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Moiré method applied to sediment transport in a small-scale braided river

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Braided river patterns and sediment supply interactions are significant. Small-scale braided rivers were studied in a rectangular flume with an adjustable slope to investigate these relationships and to gain insight into the effect of grain sorting on bedform formation and migration. We used a 1.20-m-wide and 4.5-m-long flume and a mixture of fine and coarse sand ranging from 0.5 mm to 1.5 mm and from 1.5 to 3 mm (with median sizes 1 and 2 mm, respectively). The sediment feed rate and water discharge were maintained constant. The initial bed was flat with a 3% slope. The mean bed load discharge was calculated by weighing output sediments. The experiment produced bedforms and braided patterns. Equilibrium was reached with a constant number of moving bars.

The Moiré method was used to study the bed topography and bedform migration precisely. This optical method considers deformations of grey fringes projected by a video projector on the bed topography. These deformations were recorded with a digital camera and analysed using the phase shifting method (with a special algorithm adapted to the experimental setup). Data produced by this algorithm were mapped with GIS software such as ArcGis.

We chose the Moiré method among other methods (laser, photogrammetric, point gauge, etc.) because of its high spatial resolution and its simplicity. However, several technical aspects had to be resolved. Bed topography accuracy depends on the distance between the camera's focal plane and a reference plane parallel to the flume. As the flume and the rail supporting the camera were not parallel, this distance changed along the flume. Instead of moving constantly along a physical reference plane, two wedges were placed on the flume sides to create a virtual reference plane: a 2-cm-wide surface on the top of each wedge was extracted from photographs using image processing software, and these surfaces were used to extrapolate a single virtual reference plane for the whole flume.
Two additional wedges of known height placed above the reference plane wedges were used for calibration. Basically, only one wedge was necessary but the second one was used as a control.