

Integration Study of Observation Technology for Lan-Tai Large-Scale Landslide Demonstration Site in 114 Fiscal Year

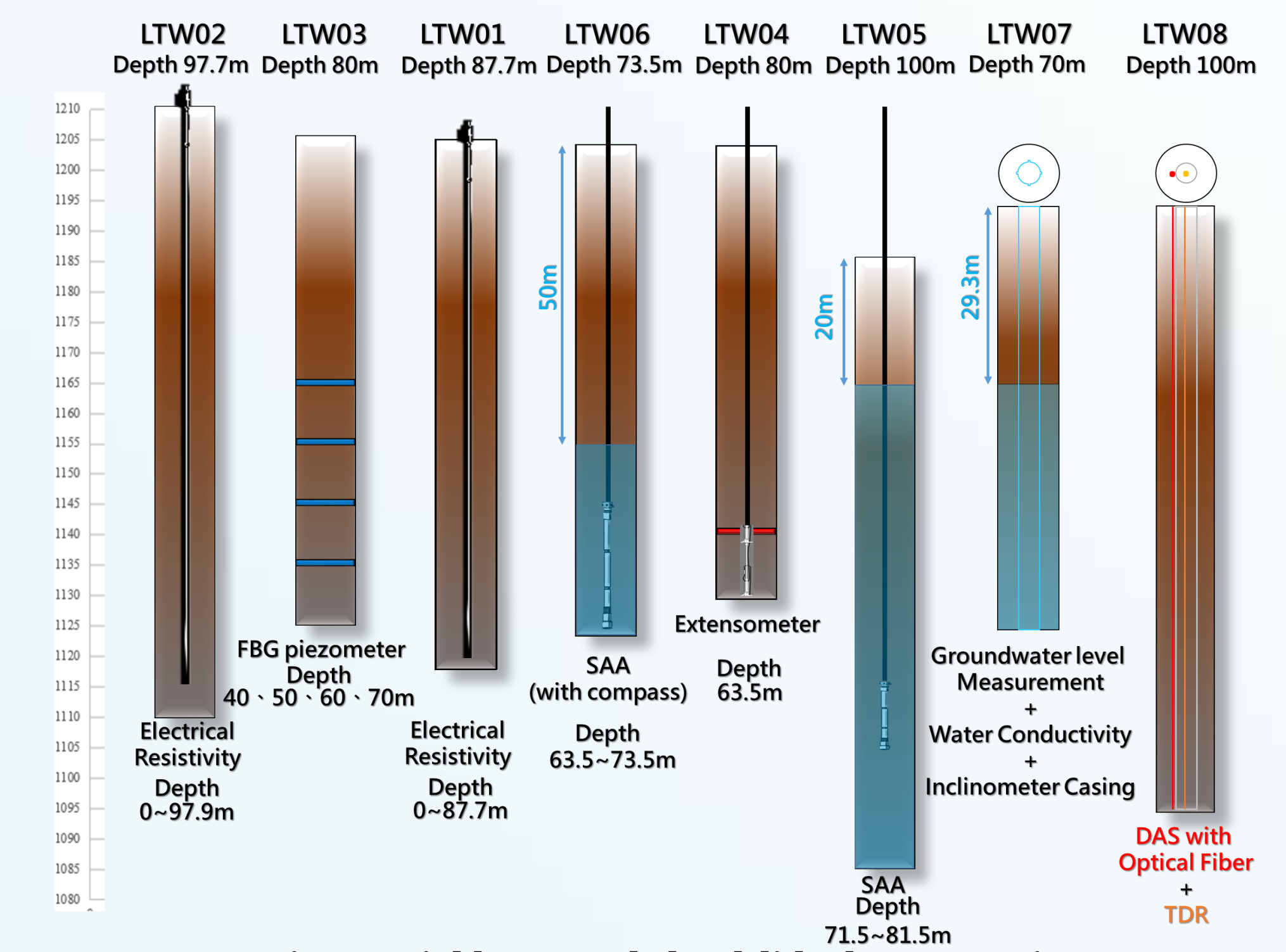
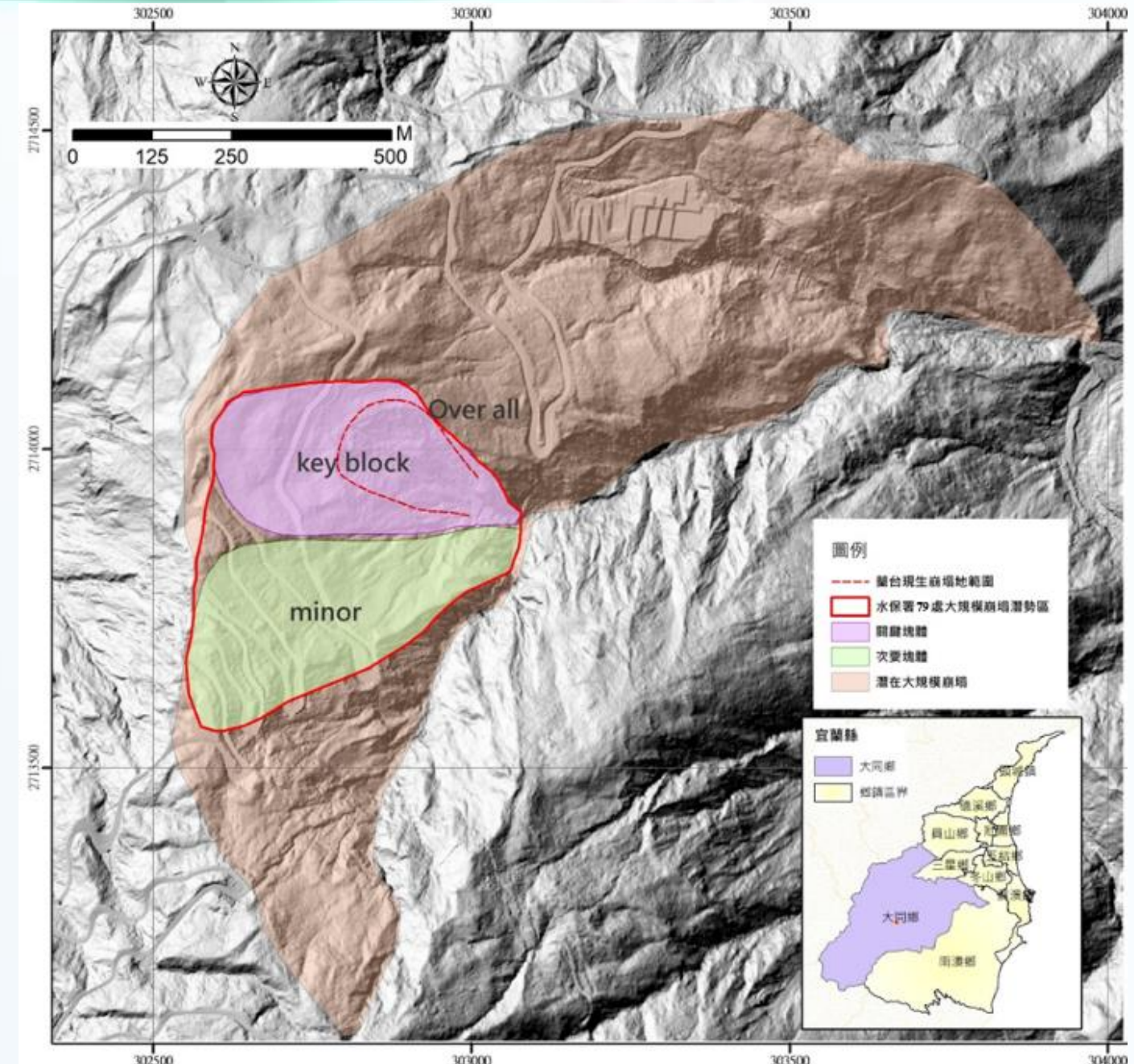


