

Active tectonics in the southwestern part of the Western foothills, Taiwan in relation to mud volcanoes

Presenter: Ngoc-Thao Nguyen

Advisor: Prof. Maryline Le Beon

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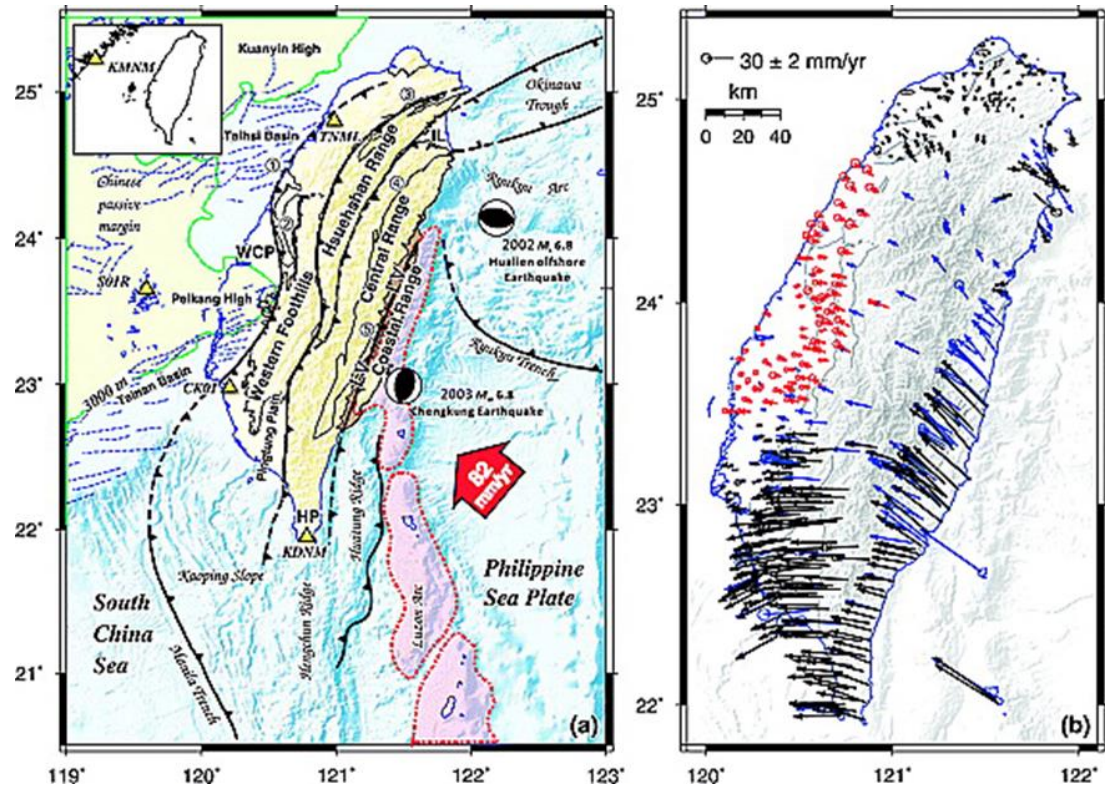
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Introduction

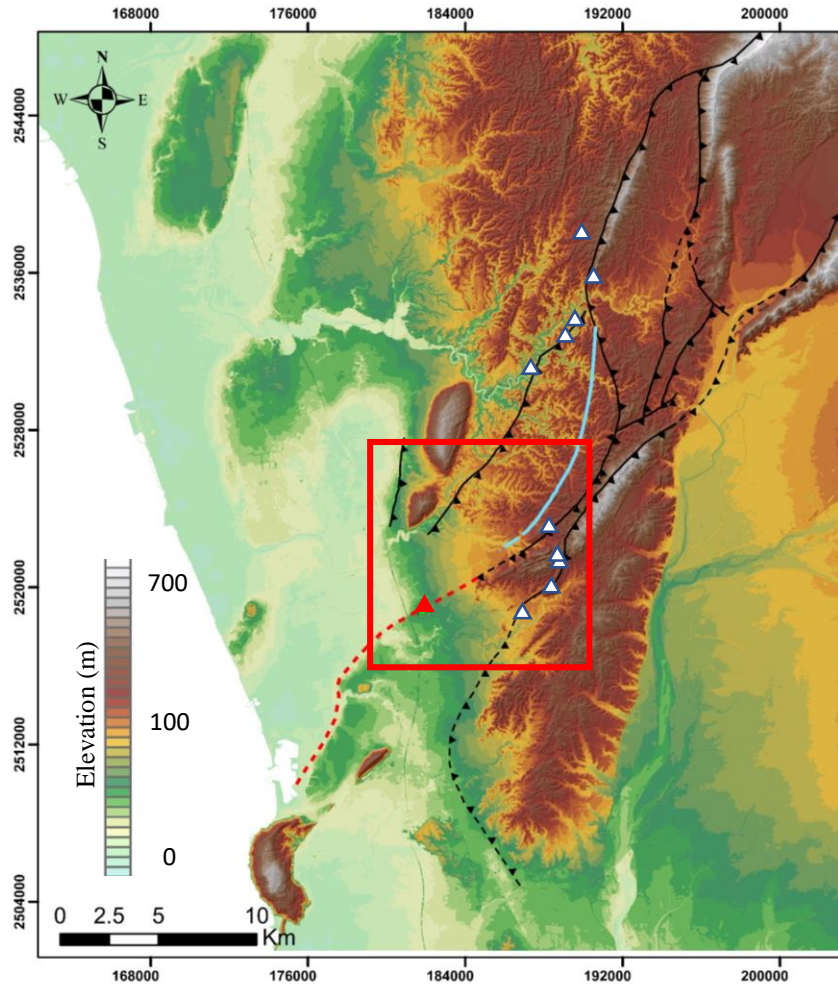
The concept of tectonic escape (or tectonic extrusion) associated with collision zones describes the kinematics of lateral motions of geological units moving toward a free boundary

