Probing the Frontal Deformation Zone of the Chihshang Fault with Boreholes and High Resolution Electrical Resistivity Imaging Methods: A Case Study at the Dapo Site in Eastern Taiwan

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■ *The Electrical Resistivity Imaging Methods*

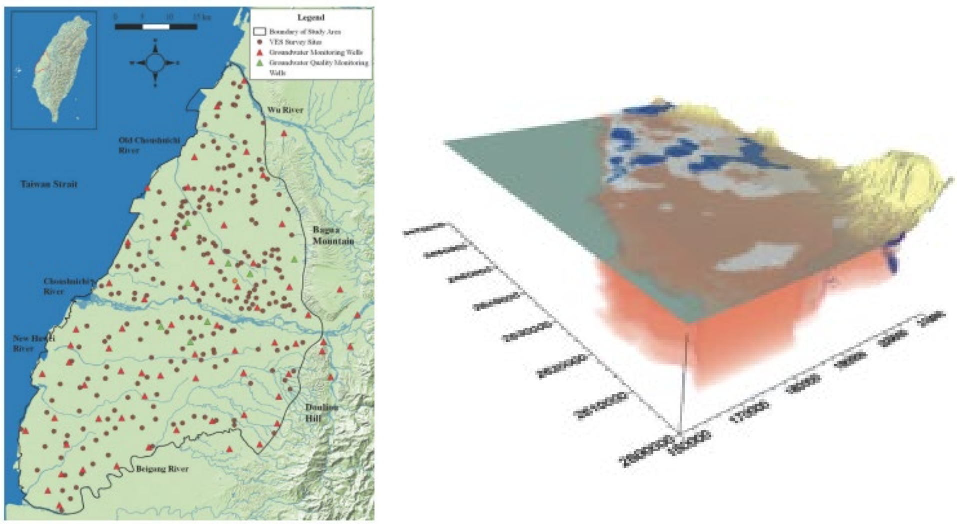
- Low-frequency electrical currents are injected into the subsurface and the variation of the potentials can be measured at pairs of electrodes of different locations

- One can get the resistivity images by inverting the measurements with the physical relationships.

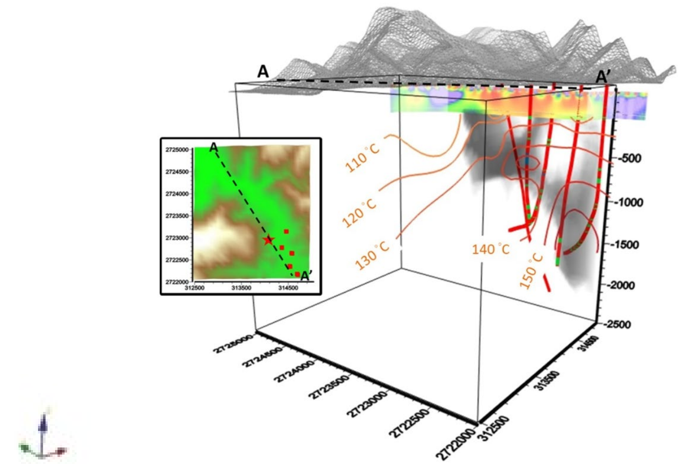
- Subsurface structures/ lithology can exhibits different resistivity performance, and therefore can be shown in the resistivity images.

■ *Geological models that built from the Resistivity models*

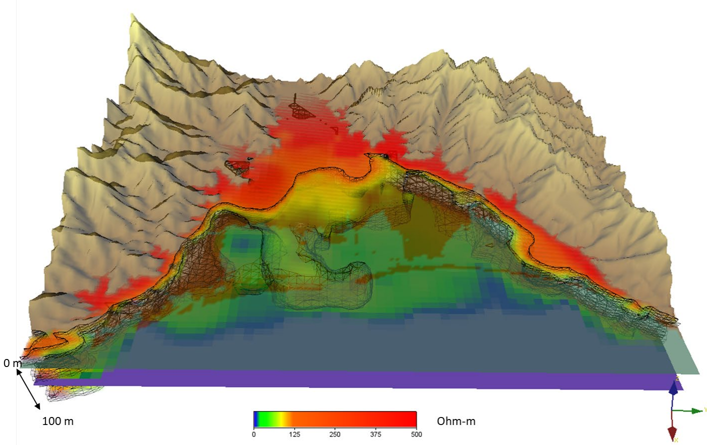
3D model for the Choushui Plain



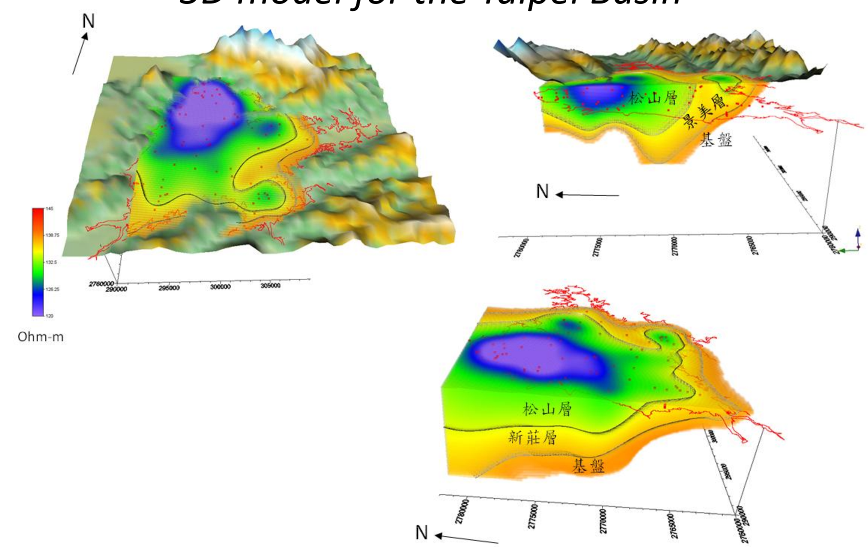
3D model for the Chinshui Geothermal field



