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Influence of bars on the distribution of bedload fluxes in asymmetrical bifurcations of the Loire River (France)

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Channel bifurcations strongly influence the morphological evolution of rivers by controlling the fluxes of water and sediment inside the fluvial system. The improvement of knowledge about the hydro-sedimentary processes of the bifurcations is fundamental to optimize river management. For this purpose, three bifurcations are studied near Bréhémont (France) on the middle reaches of the Loire River, where the multiple channel pattern is affected by incision. The bifurcations monitored are largely asymmetrical as they connect the incised main channel to secondary channels only during floods.

Bathymetric data show that during floods, the morphological evolution of bars present in the main channel affects the distribution of sediments in bifurcations. So the lateral aggradation and progradation of the abovementioned bars located close to the onset of a secondary channel can form (i) a sediment reservoir and (ii) a ramp which associated with secondary helical currents makes easier the exportation of the bedload from the main channel to the secondary branches. Bathymetric surveys also show that during floods, bars are overlapped by dunes whose dimensions depend on hydraulic conditions. When secondary channels are connected, the distribution of water in bifurcations causes a drop of the capacity of bedload transport in the main channel resulting in a significant decrease of the height and length of dunes. In order to detail interactions between hydraulics and bedform dynamics in bifurcations, an innovative pluri-disciplinary monitoring combining aDcp, multiple-beam sounding, sediment traps and stratigraphic measurements will be displayed for the next floods during forthcoming surveys.