Geophysical Research Abstracts
Vol. 15, EGU2013-1849, 2013
EGU General Assembly 2013

The timing of exhumation of the Lesser Himalaya

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Knowledge of the exhumation of the Lesser Himalaya (LH) is important to the development of models of crustal deformation and to testing whether erosion of the LH has contributed to changes in ocean geochemistry, (e.g. Pierson-Wickmann et al 2000; Chesley et al 2000). Since most of the LH is unmetamorphosed, using bedrock to determine the timing of exhumation has been confined to fission track studies, whilst detrital work has concentrated on using the earliest isotopic / petrographic detection of LH detritus in the dated foreland basin sedimentary record to constrain the timing of exhumation (DeCelles et al 1998; Robinson et al 2001; Huyghe et al 2001; Szulc et al 2006; Najman et al 2009). Bulk Sm-Nd analyses of foreland basin mudstones, and U-Pb analyses of detrital zircons were used since the LH and Higher Himalaya (HH), which was exhuming previously, were considered to differ in their Sm-Nd characteristics and zircon age spectra. However, the HH, exhumed earlier and of high topography, continues to dominate the detrital load to the basin, thus hindering detection of the subordinate LH due to dilution effects when bulk isotopic analyses are used. Additionally, emerging work shows that there is some overlap in the U-Pb age spectra of zircons and bulk Nd from the HH and LH (McKenzie et al 2011). Thus there is ambiguity in the detection of the earliest LH detritus in the foreland basin; erosion of the LH occurred by 11 Ma, but may have begun by 16 Ma (Bernet et al 2006).

In addition to Ar-Ar analyses on detrital micas and Sm-Nd analyses on conglomerate clasts, we employed new techniques to the foreland basin succession in order to detect LH input:
- Re-Os analyses on mudstones. Material of high 187Os/188Os is found in the LH (e.g. Pierson-Wickmann et al 2000) but has not so far been found in the HH.
- U-Pb analyses on detrital rutiles. HH and LH rutiles are distinguishable by their different cooling ages (Bracciali et al - poster in this session; this study).
- Sm-Nd on detrital apatite. Sm-Nd analyses on single grains will not be subject to the dilution issues of bulk analyses and recent work has used this approach to distinguish HH from Trans-Himalayan detritus (Henderson et al 2010).

We will discuss the effectiveness of these techniques in distinguishing HH from LH detritus in the foreland succession and thus further constrain the exhumation of the LH.