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Spatial patterns of sediment erosion and deposition during an extreme flood event: Data to assess the meaning and interpretation of sediment connectivity in river systems.

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Although many types of connectivity are defined, overall, there is widespread recognition that the term connectivity in any 'geo-ecological' sense is useful in promoting the interconnection between the morphological components of the landscape and the material fluxes that move across, and through, the drainage basin. All forms of connectivity are considered relevant to the storage, residency and delivery of sediments and pollutants within a drainage basin. Whilst recent studies have acknowledged the role of connectivity in catchment modelling and landuse management, the lack of field data which actually measures and quantifies it as a process in time and space hinders its widespread adoption as a practical tool in water quality protection and river management. This is especially the case in relation to sediment connectivity. While the spatial arrangement of major depositional landforms such as alluvial fans, floodplains and within-channel bars has been proposed as a means of assessing connectivity or dis-connectivity within a catchment, such depositional landforms are ubiquitous and the approach provides a difficult framework to assess relative rates or spatial patterns of sediment storage, transfer and delivery.

In recognition of the lack of field data supporting the concept of connectivity, this paper investigates data from an extreme flood event in southeast Queensland during the summer of 2011 which resulted in loss of human lives, widespread flooding throughout the city of Brisbane and enormous infrastructure and ecological damage. The availability of high resolution LiDAR data from a pre-flood (2010) and post-flood (2011) time periods provided the basis for comparison of the alluvial landscapes. High resolution Digital Elevation Models (DEMs) derived from both LiDAR captures were used to derive stream networks and extract stream channel characteristics and two dimensional cross sections. A change surface was then calculated by subtracting one from the other, and formed the basis of volumetric change estimates. Using data on rates and spatial patterns of erosion, deposition and redistribution for this event, we explore key aspects of sediment connectivity at three spatial scales; within-reach; between reach and downstream within the mainstem of the river network. This analysis allows us to contribute important understanding to the main question of this session: what is the theoretical basis for moving forward in the sediment connectivity conceptual framework?