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The role of the Asian monsoon in controlling erosion, weathering and the flux of sediment to the ocean

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The summer monsoon dominates the rainfall of South and SE Asia and is anticipated to be the primary control on continental erosion and weathering during the Quaternary when tectonic processes do not vary significantly except at local scales. Periods of strong monsoon generally correlate with interglacial, sealevel highstands. Such periods are recognized as times of enhanced reworking of stored sediment from flood plains or fluvial terraces within mountains, resulting in fast sedimentation being recorded in delta systems. Rising sealevels usually prevent large sediment volumes being reworked on to the continental slope, but what is deposited during periods of intensifying monsoon is more altered than sediment deposited prior to that time. In the South China Sea sedimentation on to the slope is largely driven by reworking of older weathered materials from the shelf, rather than directly from productive sources, such as Taiwan. Enhanced reworking is only curtailed by rising sealevels drowning the continental slope and shifting erosion further back onshore. While hotter, wetter conditions favor faster chemical weathering, the more weathered nature of sediment deposited at that time represents reworking of older stored sediment, not an immediate response to changing environmental conditions. New OSL dates from the Indus Basin support the idea of valley filling during time of strengthening monsoon followed by subsequent incision and reworking. Landslide damming caused by heavy summer rains may be a dominant process in this sediment buffering process, which results in lag times between initial erosion and delivery to the ocean on the order of 5–15 k.y. for finer grained sediment and potentially longer for dense detrital phases, such as zircon. Recognizing these lags is important when correlating marine erosion records with terrestrial climate records derived from lakes or caves if we are to understand the response of landscape to climate change.