Tectonic escape was proposed for Southwestern Taiwan: this escape occurs in response to both ongoing collisional shortening and local indentation by basement high of Chinese margin (*Lu et al, 1998*)

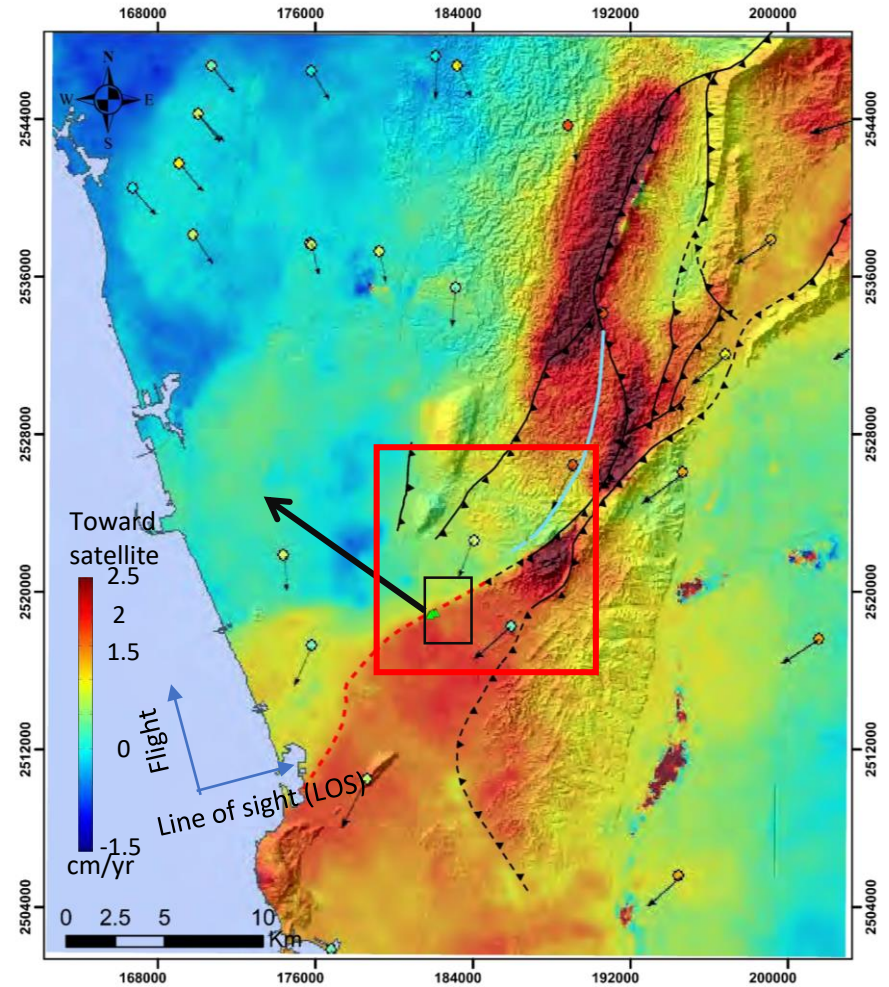


Geotectonic framework and major structural units of Taiwan between the Eurasian and Philippine Sea plate (*Yu et al., 1997*)

Introduction



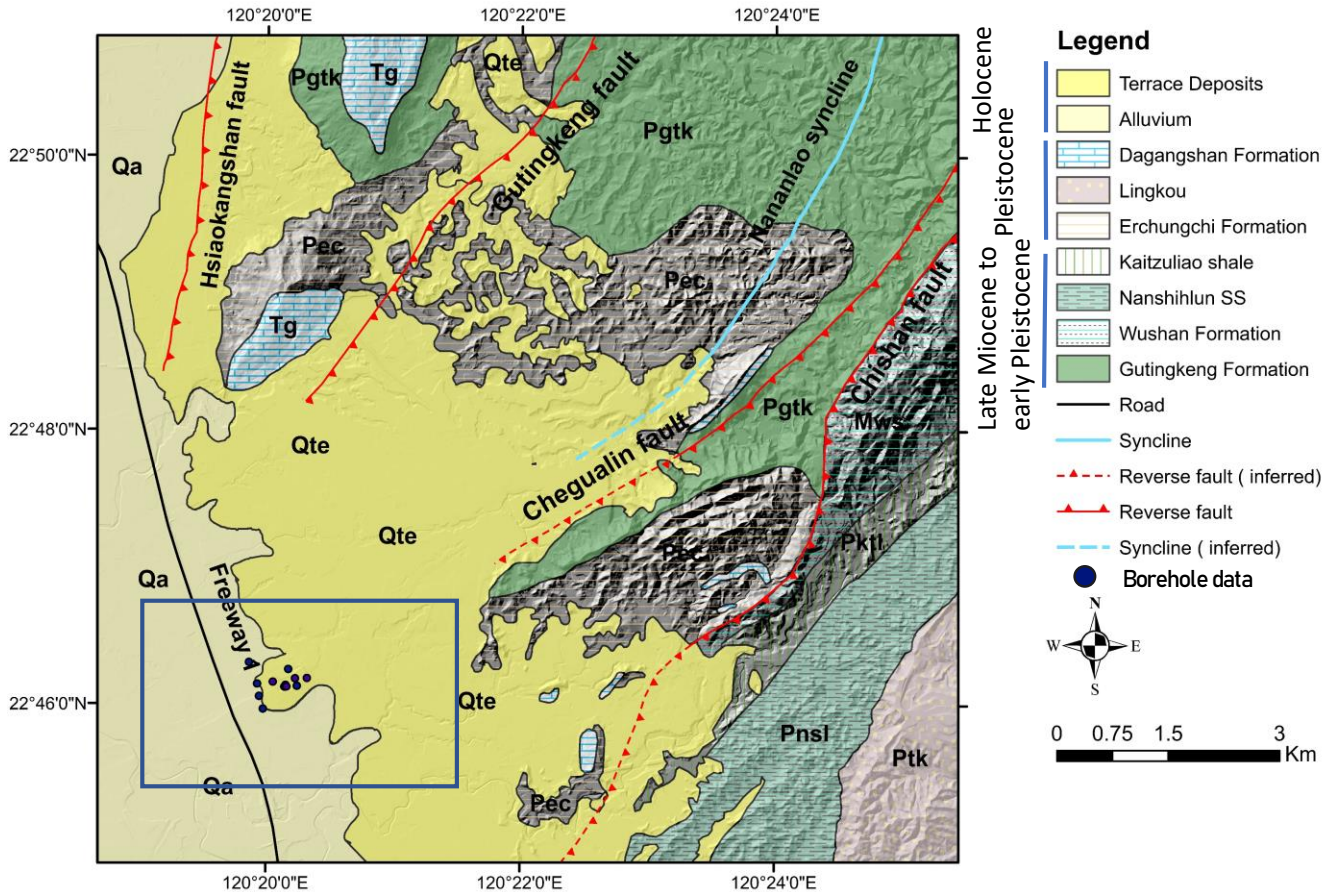
Gunshuiping mud volcanoes in Yanchao, Kaohsiung, Taiwan