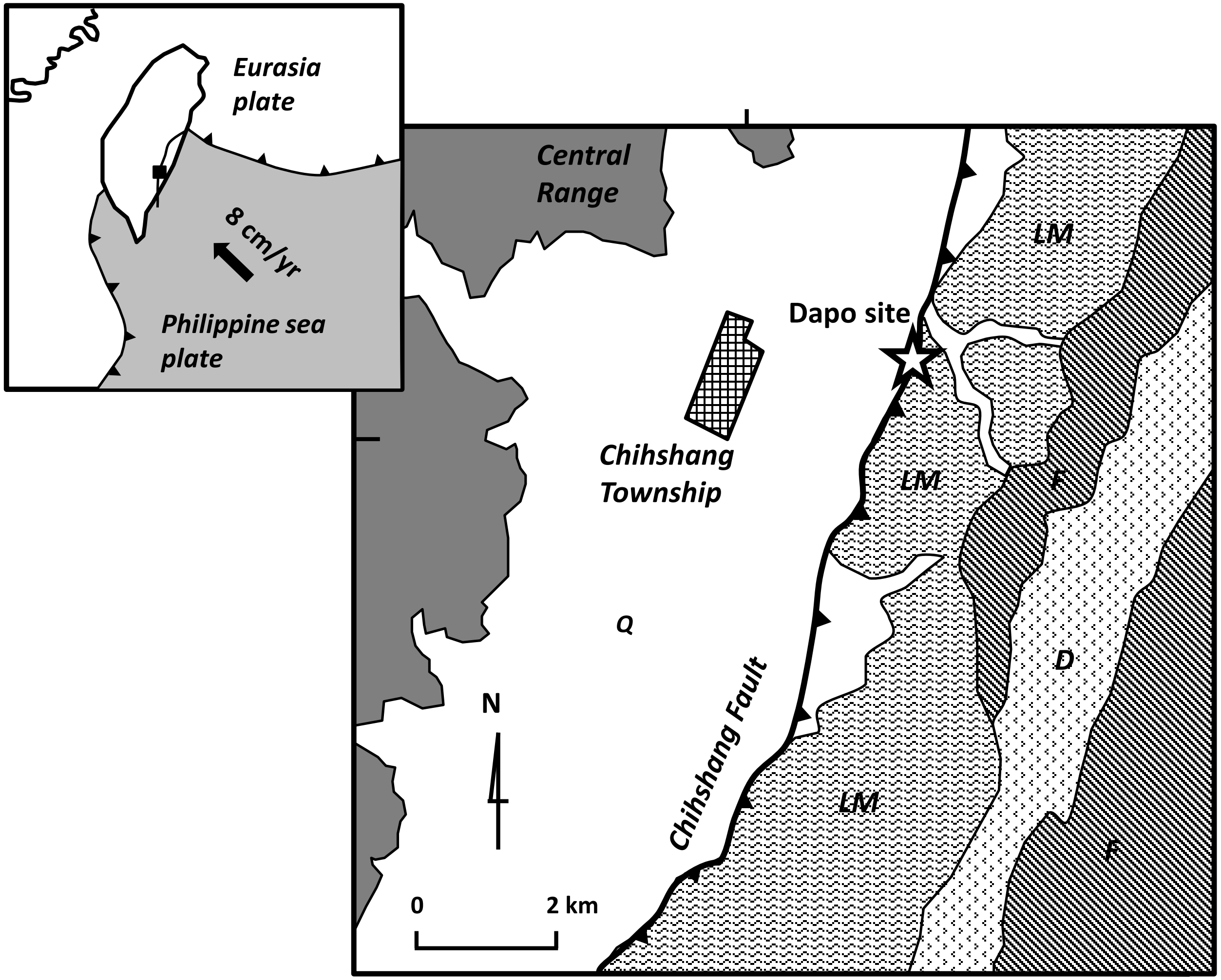
3D model for the Ilan Basin



3D model for the Taipei Basin



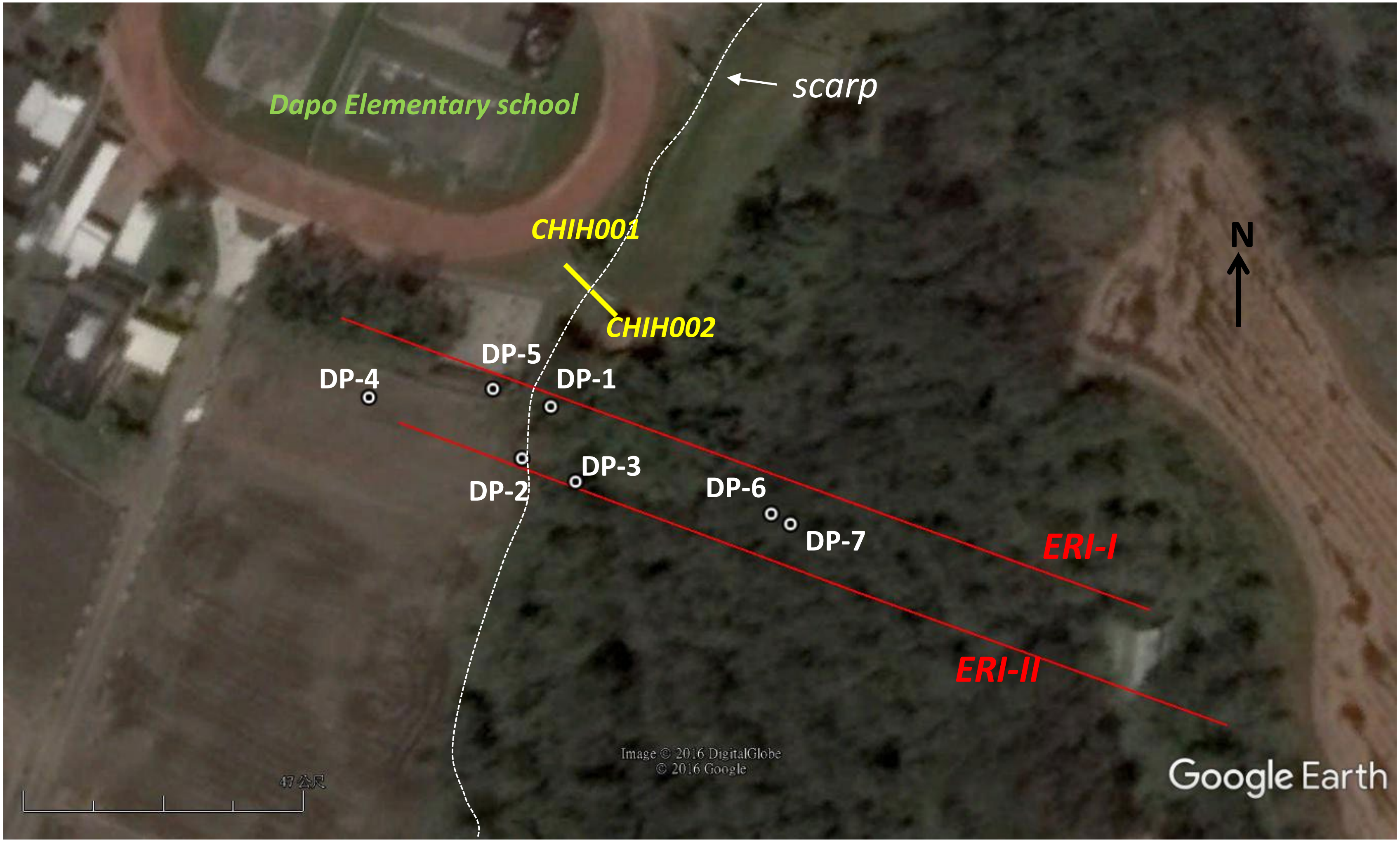
■ *The Study area at the Dapo site in Chihshang, Taitung*



