The Himalaya-Bengal fan denudation-accumulation system during the past 20 Ma

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Mass balances for both denudation in the Himalayas and sediment accumulation in the Subhimalayan basins, including the Bengal deep-sea fan but excluding the Indus fan, yield 7.1 x 10^6 km^3 and 7.4 x 10^6 km^2 (s ± 20%), rock of 2.75 g/cm^3 density), respectively, for the past 20 Ma. Coarsening and increased sediment accumulation rates in the foreland basin and in the Bengal foredeep indicate accentuated tectonic activity and unroofing in the Himalayas since that time. The sediment volume includes ≥ 1 x 10^6 km^3 of Neogene Bengal fan sediment that was lost via the Nicobar fan to the Sunda accretionary wedge. In addition, the Indian peninsular rivers contributed about c. 0.6 x 10^6 km^3 of solid load to the basins. Average denudation during the past 20 Ma, as derived from geothermobarometric data and restored cross sections, occurred most rapidly along the High Himalayan crystalline chain (vertical unroofing c. 1000 m/Ma; northward lateral retreat of southern Himalayan slope, exposed to monsoonal rain, ≥ 3.5 km/Ma), and much slower in the Tethyan sedimentary zones to the north (average 150 m/Ma). The solute loads of the modern Himalayan rivers indicate a mean chemical denudation rate of 17 m/Ma. The distinct decrease in sediment accumulation on the outer Bengal fan between about 7 and 1 Ma (in contrast to the Indus fan) is probably caused by exogenic factors rather than by a significant decline in tectonic activity. Pre-20 Ma sediments in the Subhimalayan basins were derived mainly from the southern margin of the Tibet plateau or from sources outside the study area.

Evolution and facies architecture of a Himalayan Cretaceous forearc basin

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The mid-Cretaceous to Eocene flysch deposits of the Xigaze forearc basin in southern Tibet were investigated in a 120 km segment along the Indus-Yarlung suture zone. The basin evolved south of the magmatic arc (Gangdise belt) of the Lhasa block on top of trapped oceanic or transitional crust.

Remnants of shelf carbonates are preserved along the northern edge of the basin. The mapped segment was shortened by about 65%; metamorphism reached low grade conditions along the northern margin of the basin.
The flysch sequence reaches a thickness of at least 5 km and consists to a large degree of volcaniclastic (andesitiec to dacitic)material shed from the magmatic-arc Gangdise belt. Particularly in the western part of the study area, plutonic and sedimentary rocks from deep erosion levels and/or more distal sources contributed to the basin fill. Rivers from the Lhasa block acted as point sources and fed five major deep-sea channel systems. Turbidity currents in the channels were directed towards the growing accretionary wedge of the subduction zone, thus indicating that the basin was continuously filled up to outer ridge level and gradually shallowing. Three forearc flysch is subdivided into at least three megasequences, which begin with wide (up to several km) incised (10 to 50 m), coarse-grained channel fills and their associated fan deposits. The upper parts of the megasequences contain hemipelagic dark shales and marls (deposited above the CCD). Lateral channel migration, channel migration, channel lobe swtching, but also volcanic pulses generated a predominantly fining-upward, high-frequency cyclicity.
After continental collision, the marine sedimentation in the forearc basin was replaced by fluvial deposits of the Eocene-Oligocene Qiuwu formation, which is time-equivalent to the Kailas and Indus molasses farther west and rich in coarse gravel derived from the Gangdise belt. Both forearc flysch and Qiuwu formation were deformed simultaneously during the Miocene. We assume that the molasse-type Qiuwu formation represents the final continental facies of the forearc basin filling.

Depositional events and their records - an introduction

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Course and University Lectures topic

Event deposits of some lateral extent as defined here occur almost in all types of sedimentary basins. They reflect either local, intra - basinal processes, or they are associated with regional or global mechanisms. Some types of event beds, such as sediment gravity flows, sandy and muddy turbidites, are common and usually well preserved. They make up large proportions of basin fills, whereas others (e.g., tsunami deposits and in-situ earthquake structures) appear to be less frequent or rare in the geological record. Volume, frequency, and facies of event deposits are controlled by several