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Global- and local-scale characterisation of bed surface structure in coarse-grained alluvial rivers

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It is widely recognised that adjustments in bed surface grain size (texture) and grain arrangement (structure) exert significant controls on the stability of coarse-grained alluvial rivers. Modifications to bed surface texture and structure occur during active sediment transport and are mediated by the process of mobile armouring which concentrates coarser-than-average particles on the surface and organises them into a variety of grain- and bedform-scale configurations. Textural aspects of surface armouring are well understood to the extent that sediment transport models can be used to predict the size distribution of armours that develop under different sediment supply regimes and shear stresses. Research has also found that the adjustment of bed surface grain size is often patchy and that the development of finer-grained and coarser-grained areas of the bed has important implications for both the rate and grain size of transported sediment. The structural aspects of stream-bed armouring, however, are less well understood, largely because of the difficulty of recognising and characterising bedforms and bed-structures that have dimensions similar to their constituent particles. Moreover, bed structure is generally parameterised using global scale descriptors of the bed surface such that information on the spatial heterogeneity of the structure is lost. The aim of this poster is to characterise the structural characteristics of water-worked river gravels, paying particular attention to quantifying the spatial heterogeneity of those characteristics using local scale descriptors. Results reported from a number of flume experiments designed to simulate the spatio-temporal evolution of bed configurations (surface texture and structure) as the system adjusts to a condition of equilibrium transport are used to evaluate the spatial variability of bed surface structure and explore its significance for modelling sediment transport rates in gravel-bed rivers.
Keywords: bed surface structure, gravel-bed rivers, sediment transport