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TI Extremely Rapid and Localized Erosion in the Himalaya Recorded in Sediments of the Bengal Fan

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AB Vigorous erosion during mountain building is now recognized as a significant factor for integrated climate-tectonics-erosion studies in Earth system science. In this context, the ages of detrital grains in sediments both define the depositional age and provide direct evidence for the tempo of erosion. In the eastern syntaxis of the Himalaya, the youngest peak identified by BINOMFIT in detrital zircons from fluvial sediments of the modern Brahmaputra River is 0.6 Ma, and significantly, it includes 47% of the entire sand-sized zircon population. The youngest grains are ~ 0.1 Ma, and a significant subset has a peak age of 0.4 Ma. The youngest peak in apatite fission-track ages from the same samples is 0.4 Ma and includes 39% of the grains. These ages are astonishingly similar to bedrock cooling dates from their source in the Tsangpo gorge, where the Yarlung-Brahmaputra River slices through the Namche Barwa-Gyala Peri massif in southeast Tibet. The Tsangpo gorge is particularly significant because it is a region with exceptionally young bedrock ages, including zircon fission-track dates (0.2 Ma), biotite 40Ar/39Ar cooling ages (1.0 Ma), zircon [(U-Th)/He] cooling ages (0.3 Ma), and migmatite crystallization ages ($<$3.0 Ma). These data are all compatible with an estimated exhumation rate of about 7 mm/yr in the Tsangpo gorge, and provide an actualistic model for interpreting the distribution of grain ages in older sediments; clustering of grain ages from different geothermometers about the time of deposition is an indicator of exceptional exhumation rates, and, if sustained in the longterm, accompanying rapid uplift. The Bengal Fan is a repository for debris eroded from the Himalaya. Grains of K-feldspar, muscovite, and apatite are abundant in sediments of the Bengal Fan. Fission-track and 40Ar/39Ar dates on apatite, K-feldspar and muscovite recovered from

DSDP Sites 717 and 718 constrain deposition on the outer fan to about the past 12 m.y. With 2 exceptions, duplicate determinations of the age of the youngest grain from identical depositional horizons within the fan are essentially concordant. This remarkable synchronicity in 40Ar/39Ar and fission-track ages requires erosion and transport from the outcrop to the fan in an astonishingly short time. It requires deposition of first-cycle material with essentially the identical age at the time of deposition, despite the significantly different cooling histories that each of these systems records. This concurrence requires exceptional erosion in a setting that exposes grains of essentially "zero-age," and provides in-situ evidence that extremely rapid and localized erosion, such as that now occurring in the vicinity of the Namche Barwa-Gyala Peri massif and the Tsangpo gorge, has been a factor in exhumation of the Himalaya for at least the past 12 m.y.

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