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Seismicity and Erosion

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Earthquakes build topography but also drive erosion. Erosion, in turn, may control seismicity. Nowhere is this two way feedback more evident than in Taiwan. There, patterns of erosion and seismicity are demonstrably correlated, over decades and also at the scale of individual, large earthquakes. At the scale of the mountain belt, the pattern of erosion shares elements with the distribution of cumulative seismic moment, and the relative importance of typhoons. Are these controls independent, or does climate govern seismicity on short time scales with erosion as the go between? The density of landslides in the epicentral areas of large earthquakes follows the pattern of peak ground acceleration, and the decay of landslide density away from the earthquake epicenter has a functional form similar to that of the attenuation of seismic waves. Years after the 1999 Chi-Chi earthquake, landslide rates in central west Taiwan have remained anomalously high, although fluvial sediment transport in the epicentral Choshui River has relaxed to near background levels. Knowing the time constant of decay of fluvial sediment transport and the total excess river load, and the spatial pattern of co-seismic mass wasting, we can calculate the net topographic effect of the Chi-Chi earthquake. Erosion has not had an important effect on the earthquake topography, but it has caused deposition of a series of sediment layers offshore, with recognizable attributes. With this knowledge, foreland basin stratigraphy can be interrogated for information about paleoseismicity.