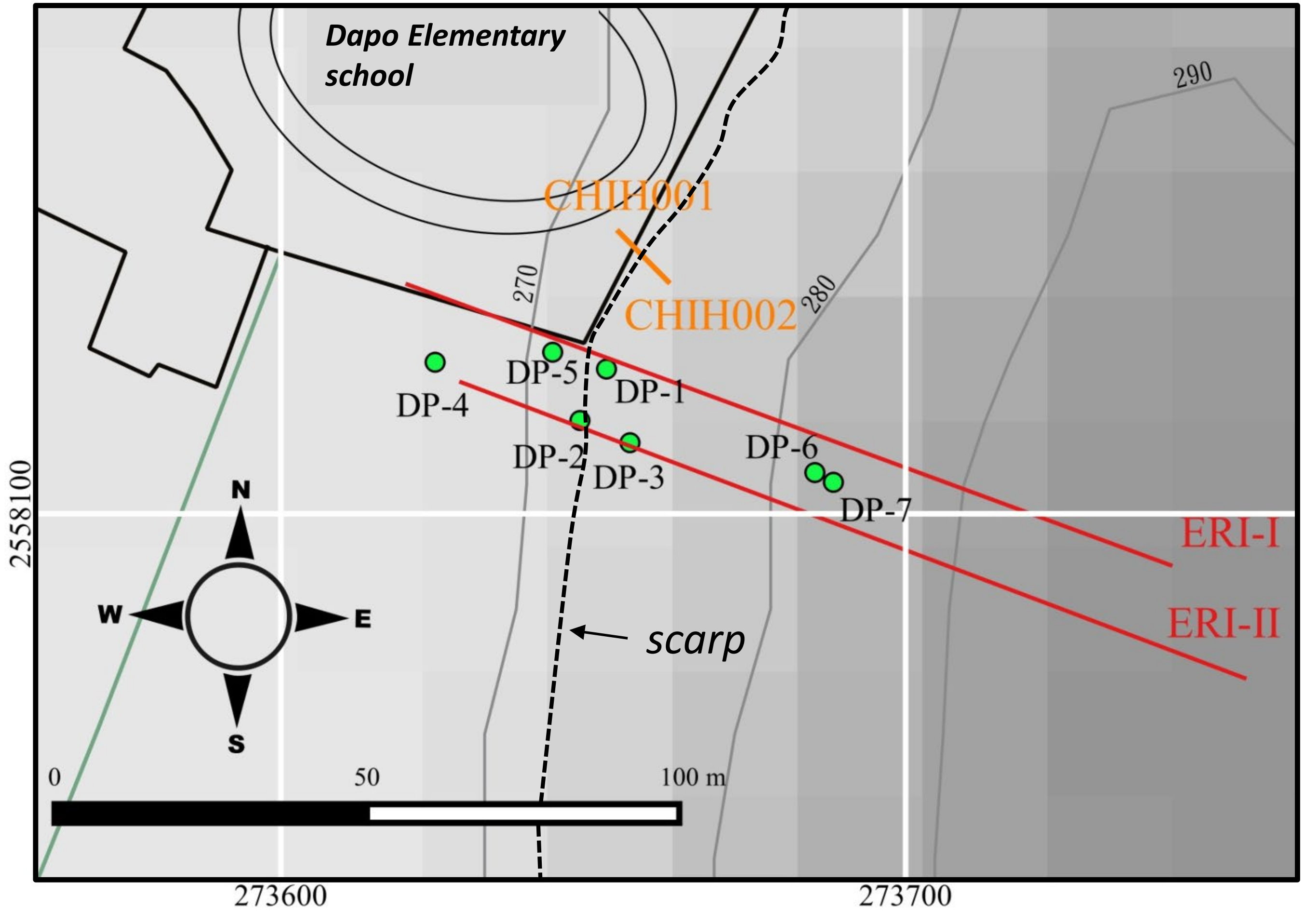
edited from [Lee et al., 2003]

*Geological units **D, F, LM**, and **Q** represent the Tuluanshan Andesites, the Fangshuliao formation, the Lichi mélange, and the Quaternary deposits.*

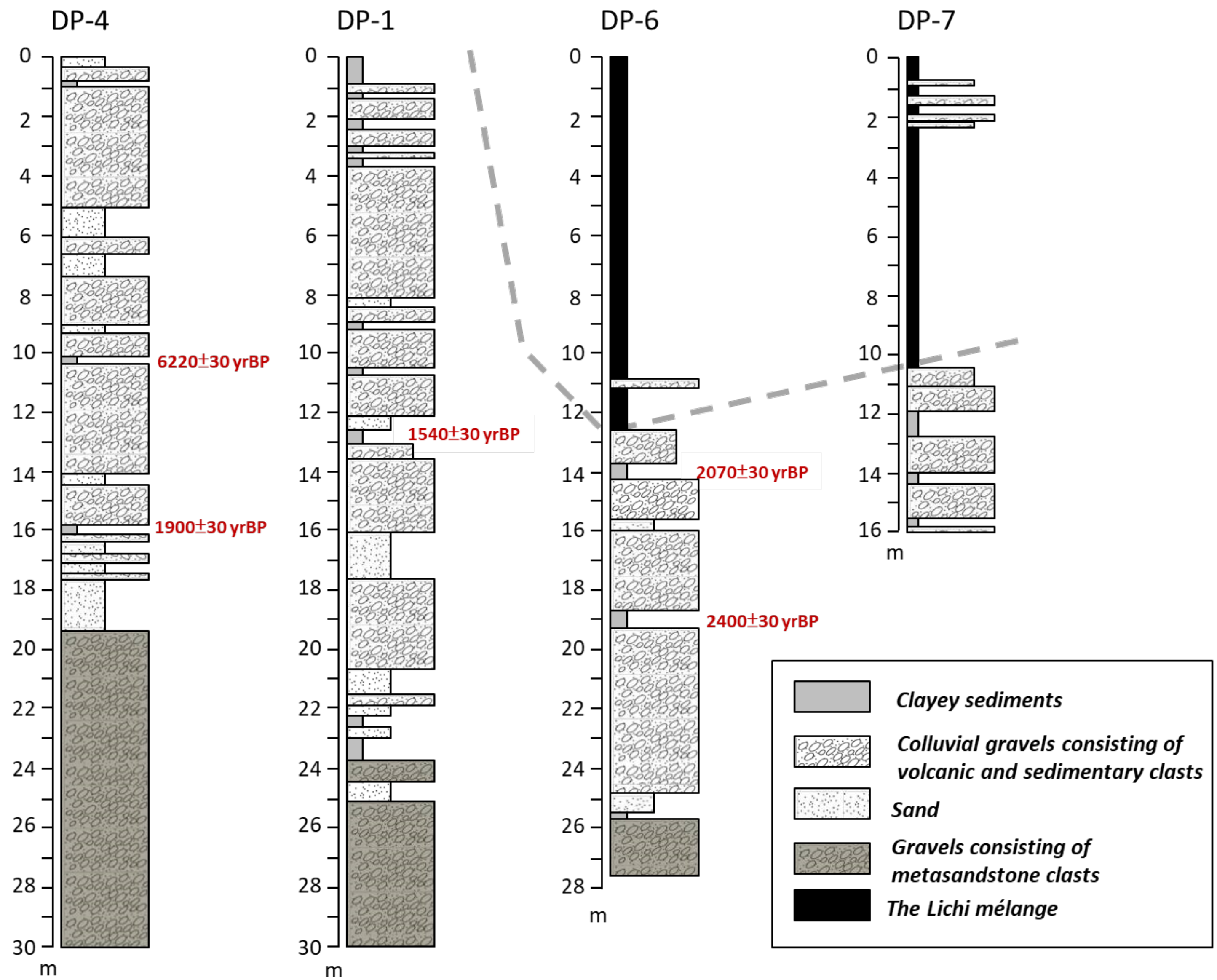
■ *The survey and instrument configurations at the Dapo site in Chishang, Taitung*