GNSS (GPS) Station
Surface deformation monitoring
Seismic Station
Seismic wave noise monitoring
MEMS-SDM Inclinometer
Tilt monitoring
Surface Extensometer
measure displacement and displacement speed
CCD Camera
Real-time event image tracking
Rain Gauge
Rainfall measurement
River Waterlevel Gauge
River water level monitoring
Differential Settlement Measurement
Elevation change measurement

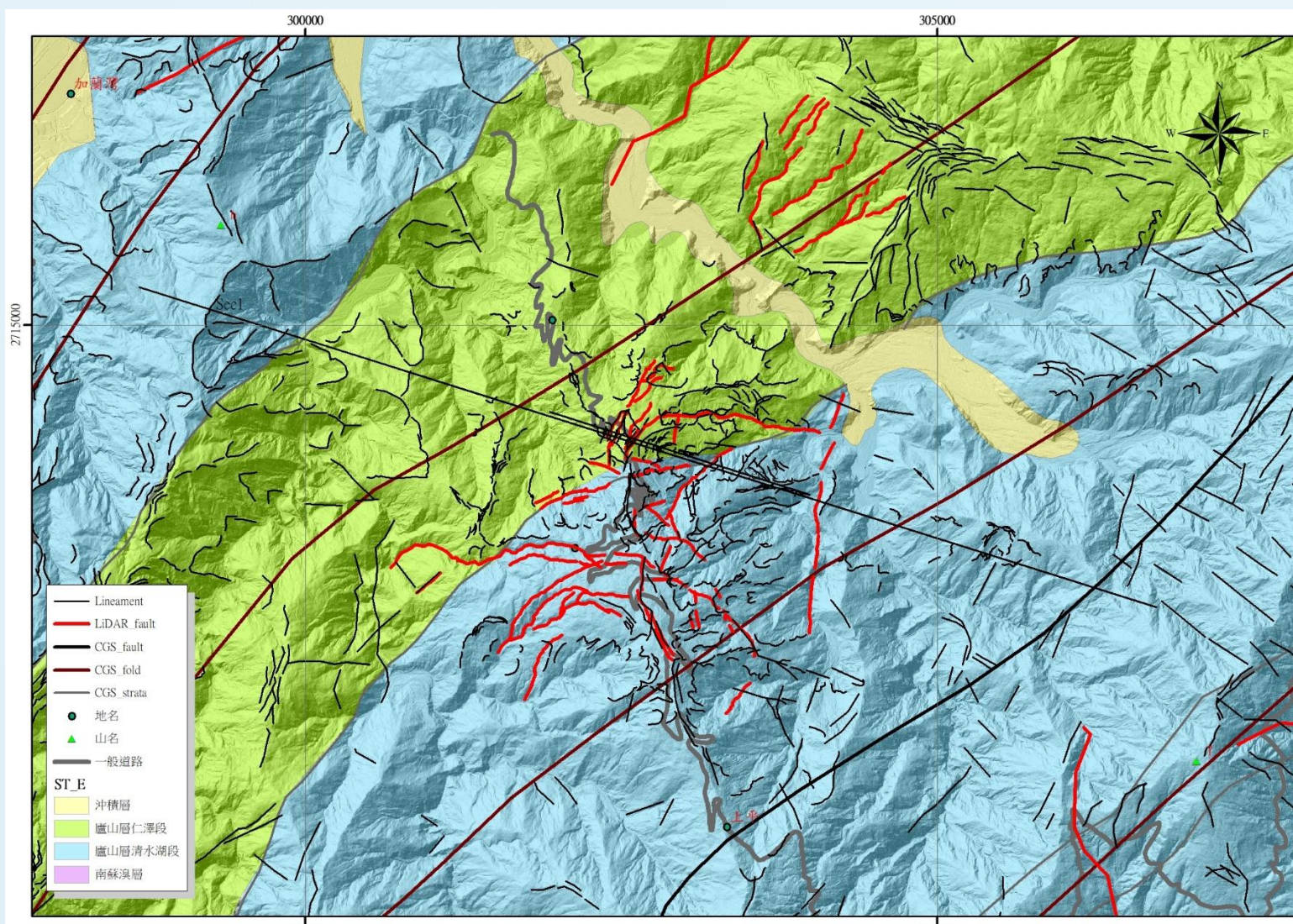
Extensometer
Real-time measure displacement and displacement speed
SAA Inclinometer
Real-time 3-dimensional displacement monitoring
IPI Inclinometer
2-dimensional displacement monitoring
DAS with Optical fiber
Distributed Acoustic Sensing with Optical fiber
Water Pressure Gauge
Free surface water level monitoring
FBG piezometer
Stratified pressurized groundwater pressure monitoring
Electrical Resistivity Survey
2-dimensional resistance observation
