Geophysical Research Abstracts
Vol. 13, EGU2011-4862, 2011
EGU General Assembly 2011

Some potential pitfalls when detrital radiogenic data are used to constrain the evolution of orogenic belts

Andrew Carter
Earth and Planetary Sciences, Birkbeck University of London, London WC1E 7HX, United Kingdom (a.carter@ucl.ac.uk)

Detrital thermochronometry (AFT, AHe, 40Ar/39Ar) and geochronometry (U-Pb) data are increasingly used to locate sediment sources and define long-term (10x5 to 10x7 yrs) exhumation states of source regions. Such data are often compared against modern erosion data from river loads to argue for change or constancy in source region behaviour but the validity of this approach should be questioned on the basis that short-term climate oscillations and anthropogenic interferences may provide a distorted image of erosion. More fundamental issues relate to the sediment transfer process that may cause mixing of unrelated signals and/or introduce significant time lags between forcing mechanisms driving erosion and sediment deposition.

If a research goal is to explain changes in sediment flux due to climate change we first need to establish if the climate proxy records and transfer system are suitably in step or whether there is a lag between perturbation, response and depositional archive. Theoretical considerations, based on simplifying diffusion models, show that although landscapes quickly adjust to perturbations in climate only short (< 300km) transfer systems will produce a sediment record in tune with the changes. Landscape responses to tectonic perturbations mostly take longer and are therefore less likely to be in equilibrium even for 100 ka timescales. Consequently, orogenic studies that seek to use modern detrital data to characterise catchment scale erosion need to adopt sampling strategies to take into account signal modification by the transfer process, and to consider landscape response times by different forcing mechanisms. Examples from the Himalayas will be used to reinforce these points.