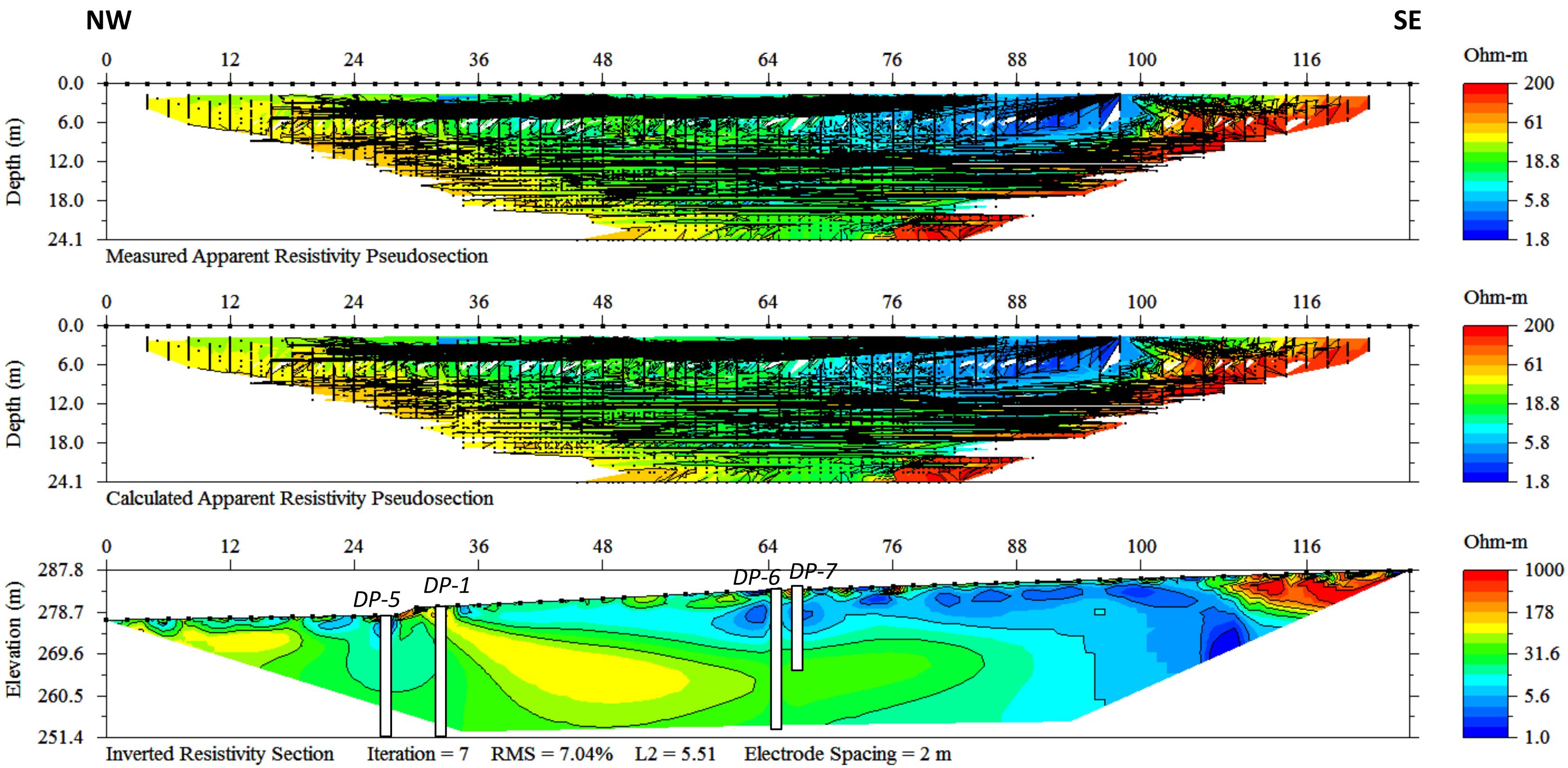
■ *The topography at the Dapo site in Chishang, Taitung*



