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Linkage of denudation and precipitation in the Himalayas

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The study of couplings between tectonics and denudation processes has become an important field of investigation for the understanding of mountain building mechanisms.
Recent studies have discussed the existence of a correlation between the relative localizations of high precipitation and high denudation areas. Whereas Burbank et al. [2003] conclude that precipitation and erosion are decoupled across the Himalayas of Nepal, Thiede et al. [2004] suggest the opposite: that the denudation rate in the Higher Himalaya is mainly controlled by the high rainfalls associated to the orographic rain shadow.
In this study we address this problem through the use of a thermomechanical numerical modeling which includes a realistic denudation formalism taking into account both fluvial incision and hillslope landsliding. We test different combinations of rainfall distribution and geometries for the Main Himalayan Thrust, in order to identify the predominant factor in localizing the denudation.
Our results indicate that the precipitation pattern influence the width of the high denudation area and the intensity of the denudation. The location of this area is however controlled by the geometry of the MHT rather than by the rainfall distribution. In a mechanically coupled system, the tectonics behaviour is mostly sensitive to the global amount of precipitation and not to small scale variations: in the case of the Himalayas looking for spatial correlation between denudation and precipitation at a wavelength smaller than 20-40km is likely not justified.