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Characteristics of sedimentary structures in coarse-grained alluvial rivers

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The characteristics of coarse-grained alluvial surfaces have important implications for the estimation of flow resistance, entrainment thresholds and sediment transport rates in gravel-bed rivers. This area of research has, thus, demanded attention from geomorphologists, sedimentologists, and river engineers. The majority of research has focused towards understanding the characteristics and adjustments in surface grain size. Bed stability, however, is not ultimately defined by particle size but how grains are arranged within the bed surface. For example, by the organisation of particles into a variety of grain and form scale sedimentary structures and bedforms (e.g. imbrication; pebble clusters, stone nets, transverse ribs). While it is widely acknowledged sedimentary structuring must be considered within estimates of flow resistance and sediment transport, relatively little is known about the structural properties of water-worked river gravels. As a consequence, we remain woefully ignorant of this important aspect of gravel-bed river sedimentology.

The aim of this poster is to present some preliminary results of a study designed to characterise the morphodynamics of sedimentary structures in coarse-grained alluvial rivers and their implications upon entrainment thresholds and sediment transport rates. The poster focuses on investigating the variability in grain and form scale sedimentary structuring across a number of field sites. Representative patches of three gravel bars on the Rivers Wharfe, Manifold and Afon Elan, UK, have been surveyed using a Leica HDS 3000 Terrestrial Laser Scanner. The resultant raw point-cloud data, recorded at a 4mm resolution, has been registered, filtered, and interpolated to produce highly detailed $2\frac{1}{2}$D digital elevation models of gravel-bed surface topography. These surfaces have been analysed using a number of structural parameters including bed elevation probability distribution function statistics (standard deviation, skewness, kurtosis), semivariograms, and inclination indices. This research enhances our understanding of alluvial bed surface structures and lays the foundations for developing a more detailed understanding of their morphodynamics.