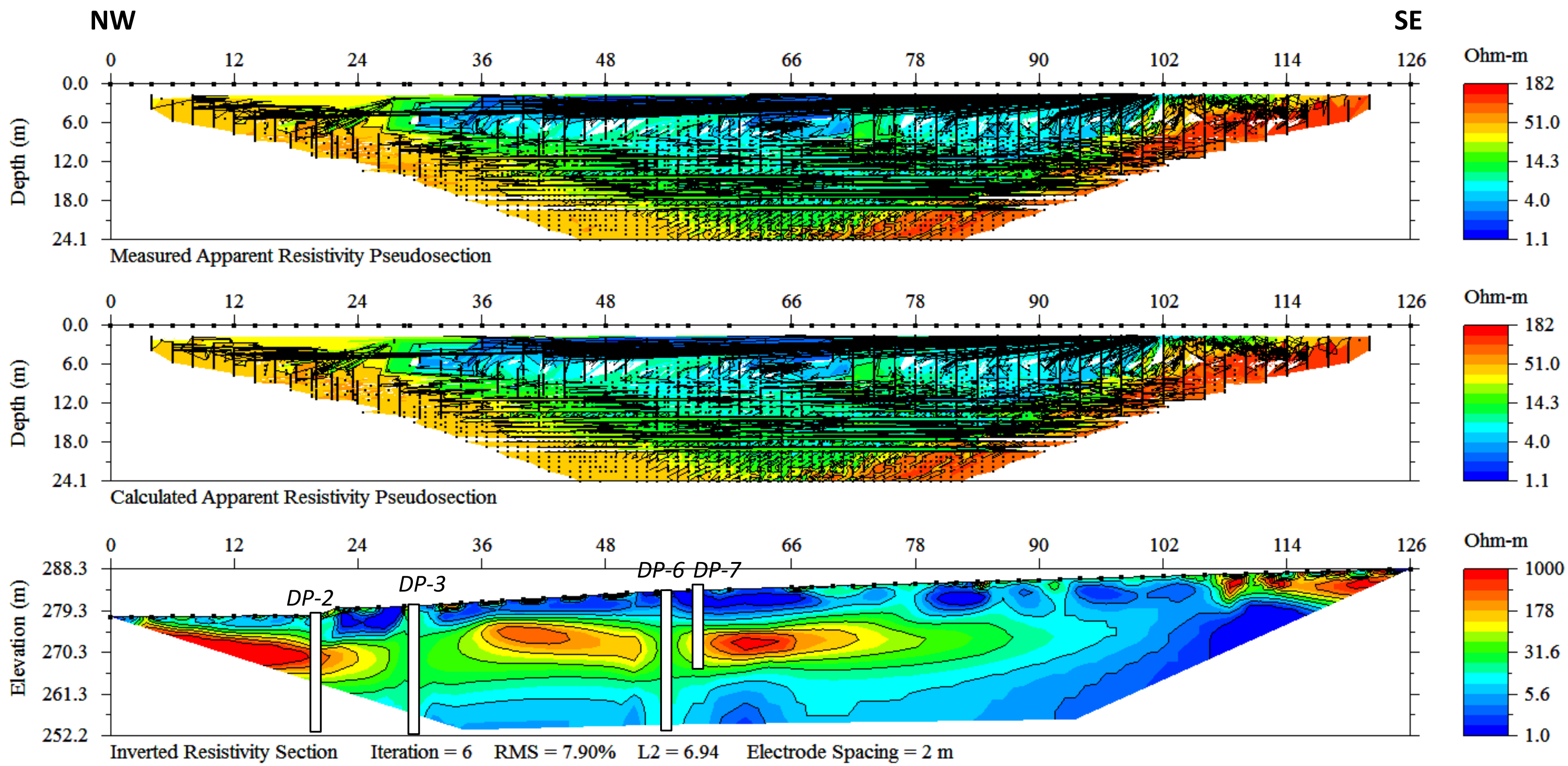
■ *The borehole records at the study site*



■ *The inverted resistivity image of the ERT-I line*

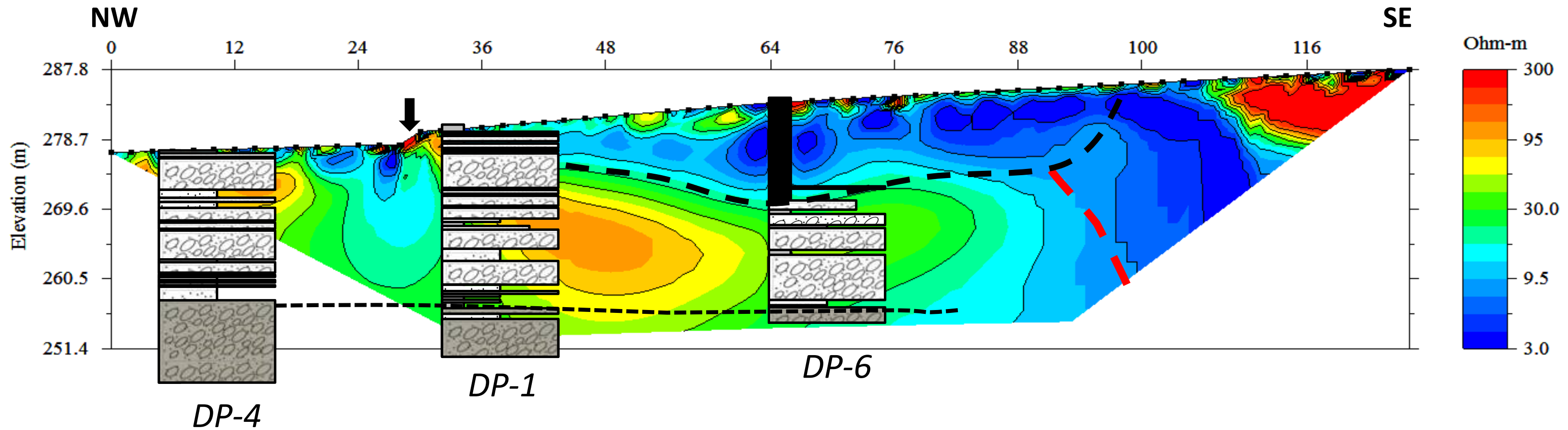


■ *The inverted resistivity image of the ERT-II line*

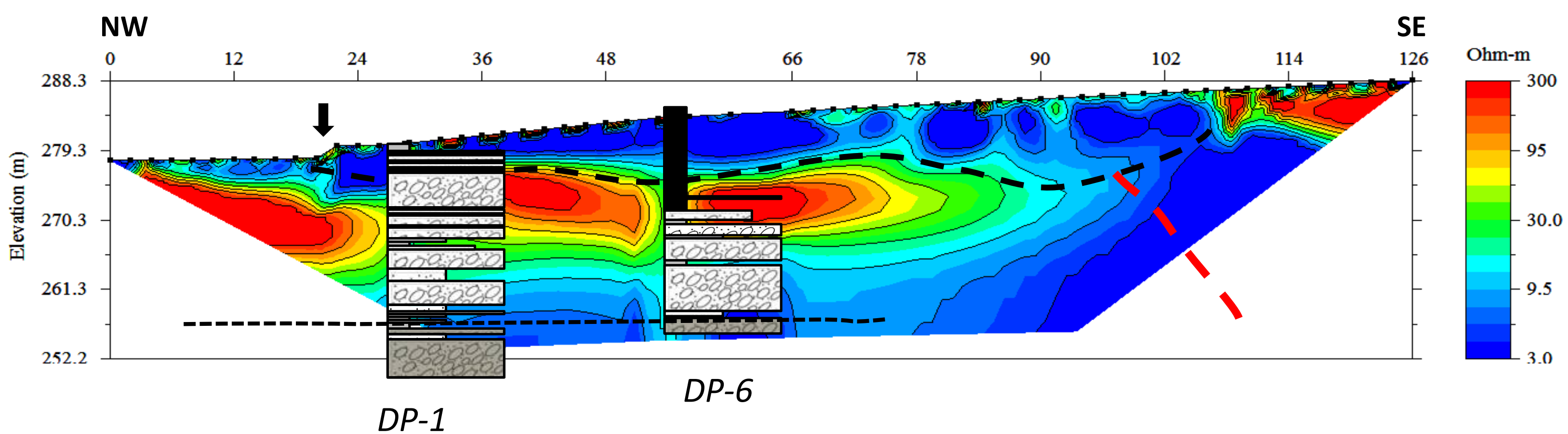


■ *The comparison between the resistivity images and the borehole records(in H/V scales of 1:1)*