InSAR data from 2007-2011 (*Pathier et al, 2014*)

- GPS data suggest the existence of the right-lateral strike-slip fault
- Mud volcano (Gunshuiping, Yanchao, Kaohsiung) located along the potential fault

Geological setting



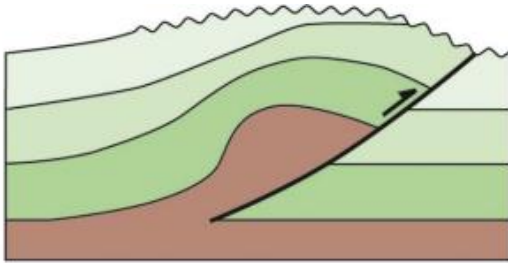
- Research area: Yanchao, Kaohsiung (dark blue rectangular on geological map)
- The research area is covered by thick marine and alluvial sediment
- Gutingkeng formation: Massive mudstone, thick-bedded massive mudstone intercalated with thin to medium-bedded sandstone and mudstone with thick-bedded sandstone lenses

- In the foothills, the Chequalin Fault is a thrust fault striking NE with a low dipping angle
- However, in the plain the fault is proposed to strike N68E and has mainly a strike-slip component based on geodetic data

Purpose

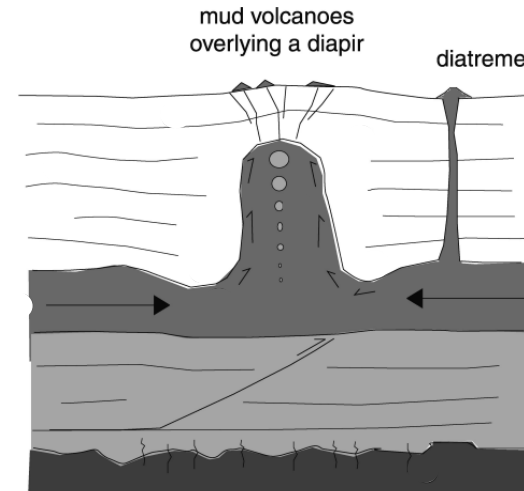
- Quantify the kinematics of the fault based on Holocene deposits and geomorphology
- Determine how the mud volcano formed?

Hypothesis



Source: Hudec, M. R., & Soto, J. I. (2021)

Faults cut through the formation causing fractures in the strata
Providing the pathway for shale piercement



Source: Kopf (2000)

Mud extrusion is a well-known phenomenon whereby fluid-rich, fine-grained sediments ascend within a lithologic succession because of their buoyancy.

