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Cyclone Driven Sediment Loads in a Tropical Mega-River.

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Understanding the links between environmental change and sediment transport in the mega-rivers that dominate the flux of terrestrial sediment to their deltas and oceans remains a major challenge. Many large river systems display significant seasonality in flow regime, which is affected to a greater or lesser degree by the influence of large tropical storms, which act to increase their variability and thus drive uncertainty in predicting the impacts associated with changes in future flow regimes. Here we demonstrate the significance of tropical storms in driving sediment flux from one of the world's largest rivers, the Mekong, to its delta. Data was collected at Kratie, Cambodia; this being the site of the Mekong's final reliable flow gauging station before the Mekong delta. Suspended sediment fluxes were estimated by calibrating acoustic backscatter returns from an acoustic Doppler current profiler to observed suspended sediment concentrations (SSCs) across a monsoon cycle. The retrieved SSCs were combined with flow velocity estimates to recover the sediment flux. These estimates of flux were then used to build sediment rating curves to predict suspended flux as a function of flow discharge. A hydrological model, VMod, was then used to estimate daily discharge values for the same historical period, but for a scenario in which the effects of tropical storms on the flow regime are isolated. This was achieved by forcing the hydrological model with daily precipitation values that account for precipitation anomalies associated with observed tropical storms. The difference in cumulative sediment transport estimated by combining the two flow discharge scenarios with the constructed sediment rating curves allowed the contribution of tropical storms to the Lower Mekong's suspended sediment transport regime to be isolated.

It was found that sediment loads in the Mekong River attenuate downstream from approximately 120 MT in Laos and Thailand to ∼80-90 MT in the alluvial floodplain reaches of Cambodia. Furthermore, it is shown that the proportion of flux generated from tropical cyclones increases downstream and dominates (∼60%) the flux observed around the confluence of the 3S basin (the Se San, Sre Pok and Se Kong Rivers) which drains the Vietnamese highlands. This implies future changes in cyclone tracks may impact upon sediment delivery to the Mekong delta.