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A role for low-temperature detrital thermochronology in landscape evolution studies.

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Numerical models of physical processes provide high fidelity understanding of landscape responses to short-lived climate and tectonic perturbations but understanding the significance of these changes and how they combine to influence landscape development over the long-term requires constraints from thermochronological data. For example; the December 2004 earthquake linked to subduction of the Indian plate caused the Andaman islands to tilt with $\sim$1.5m of uplift in the east and a similar amount of subsidence 40km to the west. Since subduction in this region has been ongoing for at least 60 Myrs we can ask what is a possible long-term occurrence interval for earthquakes of this magnitude? Modelled thermal histories of combined apatite fission track (FT) and (U-Th)/He data from Paleogene sediments exposed in the uplifted eastern parts of the islands indicate$\sim$1000m of uplift and erosion over the last 5 Myrs equivalent to a 20 Kyr occurrence interval.

Whilst we can learn a lot from bedrock studies in many areas the bedrock exhumation record is short due to erosion. In the Himalayas bedrock exhumation studies rarely yield AFT ages older than $\sim$10 Ma, the majority are $<$ 5 Ma. For this reason researchers are increasingly utlizing the sedimentary record. Although detrital exhumation data rarely have a temporal resolution better than 1 Myr, due to the combined affects of biostratigraphic control and analytical uncertainties, they provide the best means to see back in time. In practice detrital thermochronometry requires linking individual grains to a source and the level at which this can be achieved, i.e. whether a grain can be tied to a particular lithology, stratigraphic unit or source region is an area of active research. To achieve better constraint on grain provenance new techniques are being developed that enable extraction of two or more sources of information from the same grain, such as combining FT, U-Pb and Hf dating of zircons and FT and Nd

analysis of apatites. Examples from the Himalayas and East Asia are presented that demonstrate the utility of these approaches and how such data advance understanding of landscape development.