



The Planform Mobility of Large River Channel Confluences

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Large river confluences are widely acknowledged as exerting a controlling influence upon both upstream and downstream morphology and thus channel planform evolution. Despite their importance, little is known concerning their longer-term evolution and planform morphodynamics, with much of the literature focusing on confluences as representing fixed, nodal points in the fluvial network. In contrast, some studies of large sand bed rivers in India and Bangladesh have shown large river confluences can be highly mobile, although the extent to which this is representative of large confluences around the world is unknown. Confluences have also been shown to generate substantial bed scours, and if the confluence location is mobile these scours could ‘comb’ across wide areas.

This paper presents field data of large confluences morphologies in the Ganges-Brahmaputra-Meghna river basin, illustrating the spatial extent of large river bed scours and showing scour depth can extend below base level, enhancing long term preservation potential. Based on a global review of the planform of large river confluences using Landsat imagery from 1972 to 2014 this study demonstrates such scour features can be highly mobile and there is an array of confluence morphodynamic types: from freely migrating confluences, through confluences migrating on decadal timescales to fixed confluences. Based on this analysis, a conceptual model of large river confluence types is proposed, which shows large river confluences can be sites of extensive bank erosion and avulsion, creating substantial management challenges. We quantify the abundance of mobile confluence types by classifying all large confluences in both the Amazon and Ganges-Brahmaputra-Meghna basins, showing these two large rivers have contrasting confluence morphodynamics. We show large river confluences have multiple scales of planform adjustment with important implications for river management, infrastructure and interpretation of the rock record.