Water Conductivity
Material's ability transmitting measure

This study focuses on the Lan-Tai potential large-scale landslide demonstration area, located in Datong Township, Yilan County, Taiwan. This project combines integration study and application technology with multi-temporal and multi-scale observation. According to the monitoring location, the observation can be divided into remote sensing technology (DInSAR, UAS, etc.), surface monitoring (rain gauge, GNSS, seismic station, MEMS-SDM inclinometer, surface extensometer), under-ground monitoring (piezometer, SAA, extensometer, electrical resistivity survey, conductivity). The monitoring instruments are located in the demonstration area to compare different observations with multi-temporal and scale data.

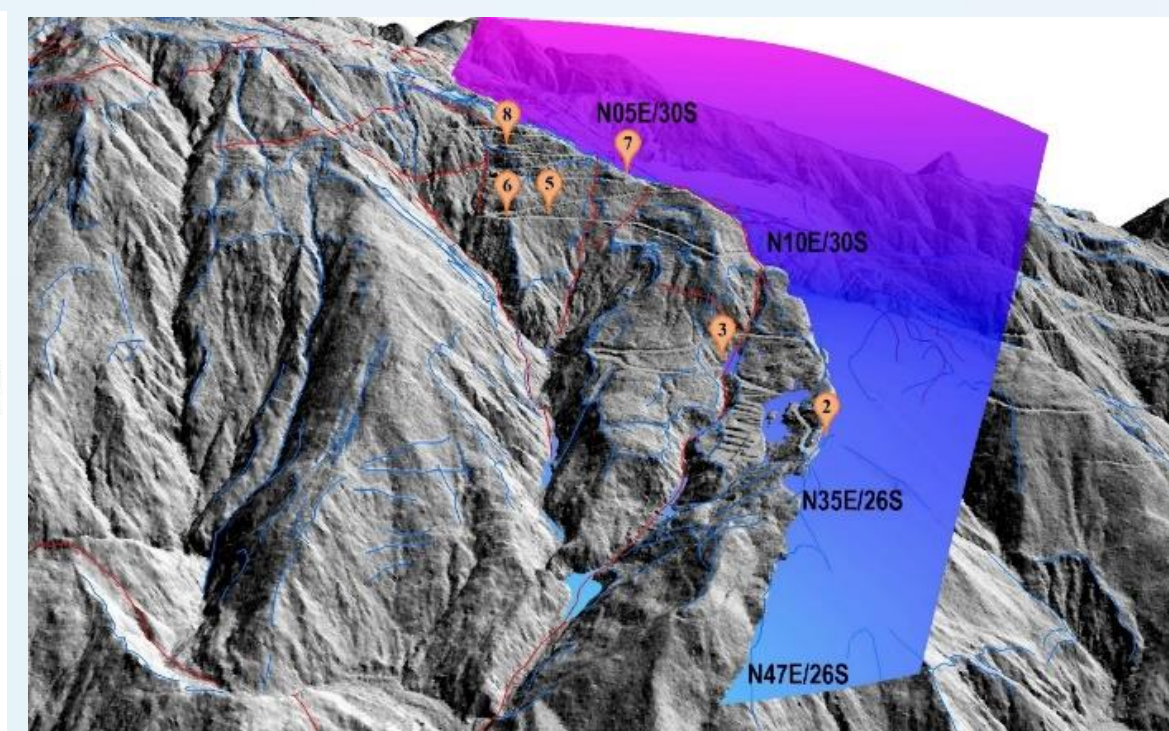
multi-scale observation
Air(A) \ Ground(G) \ Under-ground (U)



