Geophysical Research Abstracts
Vol. 20, EGU2018-5669, 2018
EGU General Assembly 2018

The Okavango River: past, present, and future?

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Large rivers and associated floodplain wetlands are characterised by various morphological, hydrological, and ecological changes. The factors driving these changes include sedimentation, erosion, river avulsion, habitat degradation due to human impacts, and hydrological regime shifts due to climate change. Understanding the types and rates of changes occurring in a fluvial system is important for the implementation of appropriate management strategies. Similarly, studying the longer-term evolution of rivers and wetlands and how they respond to external influences can allow us to predict future trajectories of change due to climatic and/or land use change.

The Okavango Delta in arid northern Botswana is one of the most ecologically diverse and pristine wetlands in the world, and was inscribed as a World Heritage site in 2014. Threats to the Okavango Delta include agricultural and hydropower development in the upstream catchment in Angola and Namibia, as well as changes in water supply due to anthropogenic climate change. The modern Okavango River in the Panhandle region of the Delta has a meandering and anastomosing channel with permanent swamps and large palaeochannels preserved on the floodplain surface. In order to improve our understanding of how the Okavango River responds to external influences, this research aims to: i) investigate the timing and hydroclimatic drivers of enhanced flow in Holocene palaeochannels of the Panhandle; ii) use historical records to investigate the types and rates of channel adjustment in the modern system, and; iii) contrast modern and palaeo-discharge and morphology.

Palaeochannels in the Panhandle are up to 5-10 times the size of the modern river and were active ~4 ka during a wet period that was also characterised by regional lake development. Increased Atlantic Ocean-sourced rainfall over the catchment due to an intensification or expansion of the Congo Air Boundary during the mid-Holocene is likely responsible for the enhanced flow that formed these palaeochannels. These channels were migrating laterally very rapidly and likely maintained a channelised course to the Mababe depression north of the Delta which experienced a high-stand in the mid-Holocene. The modern river has much smaller, laterally stable channels which are prone to avulsion (channel relocation in the wetlands) which redistributes water and sediment through a complex arrangement of intersecting channels. Local avulsions have implications for communities who rely on key points where a channel abuts the edge of the Panhandle for access to water and transport. The complex relationships between climate and hydrology, and river character (morphology) and behaviour (laterally migrating vs. avulsive) provide a template to understand how future climatic and/or land use changes may influence the Okavango River.