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Morphodynamic model validation for tropical river junctions

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The use of morphodynamic numerical modelling as an exploratory tool for understanding tropical braided river evolution and processes is well established. However there remains a challenge in confirming how well complex numerical models are representing reality. Complete validation of morphodynamic models is likely to prove impossible with confirmation of model predictions inherently partial and validation only ever possible in relative terms. Within these limitations it is still vital for researchers to confirm that models are accurately representing morphodynamic processes and that model output is shown to match to a variety of field observations to increase the probability the model is performing correctly. To date the majority of morphodynamic model validation has focused on comparing planform features or statistics from a single time slice. Furthermore, these approaches have also usually only discriminated between "wet" and "dry" parts of the system with no account for vegetation. There is therefore a need for a robust method to compare the morphological evolution of tropical braided rivers to model output.

In this presentation we describe a method for extracting land cover classification data from Landsat imagery using a supervised classification system. By generating land cover classifications, including vegetation, for multiple years we are then able to generate areas of erosion and deposition between years. These data allow comparison between the predictions generated by an established morphodynamic model (HSTAR) and field data between time-steps, as well as for individual time steps. This effectively allows the "dynamic" aspect of the morphodynamic model predictions to be compared to observations. We further advance these comparisons by using image analysis techniques to compare the: planform, erosional and depositional shapes generated by the model and from field observations. Using this suite of techniques we are able to dramatically increase the number and detail of our observational data and the robustness of resulting comparisons to model predictions. By increasing our confidence in model output we are able to subsequently use numerical modelling as a heuristic tool to investigate tropical river processes and morphodynamics at large river junctions.