Lan-Tai potential large-scale landslide demonstration area



Taipingshan Regional Geological Map

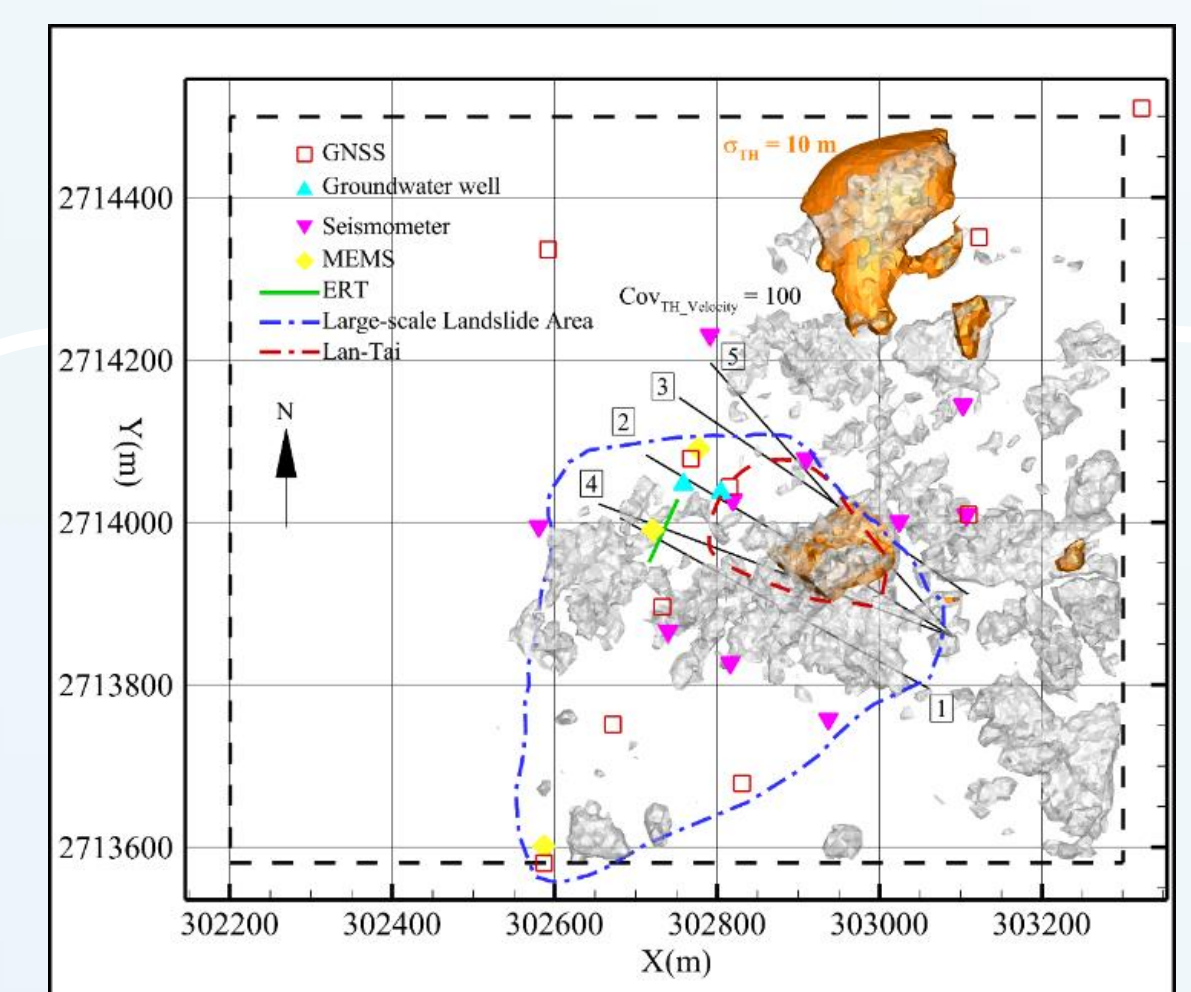


Geological Section Diagram

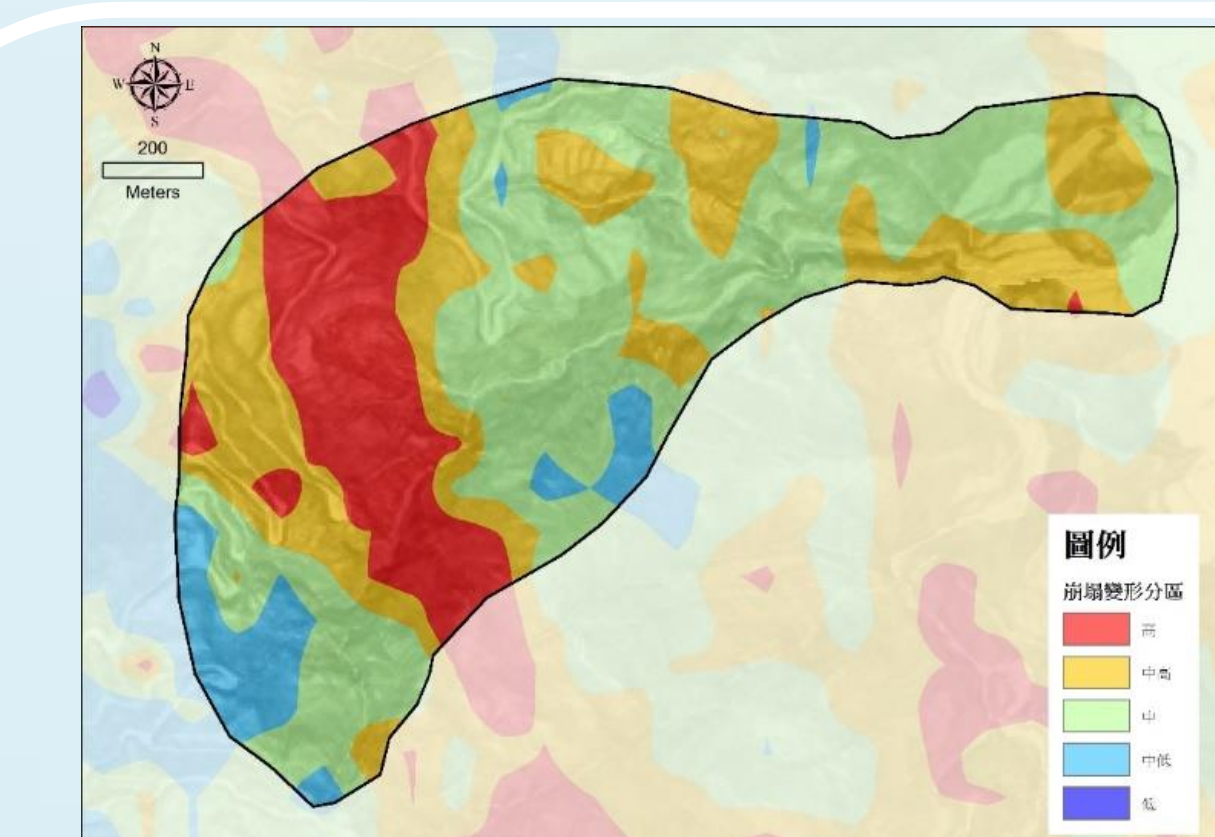
The main landslide layer simulation



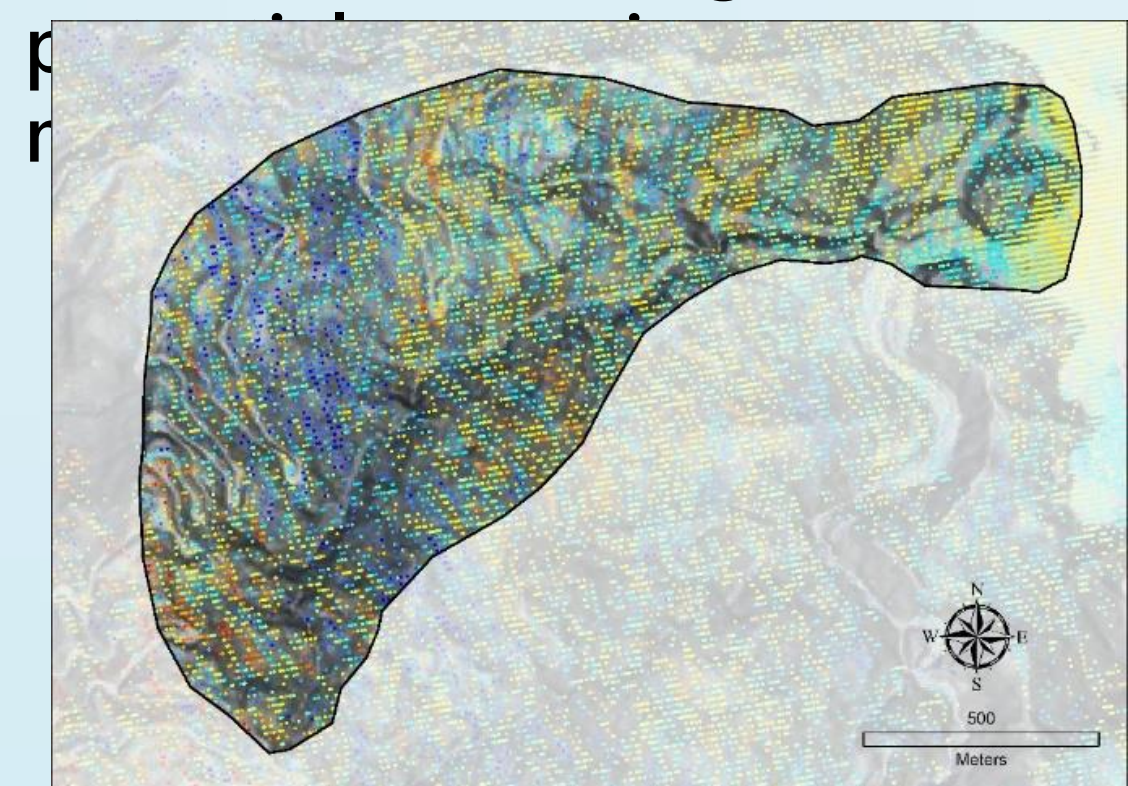
1.Surface monitoring (GNSS (GPS), MEMS-SDM inclinometer, surface extensometer) ;
2.Ground monitoring (SAA, extensometer) ; 3.Hydrological observation (rain gauge, piezometer, electrical resistivity survey, water level gauge) ; 4.Other signals monitoring (seismic station) ; 5.Non-self-measuring(groundwater conductivity, differential settlement).



