

Investigating the Structure under the Pingting Terrace from the Co-Seismic Surface Rupture of the 2022 Guanshan Earthquake

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On September 17th and 18th, 2022, shallow earthquakes with magnitudes of 6.6 (M_L) and 6.8 (M_L) occurred in the eastern Taiwan Longitudinal Valley, which marks the collision zone between the Philippine Sea plate and the Eurasian plate and led to noticeable surface deformation and ruptures within 70 km. This study primarily focuses on the southernmost section of the rupture zone - the Pingting Terrace. Surface rupture locations and behaviors correspond to changes in topography, providing mutual confirmation that the deformation behavior of Pingting Terrace is complex. Based on the distribution of surface ruptures and topography changes, this study roughly divides the Pingting Terrace into northern and southern segments, using the central concave feature as a boundary. The Riedel shear model analysis results show that the principal shear directions in the northern and southern segments are N-S trending and azimuth 20° , respectively. The maximum principal stress orientations are around 135° for the northern and 155° for the southern segments. These findings align with the fault mechanical investigation of the Lichi Mélange in the northern Muken River area of the Pingting Terrace. This suggests spatial changes in shear zone orientations within the Lichi Mélange, which contribute to developing pressure ridges due to transpressional forces. As a result, the Pingting Terrace experiences rapid uplift, causing the Luliao River to migrate southward into the Beinan River, while the eastern Beinan River turns to the eastward edge of the Pingting Terrace.

Keywords: 2022 Guanshan Earthquake, Co-seismic Surface rupture, Pingting Terrace, Lichi Mélange, flower structure