

## **Assessing morphological changes in gravel-bed rivers using LiDAR data and colour bathymetry**

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**Abstract** Estimating underwater features of channel bed surfaces without the use of bathymetric sensors results in very high levels of uncertainty. A novel approach to create more accurate and detailed Digital Terrain Models (DTMs) integrates LiDAR-derived elevations of dry surfaces, water depth of wetted areas derived from aerial photos and a predictive depth–colour relationship. This method was applied in three different sub-reaches of a northeastern Italian gravel-bed river (Brenta) before and after flood events occurred in November and December 2010 (recurrence interval: 8 and 10 years). From the data collected through channel field survey, a regression model which calculates channel depths using the correct intensity of three colour bands was implemented. LiDAR and depth points were merged and interpolated into a DTM which features an average error of  $\pm 18$  cm. The morphological evolution and the sediment volume change calculated through a difference of DTMs shows deposition and erosion areas, indicating a deficit which reduces as it goes downstream.

**Key words** fluvial erosion–deposition processes; gravel-bed river; colour bathymetry; LiDAR data; floods