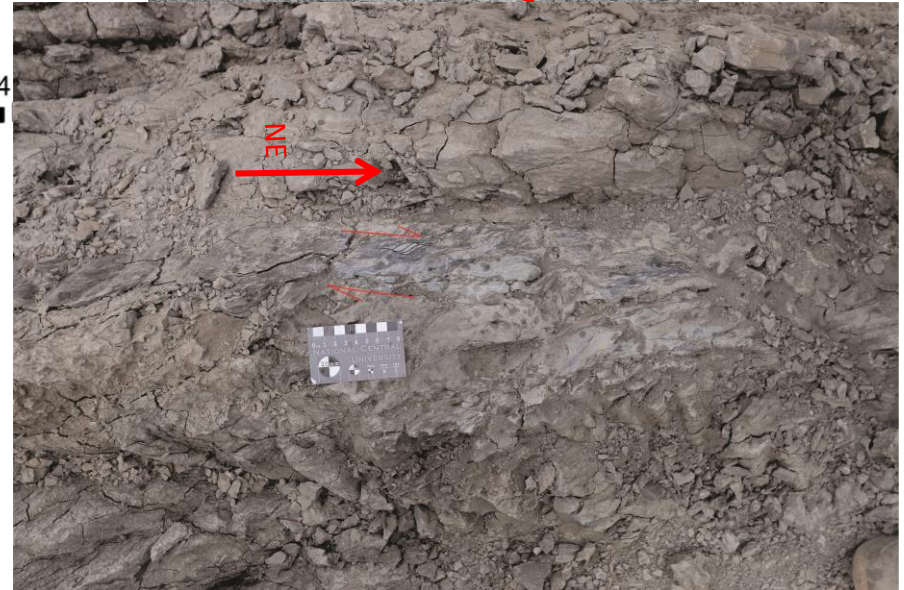
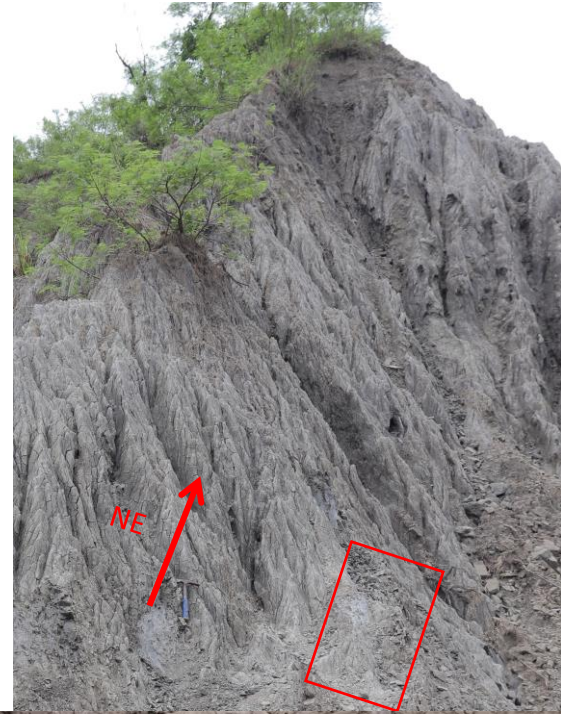
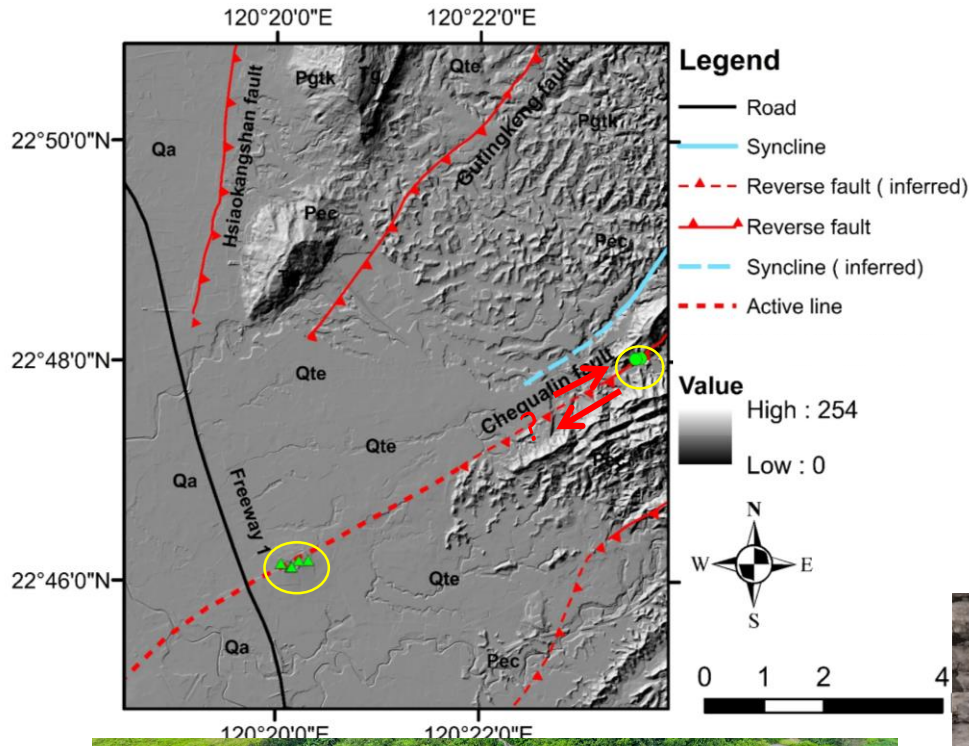
The pressure inside the mobile material is greater than the ability of the roof to resist it.

Methods

- Field observations
- Stratigraphic correlation (using borehole data)
- Geomorphology analysis
- ^{14}C dating

