



Recent Hualien/Taitung Earthquakes (2018~2024)

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Due to the fast convergence between the Eurasian plate and the Philippine Sea plate in eastern Taiwan, Hualien and Taitung have the highest seismicity and fastest surface deformation in the island of Taiwan, and possibly one of the highest in the world.

Up until early 2018, the most known earthquake in eastern Taiwan was the 1951 earthquake sequence that ruptured the Milun fault in Hualien City first (ML 7.3, Cheng et al., 1996), and later ruptured the Longitudinal Valley Fault and the Yuli Fault in the central part of the Longitudinal Valley (Shyu et al., 2007). Although there have been many earthquakes onland and offshore of eastern Taiwan, no major damages by the earthquake were reported in between.

However, between early 2018 and the first half of 2024, several major and deadly earthquakes occurred in this region. Notably, three seismic events stand out: the 20180206 Hualien City earthquake, the 20220917/0918 Chihshan-Guanshan earthquake, and the 20240403 Hualien earthquake sequences. All three events and sequences show significant surface deformation of up to 70~80 cm, and/or rupture of faults. These earthquakes do not necessarily show affinity or similarity to the deformation to the ruptures of the east-dipping Longitudinal Valley fault, such as that shows in the 2003 Chengkung earthquake (Hsu et al., 2009).

These recent earthquakes help us clarify locations and styles of the surface ruptures related to the eastern Taiwan earthquakes, and also with modern records help reconcile the surface and subsurface data, in the hope of distilling the tectonic implications of these earthquakes to Taiwan orogen.



Figure 1. Coseismic deformation of the 20220918 earthquake in the Longitudinal Valley near Songpu village next to the Coastal Range.

REFERENCES

- Cheng, S.-N., Yeh, Y. T., & Yu, M.-S. (1996). The 1951 Taitung earthquake in Taiwan. *Journal of the Geological Society of China*, 39, 267–286.
- Chuang, R. Y., Johnson, K. M., Kuo, Y.-T., Wu, Y.-M., Chang, C.-H., & Kuo, L.-C. (2014). Active back thrust in the eastern Taiwan suture revealed by the 2013 Rueisuei earthquake: Evidence for a doubly vergent orogenic wedge? *Geophysical Research Letters*, 41(10), 3464–3470. Portico. <https://doi.org/10.1002/2014gl060097>
- Hsu, Y.-J., Yu, S.-B., & Chen, H.-Y. (2009). Coseismic and postseismic deformation associated with the 2003 Chengkung, Taiwan, earthquake. *Geophysical Journal International*, 176(2), 420–430. <https://doi.org/10.1111/j.1365-246x.2008.04009.x>
- Lo, C.-L., Chang, E. T.-Y., & Chao, B. F. (2012). Relocating the historical 1951 Hualien earthquake in eastern Taiwan based on tide gauge record. *Geophysical Journal International*, 192(2), 854–860. <https://doi.org/10.1093/gji/ggs058>
- Shyu, J. B. H., Chung, L.-H., Chen, Y.-G., Lee, J.-C., & Sieh, K. (2007). Re-evaluation of the surface ruptures of the November 1951 earthquake series in eastern Taiwan, and its neotectonic implications. *Journal of Asian Earth Sciences*, 31(3), 317–331. <https://doi.org/10.1016/j.jseaes.2006.07.018>
- Yen, I.-C., Chen, W.-S., Yang, C.-C. B., Huang, N.-W., & Lin, C.-W. (2008). Paleoseismology of the Rueisuei Segment of the Longitudinal Valley Fault, Eastern Taiwan. *Bulletin of the Seismological Society of America*, 98(4), 1737–1749. <https://doi.org/10.1785/0120070113>