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**Topographic growth of Taiwan: constraints from the detrital thermochronologic record
in Plio-Pleistocene foreland sediments**

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ABSTRACT

The high and rugged topography of Taiwan formed in response to arc-continent collisional processes that have been active since at least a few million years. Despite the available large and detailed geologic and geophysical record, it remains unclear when the orogen of Taiwan started to emerge above sea-level, to erode and to attain its modern elevation. The detrital record from the retro-foreland basin indicates that in eastern Taiwan erosion rates of up to 2-7 km/Myr were attained since at least the late Pliocene (Kirstein et al., 2009) and elevations of at least 3 km were attained by 1.3-1.5 Ma (Chang et al., 2023).

We apply detrital zircon fission-track (ZFT) dating on samples from two stratigraphic sections in the Plio-Pleistocene foreland of western Taiwan to investigate when erosion started and accelerated to the modern rates. Our ages, integrated with previous data from other foreland successions on both sides of the orogen, indicate that the first input of zircons with a potential Taiwanese thermochronologic fingerprint could date back to the Late Pliocene and were derived from regions with rates accelerating to about 1 km/Ma between 10 and 6 Ma ago. Lag times generally become shorter up-section in all areas, with shorter lag times observed in the east, and longer lag times in the southwest. We use a one-dimensional modelling approach to infer when fast surface uplift and erosion must have started to deliver the first zircons with a Taiwanese thermochronologic fingerprint in the late Pliocene foreland. We use our analysis to infer erosion rates for the late Pliocene from the lag ages of 4-5 Myr.

Kirstein, L.A., Fellin, M.G., Willett, S.D., Carter, A., Chen, Y.-G., Garver, J.I., Lee, D.C., 2009, Pliocene onset of rapid exhumation in Taiwan during arc-continent collision: new insights from detrital thermochronometry, Basin Research, doi: 10.1111/j.1365-2117.2009.00426.x.

Chang, Q., T. Hren, M.T., Lai, L.S.-H., Dorsey, R.J., Byrne, T.B., 2023, Rapid topographic growth of the Taiwan orogen since ~1.3–1.5 Ma, Sci. Adv. 9, eade6415 (2023)