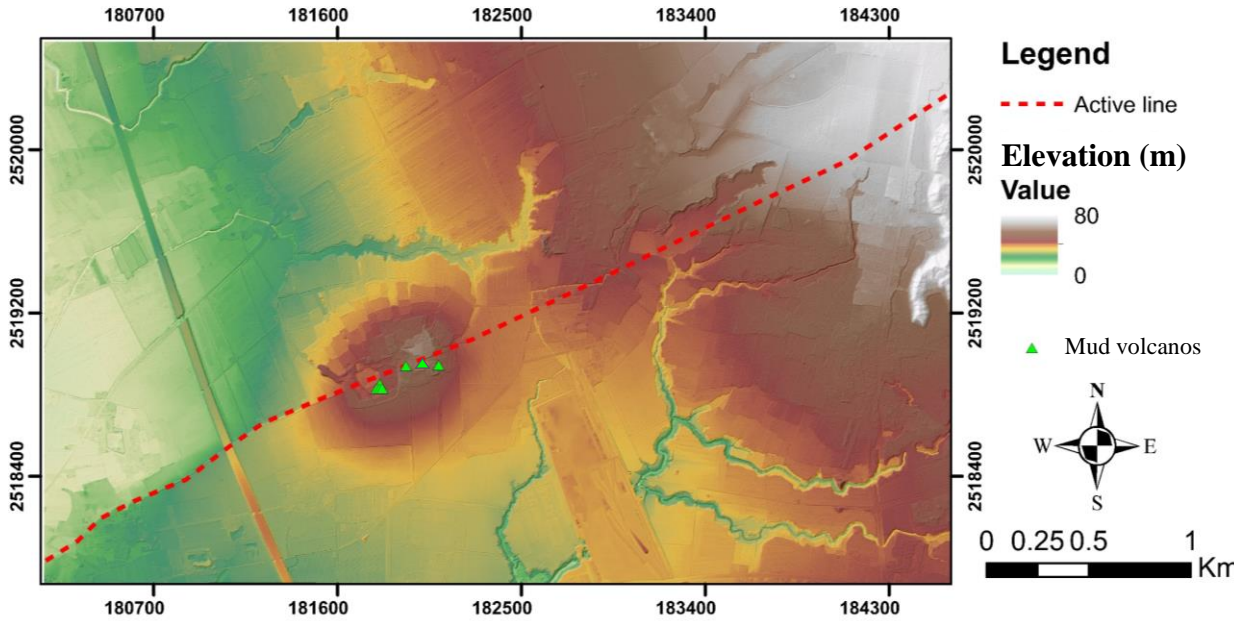
Preliminary results

Field observations



Preliminary results

Field observation



Source: Geoforce 群立科技 Claude

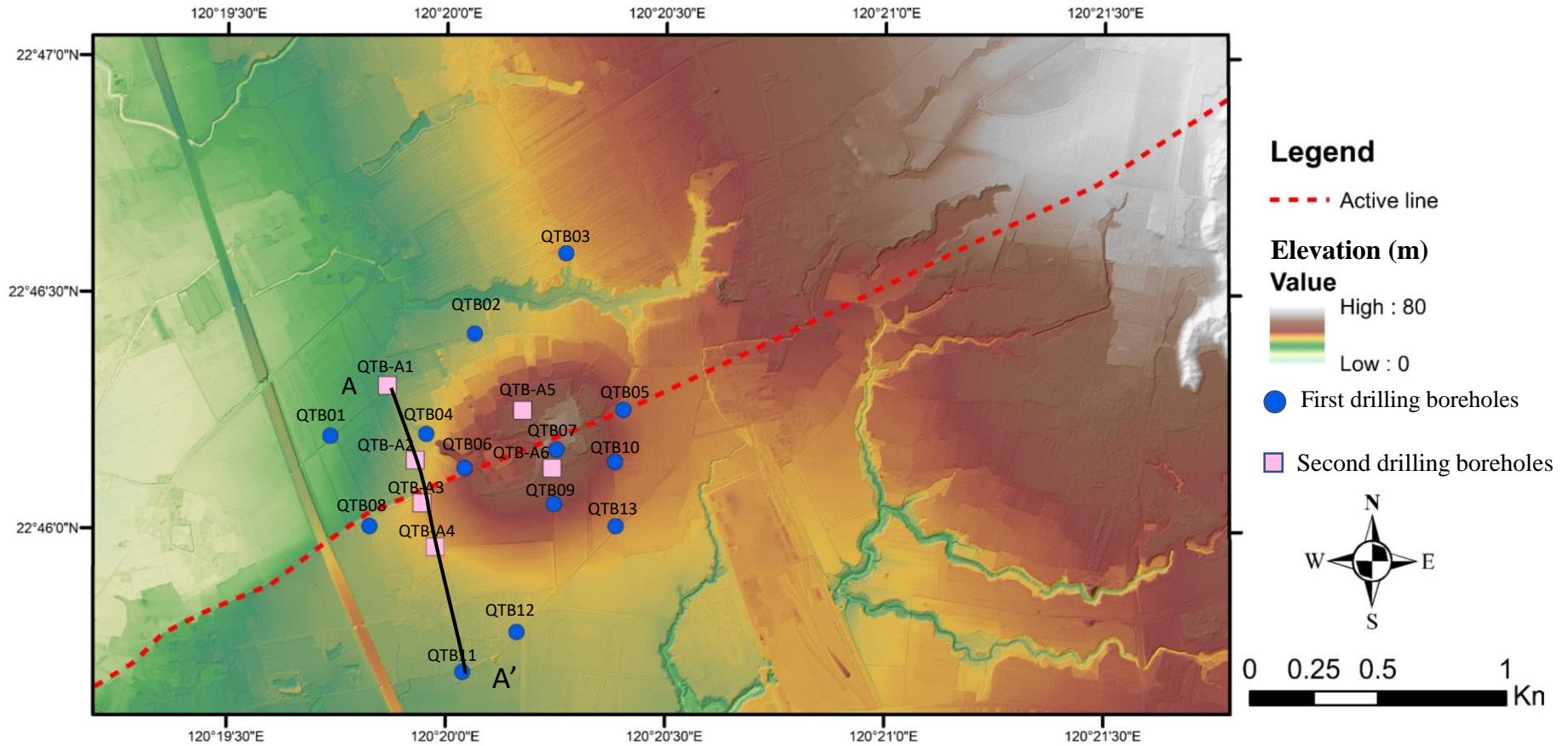
The volcano mouths in the Gunshuiping area line along the fault trace

