Geophysical Research Abstracts
Vol. 17, EGU2015-1109-1, 2015
EGU General Assembly 2015

Constraining the timing of exhumation of the Eastern Himalayan syntaxis, from a study of the palaeo-Brahmaputra deposits, Siwalik Group, Arunachal Pradesh, India

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The evolution of Himalayan syntaxes is debated: they have been subjected to anomalously young (<10 Ma) high grade metamorphism, melting and unusually high rates of exhumation (∼10mm/yr), compared to the main arc of the range where peak metamorphism / melting occurred in the Early Miocene and exhumation rates of ca 2mm/yr are more common 1. The history of the young metamorphism and rapid exhumation of the eastern syntaxis is debated. Bedrock studies have been interpreted to imply rapid exhumation since either 3-4 Ma 2 or 8-10 Ma 3. However, the earlier history of the sampled region is removed by erosion and should be preserved in the sedimentary record. Bracciali et al 4 focused on distal detrital deposits and suggested a much more recent onset, during the Quaternary.

A number of models have been proposed to explain the syntaxial evolution, supporting different controlling influences, from lithospheric channel flow, to tectonic-surface process interactions.

Ductile extrusion of weak lower crust from beneath Tibet by "channel flow" 5 is a process that has been proposed to account for the outward growth of the plateau to the east 6, exhumation of the Higher Himalaya in the Miocene when coupled with high erosion rates, and could be responsible for rapid exhumation of the syntaxis 7. Ehlers and Bendick 8 propose that initiation of rapid and localised exhumation at subduction arc terminations may result from the 3D geometry imposed by subducting curved shells at such locations. Clark and Bilham 9 evoke a change in regional stress along the India-Asia-Burma plate boundary, perhaps due to the introduction of denser (oceanic and transitional crust) material into the eastern part of the boundary late in the orogen's history. Zeitler et al 10 consider that exhumation of the syntaxis is driven by surface processes.

In order to understand how and why the syntaxis formed, this project aims to better constrain the onset of exhumation of the Namche Barwa using the proximal detrital record of material eroded from the syntaxis by the paleo-Brahmaputra. We analyse the sedimentary record to have access to earlier erosion products than preserved in the bedrock itself, in a proximal location. The Remi River section, in the Siwalik Group, is located directly downstream of the syntaxis and therefore is the most likely location to contain these sediments. Sediment provenance is characterized by U-Pb dating on detrital zircons, which allows specifically documenting an Indus-Yarlung suture-zone (and therefore paleo-Brahmaputra) provenance.

Detrital U-Pb rutile, zircon fission track and Ar/Ar mica dating is used to document rapid exhumation. When ages of the youngest population for all analysis types are essentially the same (stacked thermochronological ages), a period of very rapid exhumation at this time is indicated.

Depositional ages are determined through magnetostratigaphic dating of the Upper and Middle Siwaliks in the Remi section. Comparison of the detrital mineral cooling ages with their host sediment depositional age will allow us to determine the lag time and then exhumation rates.

Preliminary results will be discussed; they better constrain the period of rapid exhumation history of the syntaxis and will better inform the crustal deformation models presented above.