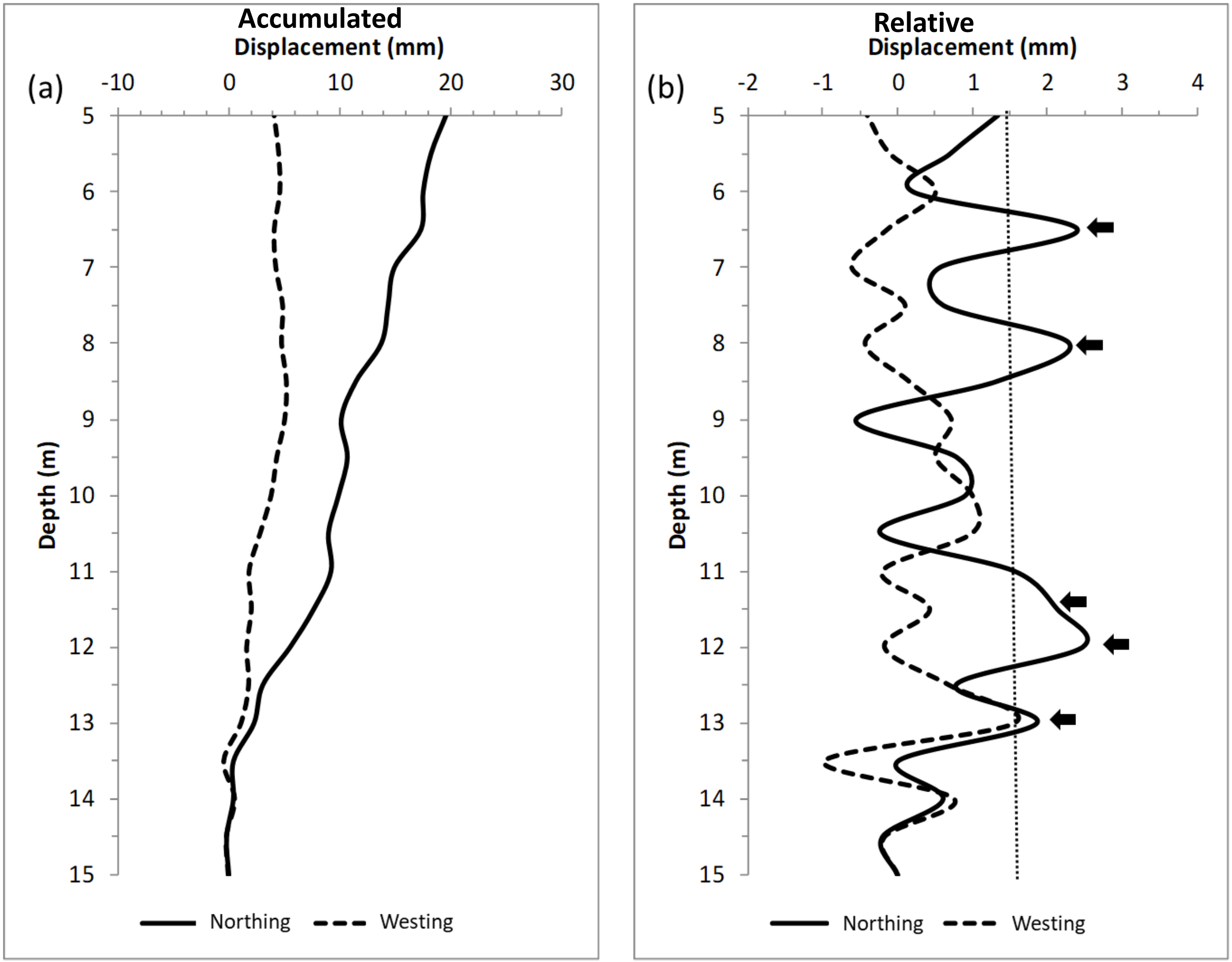
(a) **ERT I**



(b) **ERT II**

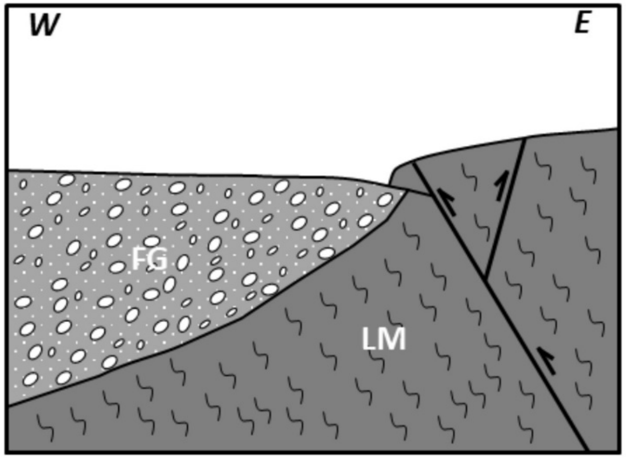


■ *The SAA tiltmeter monitoring results after 12 months*



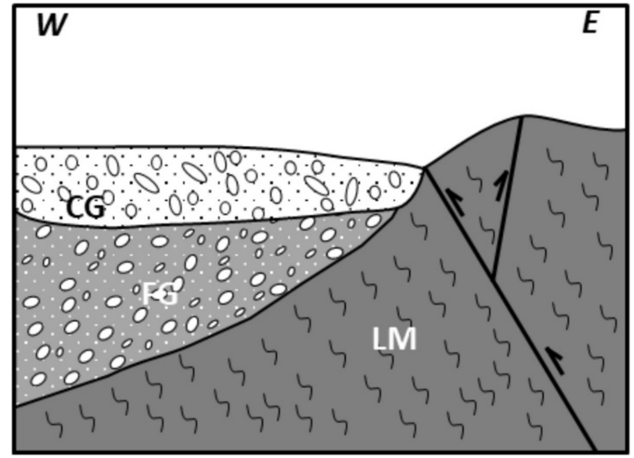
■ *The explanations for the evolution of the front deformation zone.*

(a)



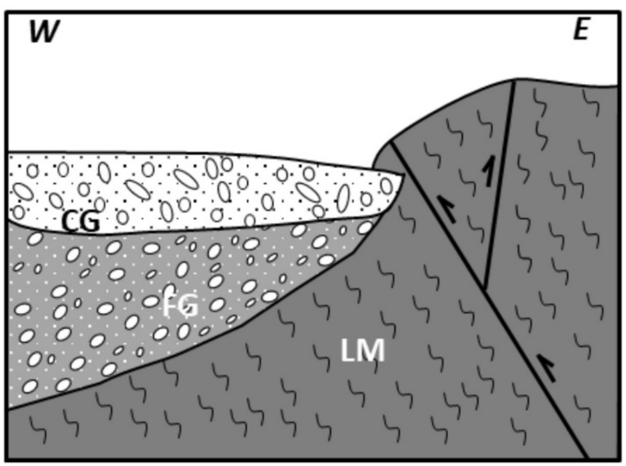
The deposition of the fluvial gravels (FG) originating from the Central Range on the heavily-sheared Lichi mélange (LM) in at least 3,000 years ago..