Preliminary results

Stratigraphic correlation

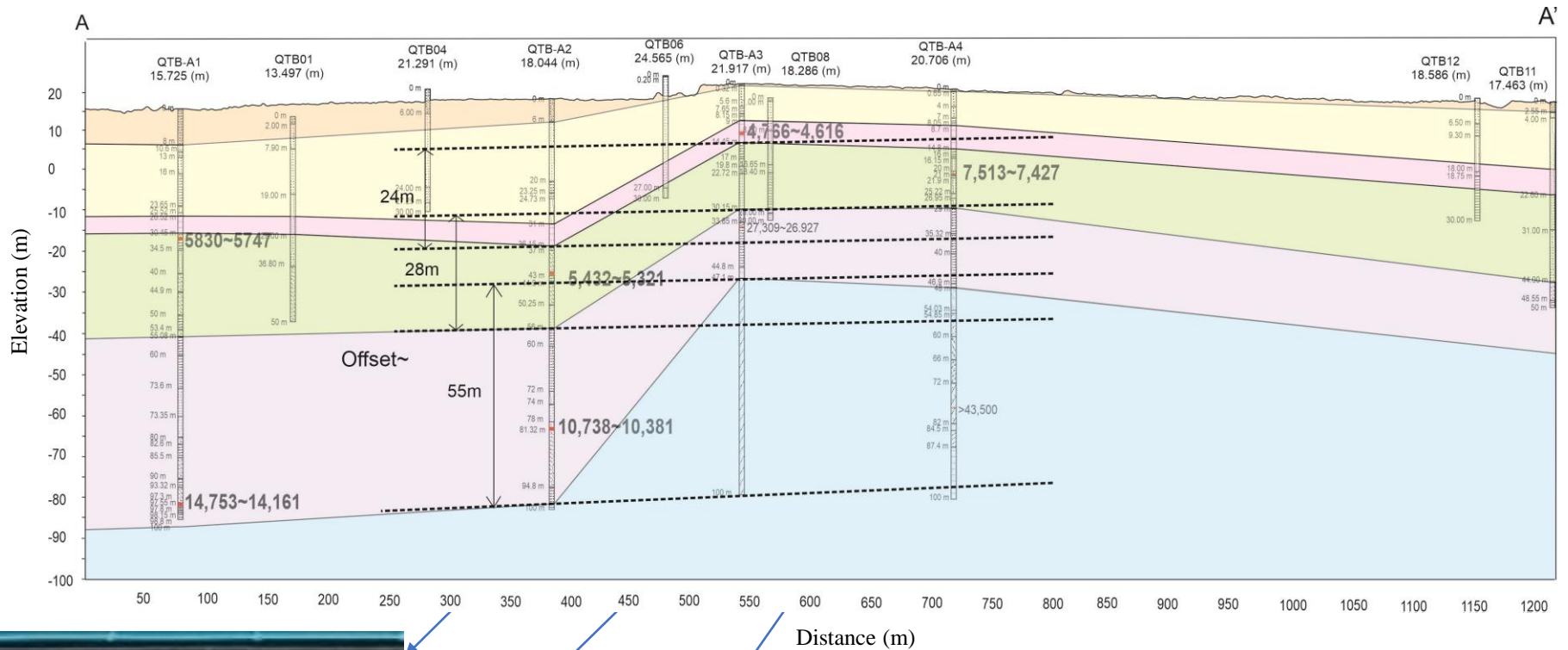
Borehole data: 21 boreholes

^{14}C dating: 12 samples

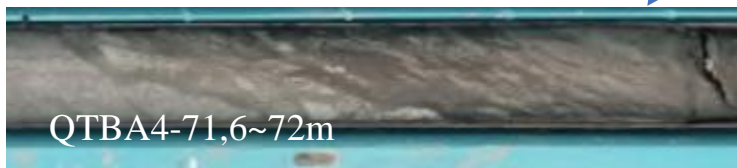


Acknowledgments to the Southern Taiwan Science Park for sharing the data; Consulting project conducted by Sinotech.