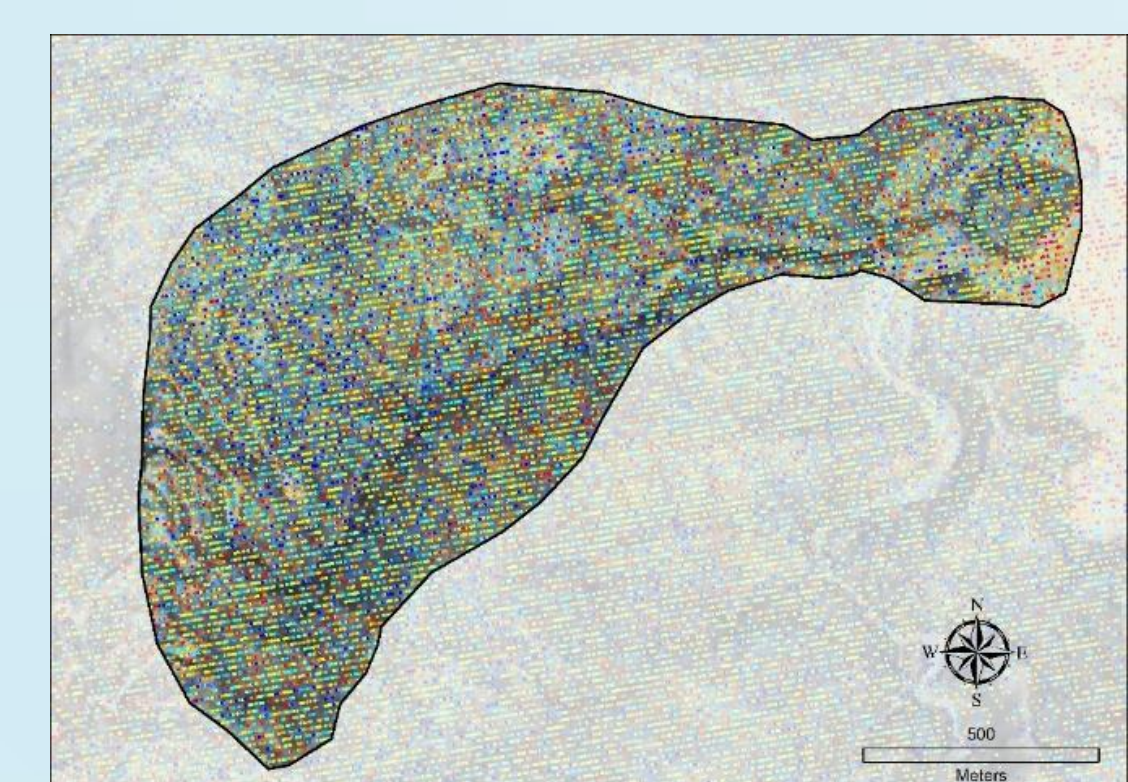
Simulation of steady-state total head of groundwater



