



## **Estimation of near-bank shear stresses for modelling bank erosion in a meander bend**

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In recent years much progress has been made in understanding and modelling bank erosion, but efforts to accurately quantify the shear stresses exerted by the flow on the bank area continue to be challenging. In this research, we attempt to test methods recently developed by Kean & Smith (2006) to determine the form drag exerted on small-scale topographic bank features and thus quantify the near-bank flow field. The research activity involves the following phases:

1. Data collection. Field work has been undertaken along a meander of the Cecina River (Tuscany). Characterization of the small-scale bank roughness was carried out by detailed measurements of the amplitude of topographic elements at 5-cm intervals on representative reaches of two eroding banks.
2. Numerical implementation. Kean & Smith's model for determining form drag for regular and irregular sequences of measured bank topographic features has been implemented.
3. Determination of near-bank shear stresses. To apply Kean and Smith's model, a reference velocity within the region of the flow unaffected by bank roughness is required. This is achieved by coupling the Kean and Smith model with an analytical three dimensional model for flow and bed topography in alluvial meandering channels developed by Nobile et al. (2007).
4. Bank erosion model. An excess shear stress formula is then used to quantify the rate of fluvial bank erosion. The accuracy of the model is tested by comparing predictions

with measurements of bank retreat along the Cecina river bend.