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Morphodynamics of active meandering rivers in a hierarchy of spatial and temporal scales

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Active meandering rivers have the advantage of exhibiting morphodynamic changes at such a rate that changes are detectable on a range of timescales, from event, through decadal, to centennial. The evidence from river reaches that have been investigated directly for 40 years by various methods is used to examine the morphodynamics over differing spatial and temporal scales. Several questions can be addressed, including: what channel changes are produced by different events, discharge periods and sequences; how do events and phases combine to produce changes in position and in morphology; to what extent are such changes coherent, systematic and predictable. The combination of evidence from detailed cross-sectional surveys, field mapping, drone and aerial photographic surveys and use of historical maps demonstrates how the morphodynamics at different scales combine and interact. Analysis indicates some systematic changes at cross-sectional and bend scale but contrasts between different reaches, bends and within bends, and reveals complex patterns and lags in propagation of change. Survey and monitoring requirements to detect and understand the interactions are identified. Research into these active meandering rivers may be indicative and helpful for our wider understanding of less dynamic rivers, where changes are less easily detected. It raises the question of whether the mechanisms are similar in more stable rivers and reaches.