Deformation zoning of the Lantai

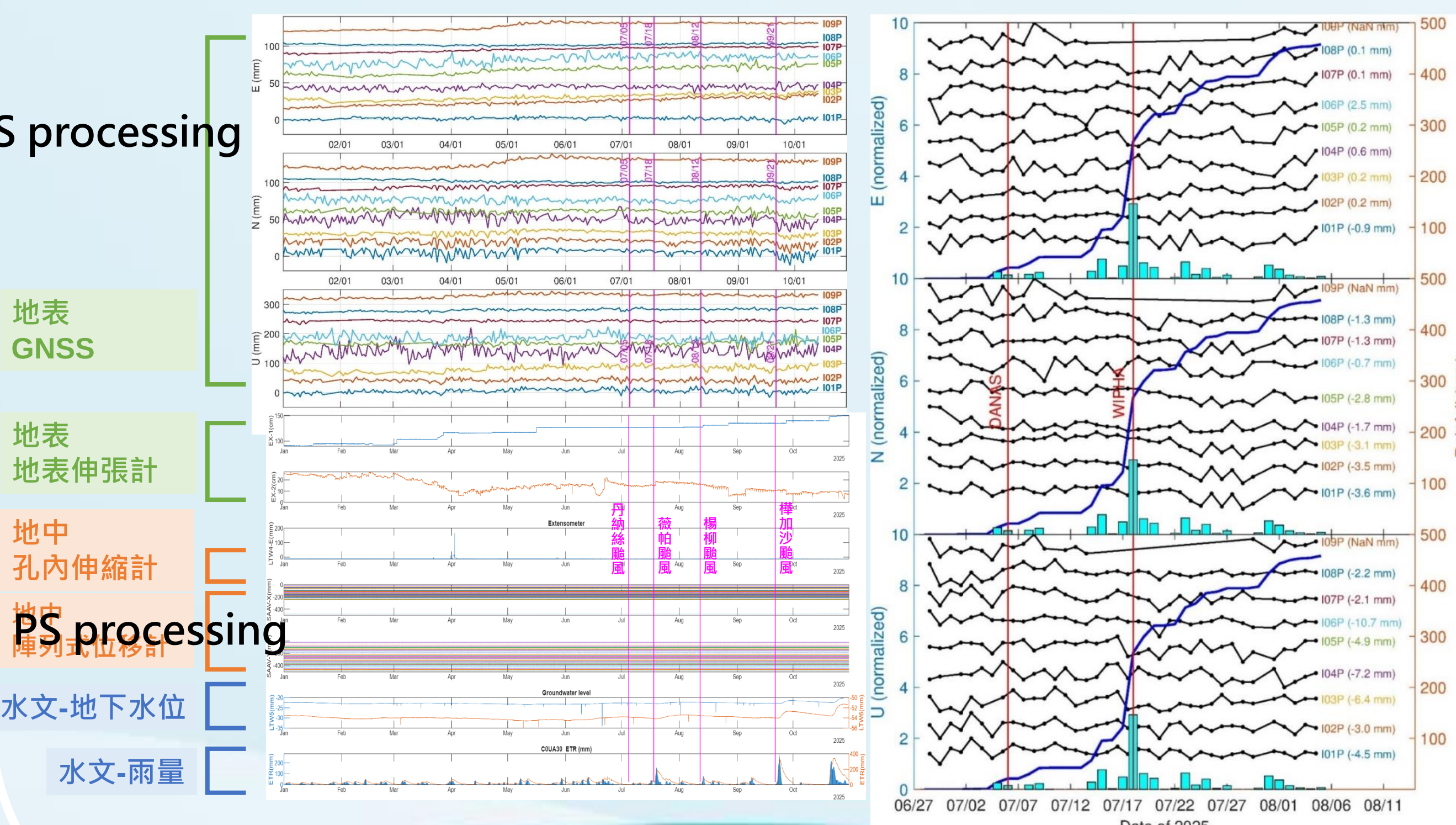


Vertical deformation distribution after SBAS processing



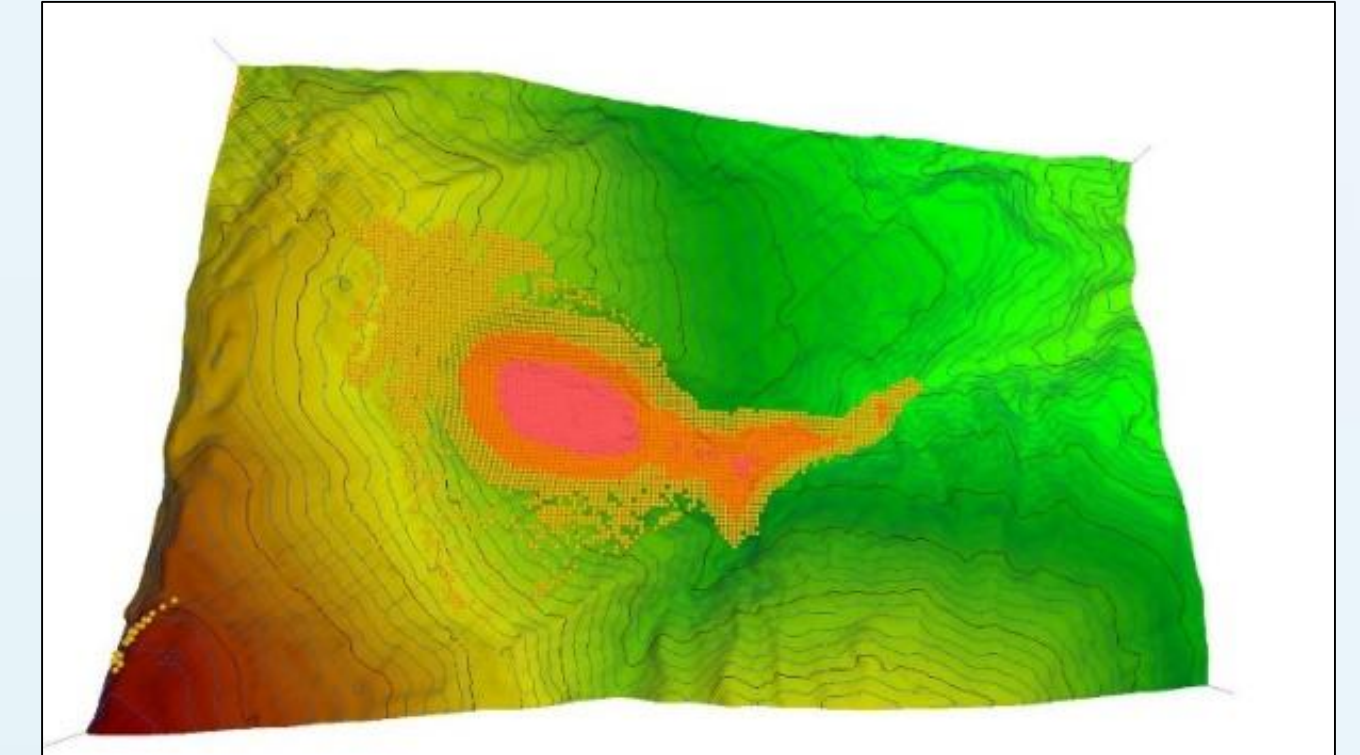
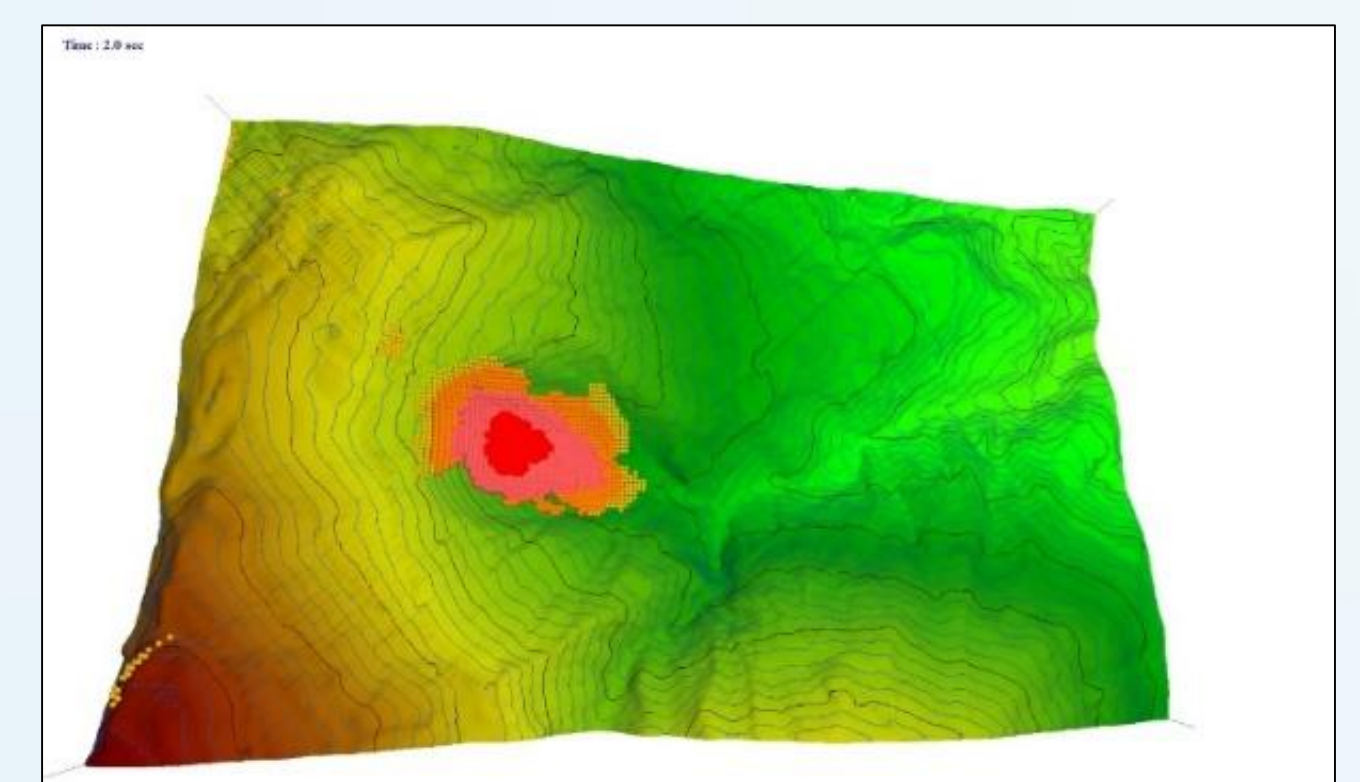
Vertical deformation distribution after SBAS + PS processing

For wide-range surface deformation data constructed, the project uses the Sentinel-1 revisit short period baseline continuous deformation analysis (SBAS InSAR) this year. The results showed that there are parts of landslide in Lantai. The ascending and descending orbits detected different slippages.



Comparison of rainfall, groundwater level, underground deformation, surface deformation and other signal monitoring data

GNSS station time-series data during Typhoons Danas and Wipha



Potential range numerical simulation results with LS-RAPID

This project builds ground water numerical 3D model, and 3D sliding numerical simulation to determine the influence area of large-scale landslide.



農業部農村發展及水土保持署
Agency of Rural Development and Soil and Water Conservation, MOA

委託機關：農業部農村發展及水土保持署 減災監測組
受託單位/設計監造單位：國立暨南國際大學
執行期間/開工起迄：114年4月-114年12月



優質 · 效率 · 團隊