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Sediment Transport and bedform dynamics during a major, typhoon-driven, flood on a large tropical river

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Fluvial sediment transport in tropical-monsoonal rivers are characterised by some of the highest sediment yields on Earth, yet the unsteady dynamics and partitioning of sediment transport as bedload and suspended load during floods has received little attention. Herein, results from multiple field surveys of a section of the Mekong River (in Cambodia) reveal the variability in sediment transport during a large flood in 2013.

High-resolution MultiBeam EchoSounder (MBES) surveys produced river bed bathymetric maps to record the movement of sedimentary bedforms though time. Suspended sediment transport rates and flow velocities were concurrently measured using an acoustic Doppler current profiler (ADCP).
These surveys found major changes in the type and size of bedforms present through time. Barchan dunes that were present before, during and after the peak flood are denudated massively at the peak of the flood by large numbers of secondary superimposed bedforms. However, during the falling limb of the flood these secondary dunes merged with the Barchans to produce the largest bedforms measured in the surveys. The difference in bedload sediment transport rates between the peak and waning leg of a major flood event was also quantified.

Data from the ADCP reveals a match between local flow velocities, bed shear stress and Rouse number that can be related to the changes in suspended sediment concentration across the river channel. This impacted the shape of bedforms though alteration of the dominant mode of sediment transport, which varied considerably across the channel. These factors contributed to a spatial disparity in local storing and erosion of sediment within the river channel.

This paper will highlight the above findings and discuss the implications for modelling the response of large river morphodynamics to large flood events.