(b)



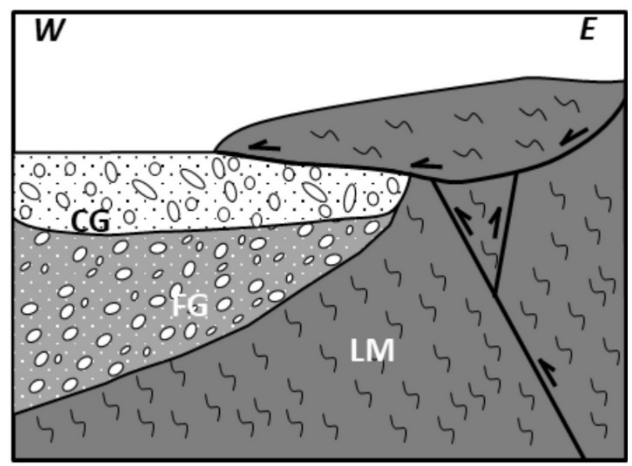
The start of the accumulation of the the Costal Range's colluvial deposits (CG) between 2,000 and 3,000 years ago.

(c)



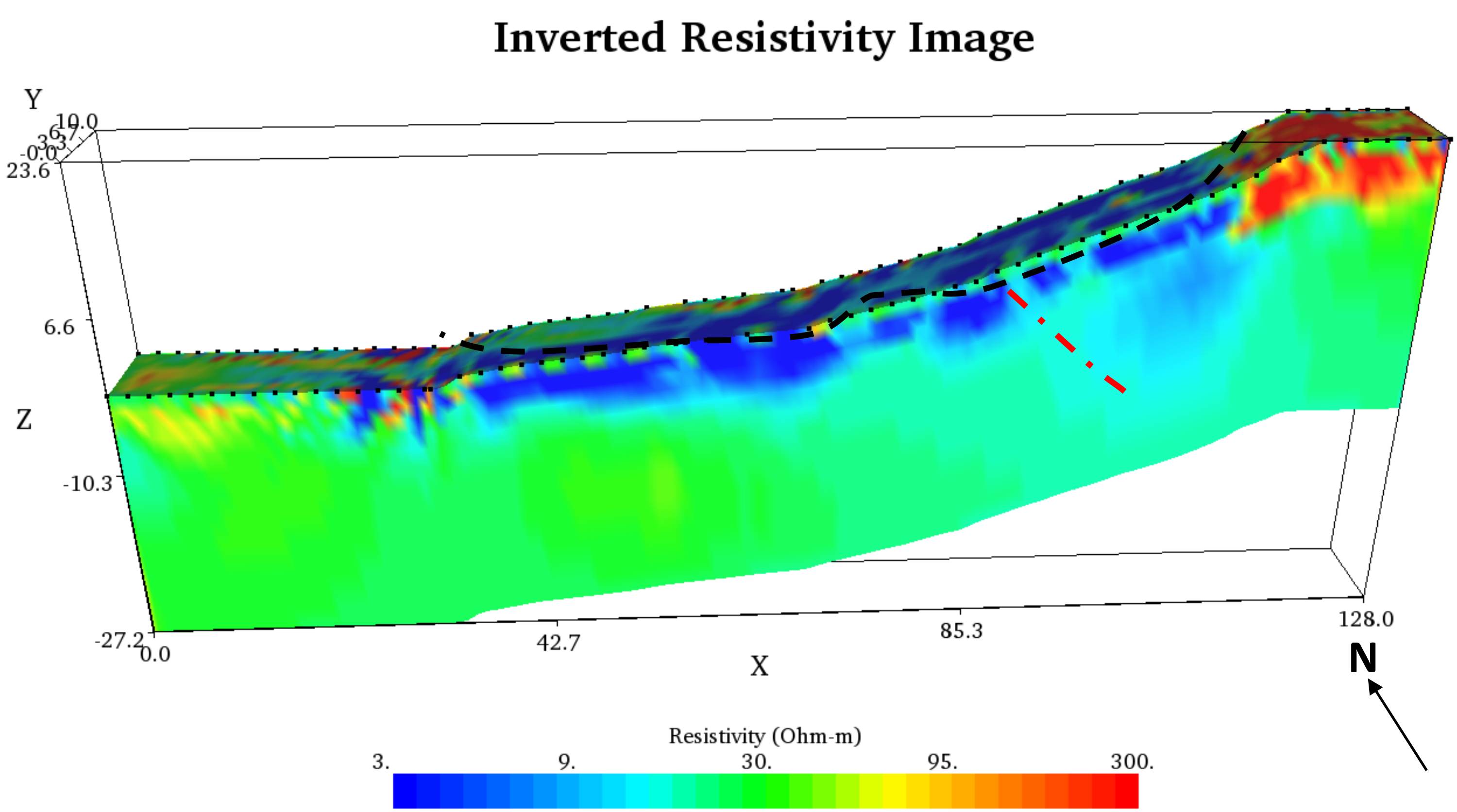
The coseismic movements of the Chihshang Fault, which resulted in the uplifted Lichi mélange and narrow frontal deformation zone after the deposition of the collovial gravels.

(d)

