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Terrestrial photogrammetry for monitoring riverbank erosion.

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The aim of this on-going research is to quantify the sediment delivered by bank erosion processes at the scale of a representative reach, using terrestrial photogrammetry, and to learn more about the processes that generate lateral fluvial changes.

The study reach is located along the Cecina (southern Tuscany, Italy), a gravel-bed river. The monitored bank is 170 m long, with an average height of about 5 m. Bank deposits were surveyed and grain size analyses were carried out for the main units.

High-resolution terrestrial photogrammetry surveys were integrated with topographic one to monitor riverbank retreat. River stages, rainfall, and water table changes along the bank were measured during flow events.

The photogrammetric surveys were repeated after major flow events in the monitoring period. These provided accurate and detailed information about the behaviour of each unit along the entire eroding bank surface before and after a flood event. The resulting 3D-data were processed with specific software packages to generate a digital terrain model of the bank surface. Comparison between the surveys enabled precise calculation of the volumetric differences between them and the total volume of material eroded. The volume of material eroded for each unit during a single flow event was then calculated.

An erosion map of the bank surface was constructed in order to identify the distribution and intensity of the erosion along the bank reach, including the areas where bank material was eroded and in some cases where it was deposited on the bank toe.

The first results shown that mass failures of the upper cohesive portion represent the dominant mechanism of sediment delivery.