Stratigraphic correlation



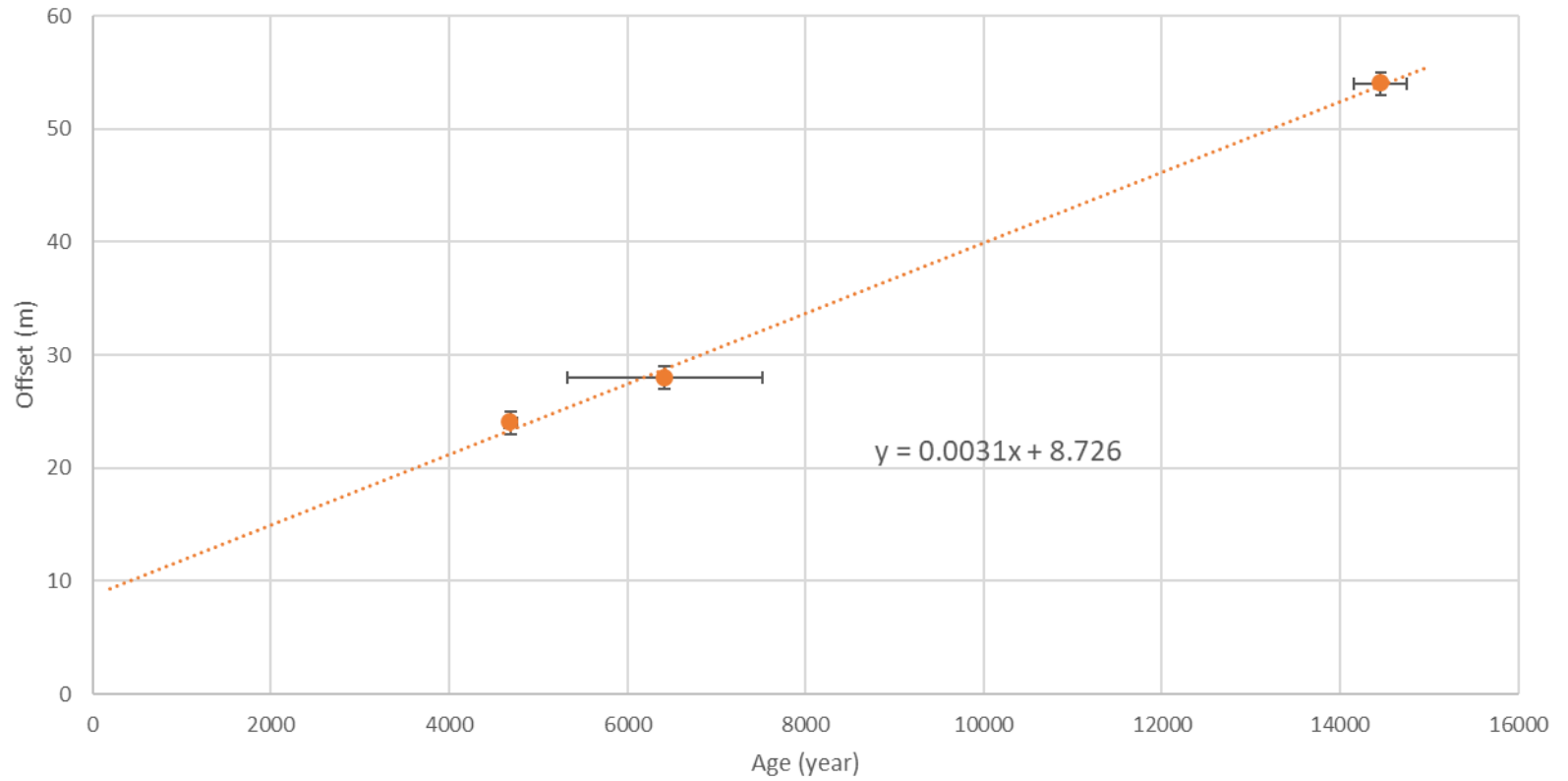
Shear texture



- A** Backfill materials
- B** Muddy sand and soil
- C** Dark blue thick coarse sand, rich in shells
- D** Clay and silt sand interbedded
- E** Grey muddy interbedded with fine sand
- F** Thick massive mudstone with the dip angle around 60-70°

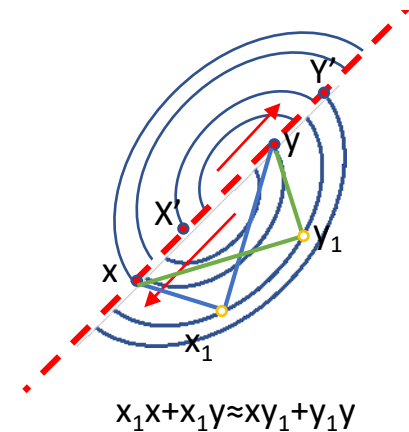
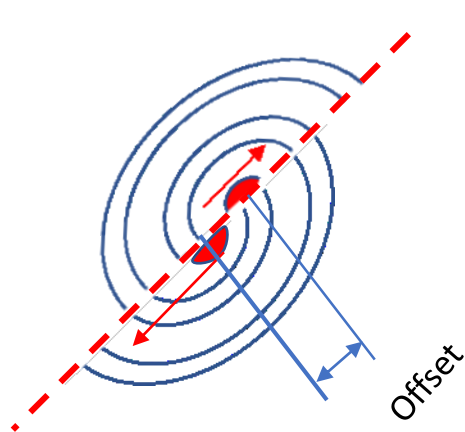
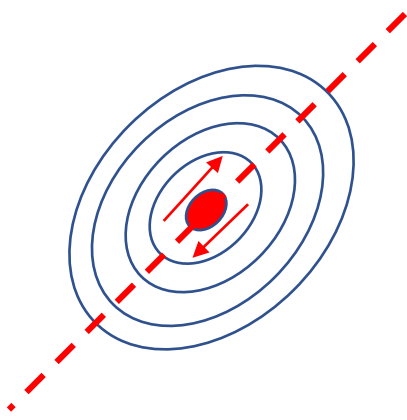
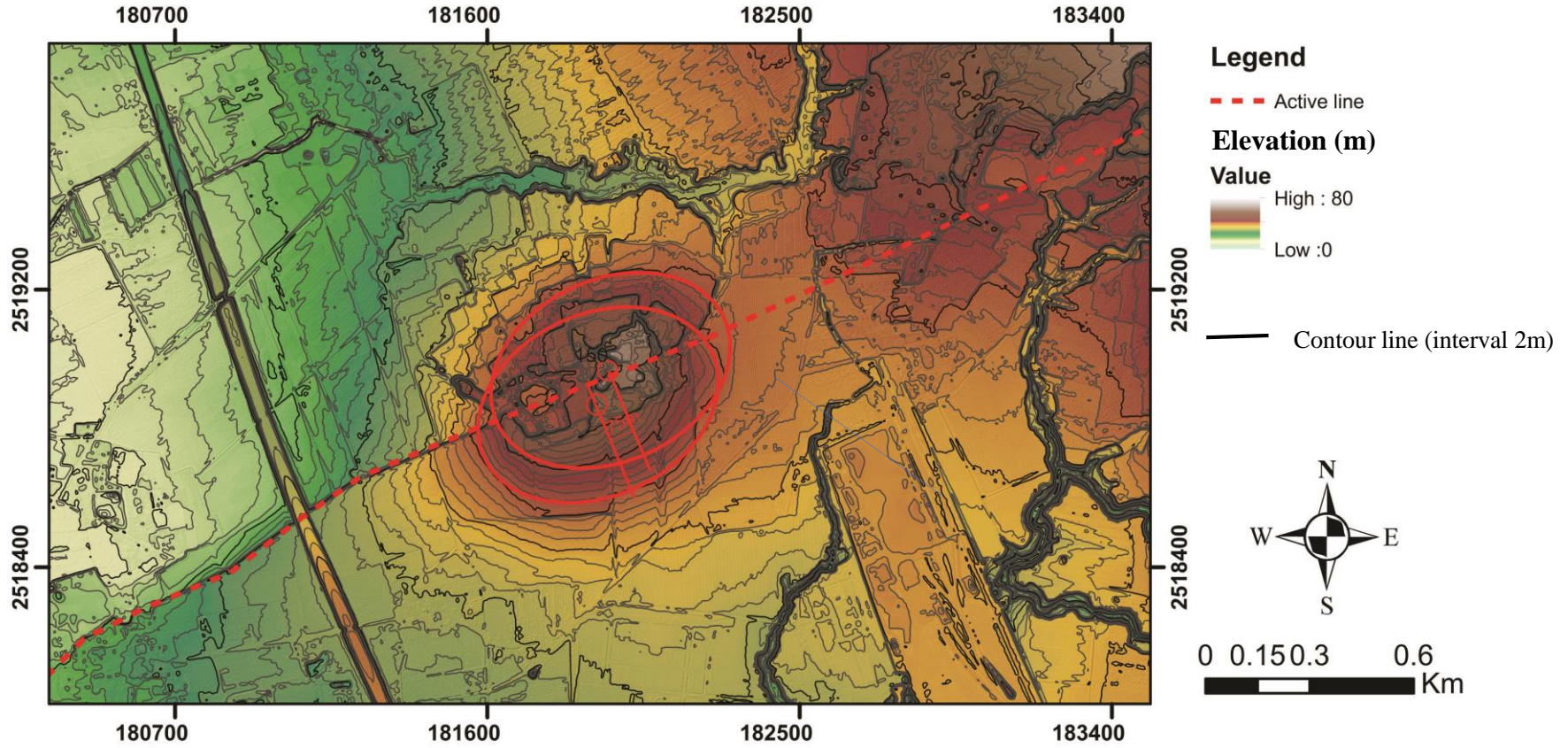
The changing in the thickness → Deforming when deposition sediment?