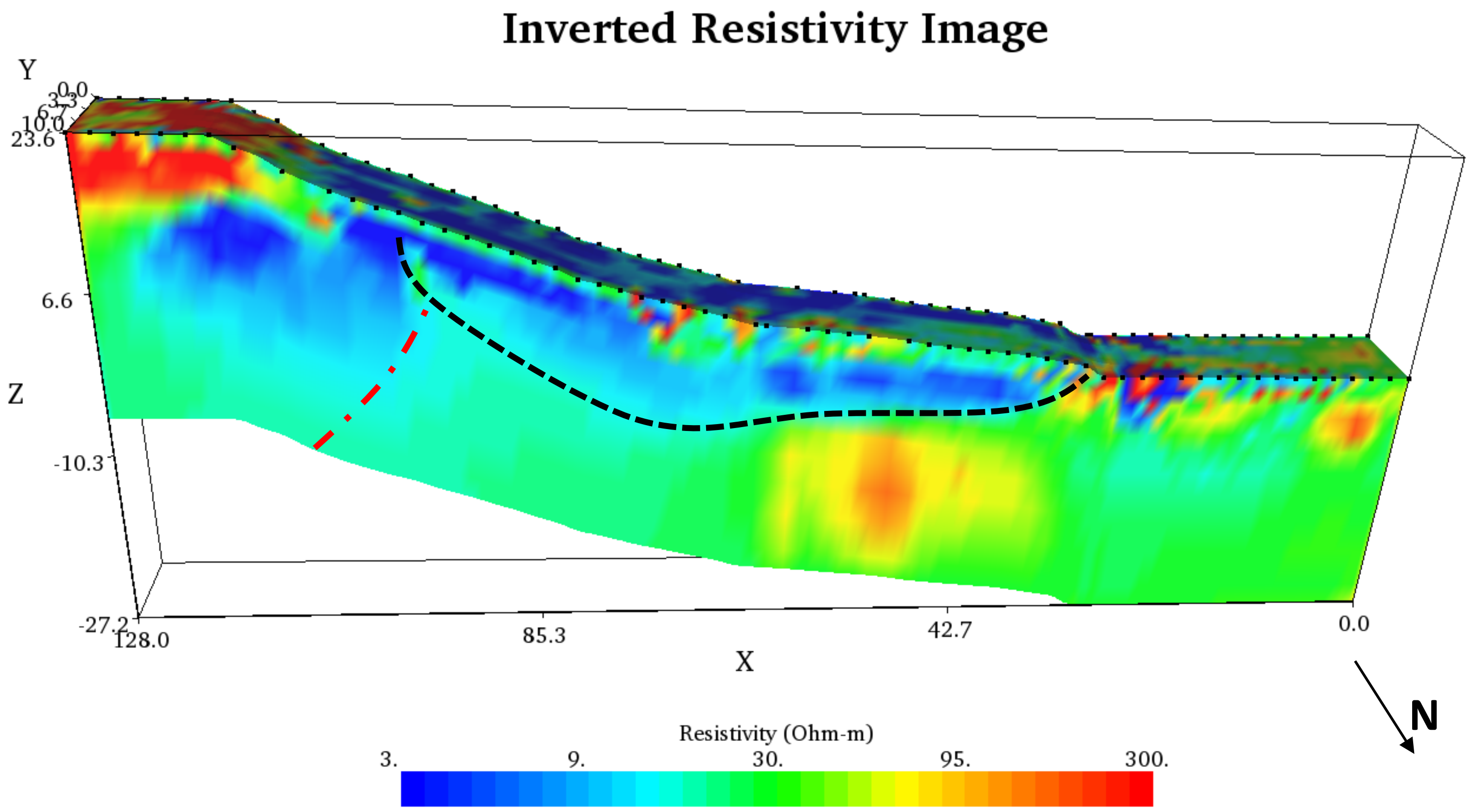


The recent slumping mass movements causing modifications to the frontal deformation zone after 2,000 years ago.

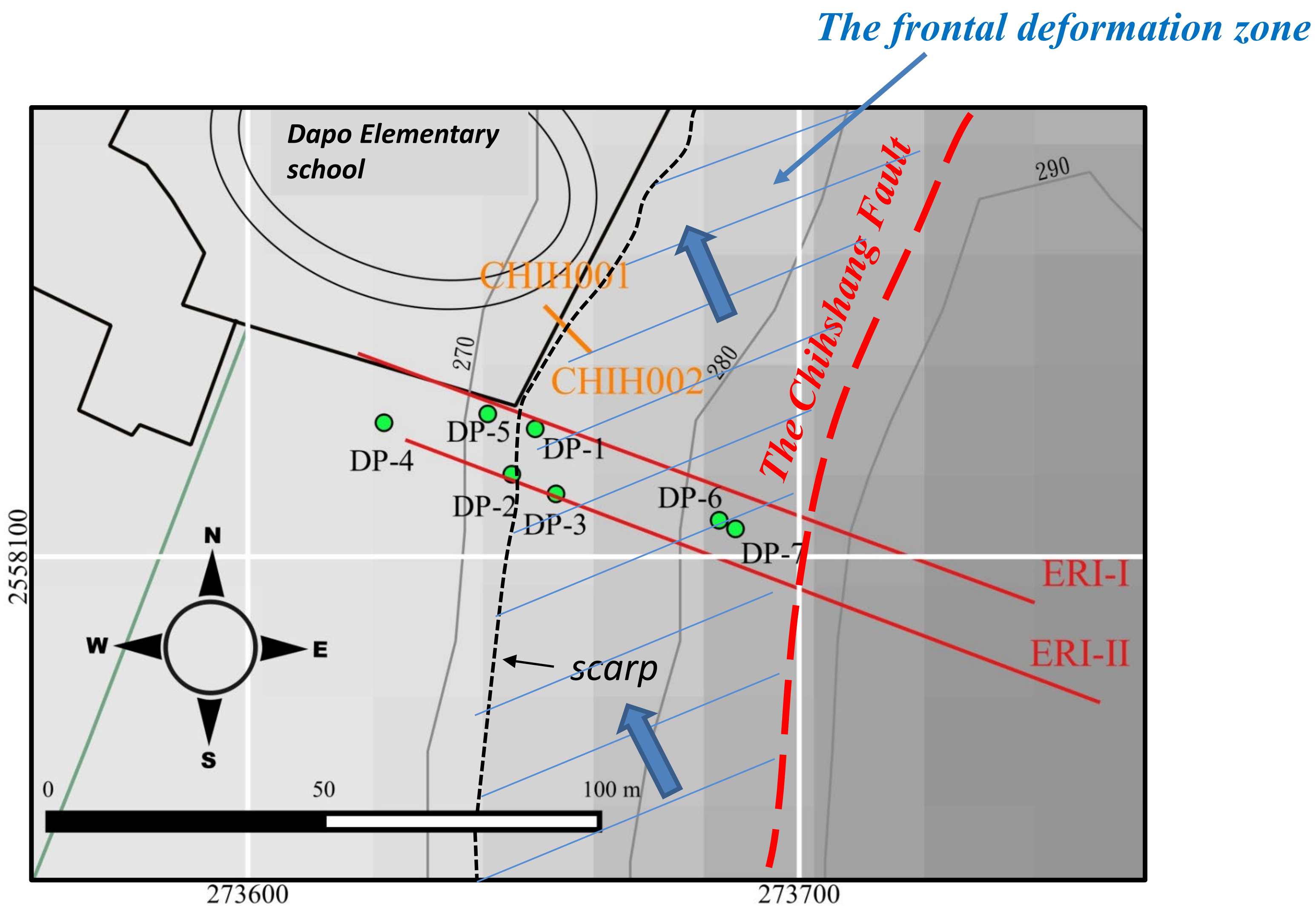
- *The 3D resistivity model and explanations for the frontal deformation zone at the Dapo site.*



■ *The 3D resistivity model and explanations for the frontal deformation zone at the Dapo site.*



■ *The re-defined fault trace of the Chihshang Fault, and the frontal deformation zone at the Dapo site.*



Conclusions

- Previous studies suggested that the fault plane of the Chihshang Fault is outcropped at the toe of the hillslope at the Dapo elementary school.

- However, we discovered that a tongue-like body of the Lichi mélange is actually the slumping results from the high resolution resistivity images, the borehole logs, and the monitoring measurements from the borehole SAA tiltmeter.

- The actual fault trace shown in the resistivity images seems to be truncated by the rupture surface of the slumping body.

- The topographic modification by the **aseismic mass movement** causes the difficulty to identify the actual fault traces in the regions suffered by heavily weathering and transportation effects.

Thanks for your listening