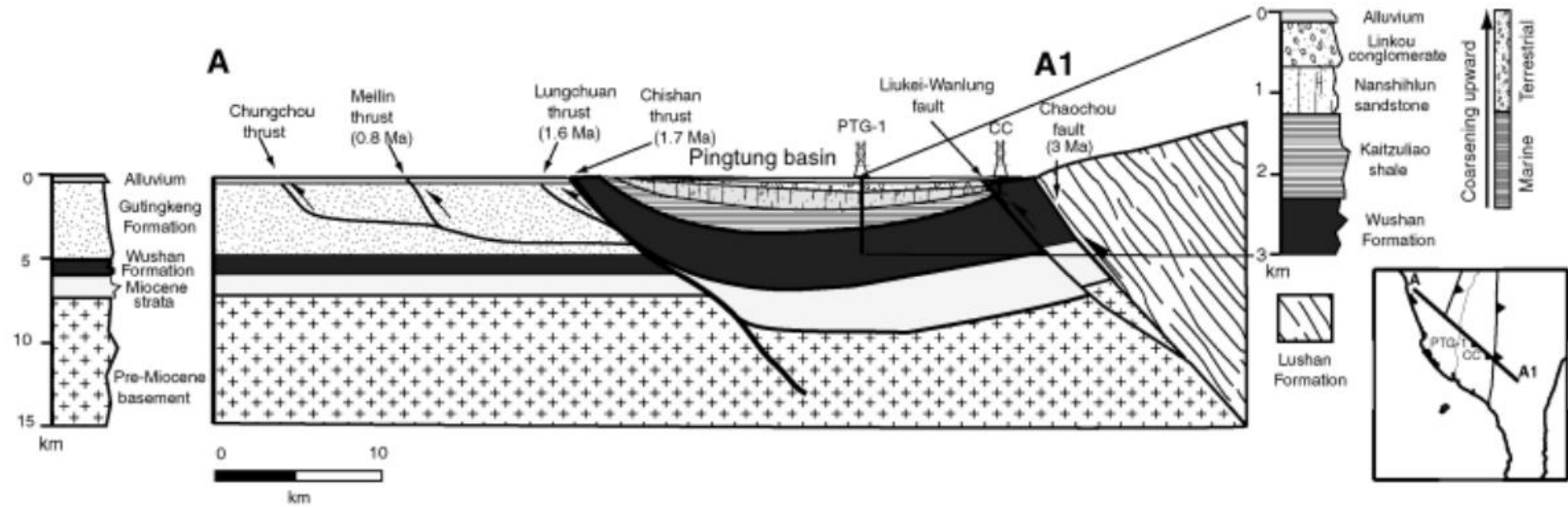
Any Questions



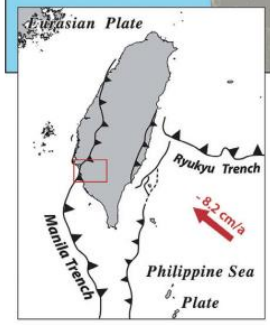
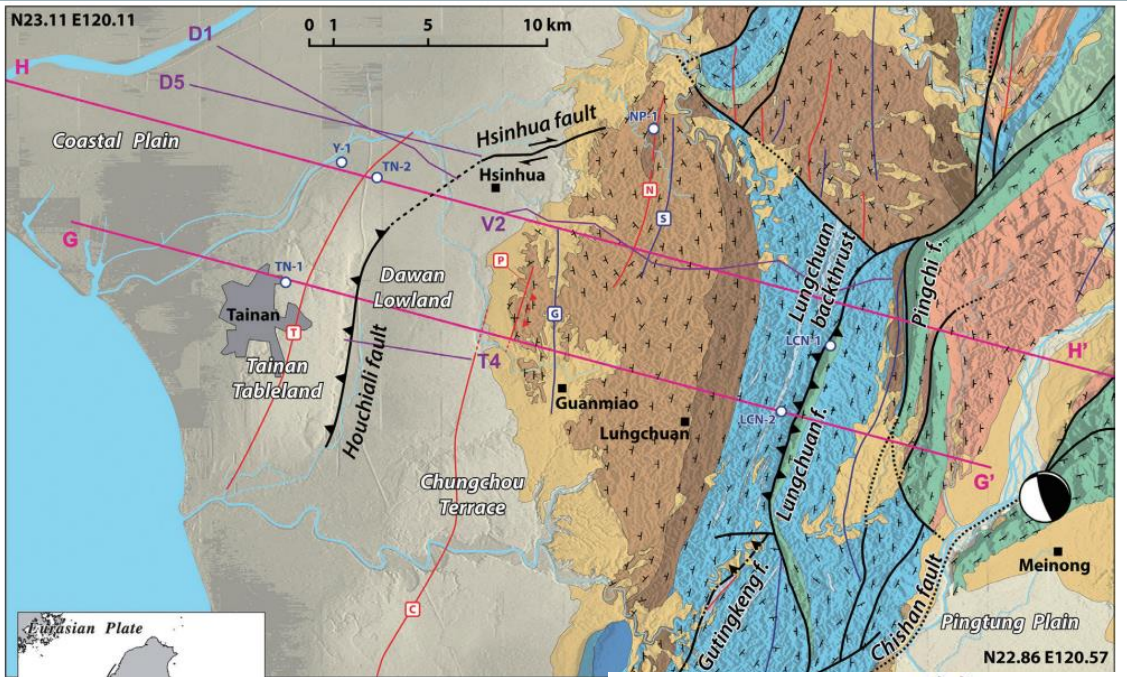




Lin and Watts. (2002)



Chiang et al., . (2004)



Caption

- Anticline axis
- Syncline axis
- Fault

Terrace
Liushuang
Erchungchi
Gutinkeng
Wushan
Changchihkeng

Le Beon et al., (2017)

