



What do changes in sediment flux mean? An example of structural controls from Taiwan

Linda Kirstein (1), Andrew Carter (2), and Yue-Gau Chen (3)

(1) University of Edinburgh, School of GeoSciences, Edinburgh, United Kingdom (linda.kirstein@ed.ac.uk), (2) University of London, Earth and Planetary Sciences, Birkbeck College, London (a.carter@ucl.ac.uk), (3) National Taiwan University, Department of Geosciences, Roosevelt Road, Taipei 10617, Taiwan, ROC. (ygchen@ntu.edu.tw)

The detrital record of orogenesis holds a unique memory of the processes that construct and destroy topography. This record provides insight into the thermal and tectonic evolution of active margins, drainage reorganisation and importantly the early, often obliterated, phases of mountain building. Rivers have been shown to dominate the delivery of sediment to the world's oceans. The path travelled by sediment from its point of origin to its deposition is generally described by the sediment routing system, often equated with the fluvial network. But how accurately does the sediment preserved in local basins reflect what was removed by erosion from the developing orogen? Here we address this question by investigating the sediment record preserved in both southern and eastern Taiwan using both zircon U/Pb and fission-track dating.

Detrital grain ages from the Miocene (12-6 Ma) sandstones in the modern accretionary wedge, Hengchun Peninsula, southern Taiwan indicate that sediment deposition in the Miocene was strongly controlled by structural trends, crustal deformation and erosion in and around the developing accretionary prism (Kirstein et al., 2010).

The Coastal Range of eastern Taiwan contains a well-preserved detrital archive of erosion with 5-6 km of sediment deposited in retro-foredeep basin(s) since ~4.7 Ma (Kirstein et al., 2010b). The rate of sedimentation recorded in the stratigraphy increases up section from 0.5 mm/yr at 3-4 Ma to ~3.6 mm/yr between 2 and 1 Ma, with the most rapid sedimentation occurring in early Pleistocene times and previously related to orogen growth and southwards propagation of arc-continent collision (Chi et al., 1981). Dating of detrital zircons clearly shows that by 1.9 Myr zircons reset by the orogeny were deposited into the adjacent retro-foredeep basin(s) in the region bounded by two discrete volcanic centres – Chimei and Chengkuangao. South of Chengkuangao reset zircons are detected later. We propose that the presence of these volcanic centres affects sediment routing and conclude that sub-marine topography influences the preservation record. Apparent increases in sedimentation rate in Taiwan are a function of closing sediment transfer pathways rather than increasing sediment flux from the evolving mountain range.

References:

Chi, W.-R., Namson, J., Suppe, J., 1981. Stratigraphic record of plate interactions in the Coastal Range of eastern Taiwan. *Memoirs of the Geological Society of China*, 4, 155-194.

Kirstein, LA, Carter, A, Chen, YG (2010) Testing inferences from palaeocurrents: Application of zircon double-dating to Miocene sediments from the Hengchun Peninsula, Taiwan. *Terra Nova*, 22, 483-493, doi: 10.1111/j.1365-3121.2010.00970.x.

Kirstein, LA, et al. (2010b) Pliocene onset of rapid exhumation in Taiwan during arc-continent collision: new insights from detrital thermochronometry. *Basin Research*, 22, 270-285. doi: 10.1111/j.1365-2117.2009.00426.x.