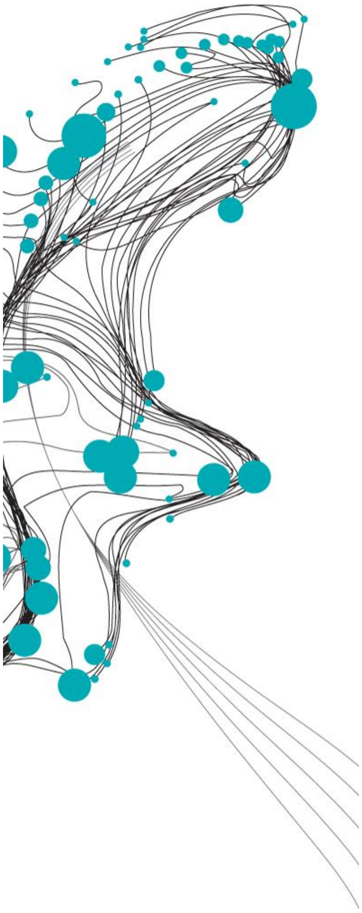

Automated detection of river morphodynamics for large multithreaded rivers with satellite imagery

A case study on the Ayeyarwady river

Understanding river planform dynamics is a difficult task as they are controlled by complex interactions between the discharge variability, sediment transport, floodplain characteristics and the valley geometry. The difficulties in understanding planform dynamics especially become clear in multithreaded river planforms, whose existence is still poorly understood. Satellite imagery combined with automated detection techniques might be key to generate a better understanding of planform dynamics, due to their ability to study large spatial scales.

There exist several ways to consistently identify the river surface. The main challenge is to eliminate the effect of a varying water level, as the water level affects the extent of the water surface. To eliminate this effect two techniques are applied. The first is to automatically detect the vegetation boundary, which is assumed to be the river bankline. The second method uses water level measurements to select images with a similar water level and automatically detects the water surface. The detection of the river surface allows to quantify planform changes in metrics such as erosion, deposition, migration rates and change in active channel area.

Next, the methods are applied at a case study of the multithreaded Ayeyarwady river (Myanmar). A roughly 250 km long river section located in the lower Ayeyarwady river is studied. Strong variability in planform dynamics over time is detected. Some years measure up to 3 times the amount of erosion as other years. The intensity of the planform dynamics is found to be strongly correlated to the average water level in the 4-month lasting flood season (see Figure 1). Thus, yearly variations in average flood season intensity explain the large yearly variability in the measured intensity of the planform dynamics.

The results of the case study show potential of automatic detection on satellite imagery to quantify and characterize planform dynamics the in complex multithreaded rivers. The ability of automated detection techniques to quantify planform dynamics on large spatial scales, allowed to quantitatively study the controls of observed planform dynamics. In this way, the large impact of flood season intensity and its yearly variations could be identified. With ever-increasing pressure on river systems due to climate change or human interventions such as river dams, understanding the controls of planform dynamics is key to successfully manage rivers and their dynamics in the future.

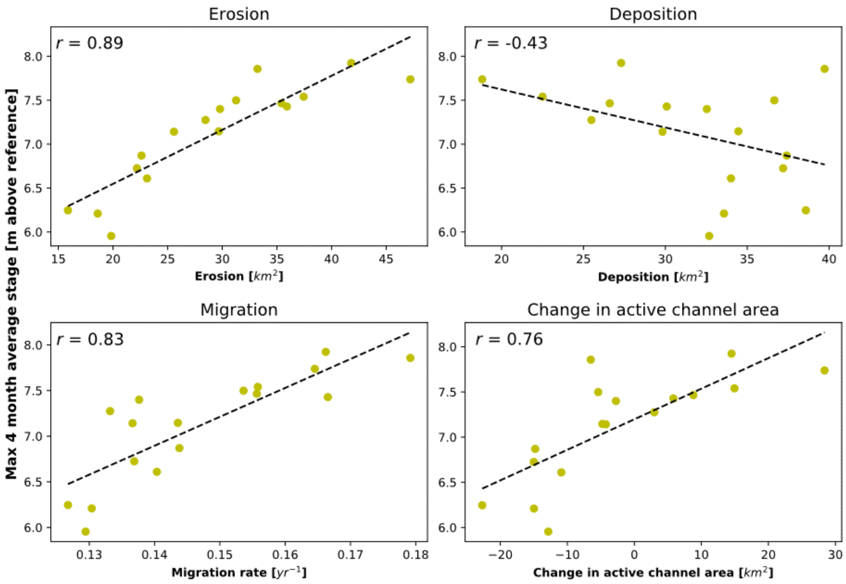

Figure 1: The measured metrics and the relation with the measured average flood season intensity. The average flood season intensity is defined at the maximum 4-month average water level.

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