Slip-rate



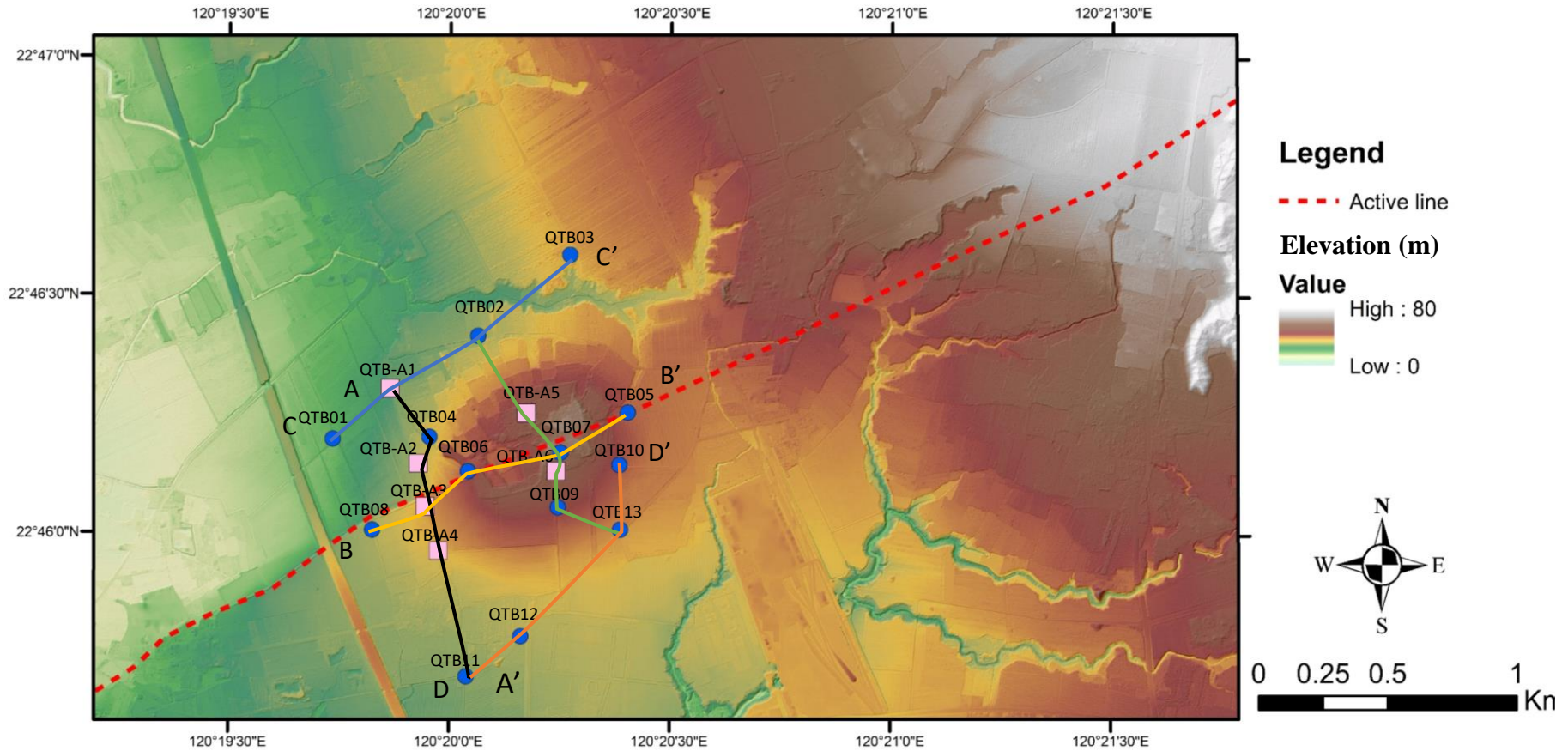
Geomorphology analysis

Offset ~75m



Future work

Keep working on stratigraphic correlation → Trying to have an overview of this area



- Have closer look at borehole data
 - Collect suitable samples for ^{14}C dating
 - Using diverse ways in geomorphology analysis to get a more precise offset rate
- Calculate slip rate and have stronger arguments for stratigraphic subsystem

Thank you for listening