

Modeling Sediment Transport in Gravel-Bed Rivers Using Field Data

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1. Introduction

Gravel-bed rivers play a crucial role in ecosystems, providing diverse habitats for various species. Their morphological evolution and sediment transport are highly dynamic, influenced by factors such as water flow, channel morphology, grain size, and sediment supply. Understanding the spatio-temporal distribution of sediment flux is essential for managing river morphology, preserving ecosystems, and informing restoration efforts. In this study, we examine sediment flux along a 1.3 km reach of the Satsunai River to gain insights into sediment transport processes and evaluate the effectiveness of a 2D sediment transport model in representing sediment dynamics in gravel-bed rivers.

2. Data and methods

The study is carried out using advanced numerical model Nays2DH, a 2D numerical model, supplemented with field data. Nays2DH was used to simulate sediment transport processes. The field point-based bedload data were collected using hydrophones devices which were installed at the riverbed prior to the flushing flow release. The hydrophone devices installed at three different locations of the domain (see figure 1) during the flushing flow event provided important information about the temporal distribution of bedload at these locations.

3. Results and discussion

The sediment flux exhibits distinct spatial and temporal variations along the reach. During peak flow, sediment transport generally increases, except at the sharp bend, where flux is lowest and increases after the peak discharge

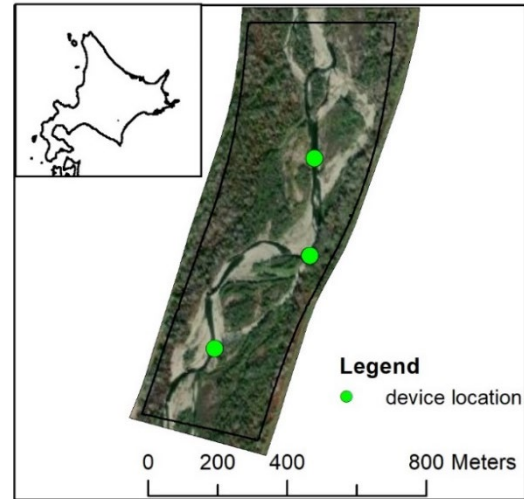


Fig. 1. Location of study site and sediment bedload measurement devices installation locations.

(see Figure 2). This pattern suggests localized sediment deposition and subsequent remobilization, influenced by flow dynamics and channel morphology. These findings provide valuable insights into sediment flux distribution, which can aid in river management, habitat preservation, and targeted restoration efforts.

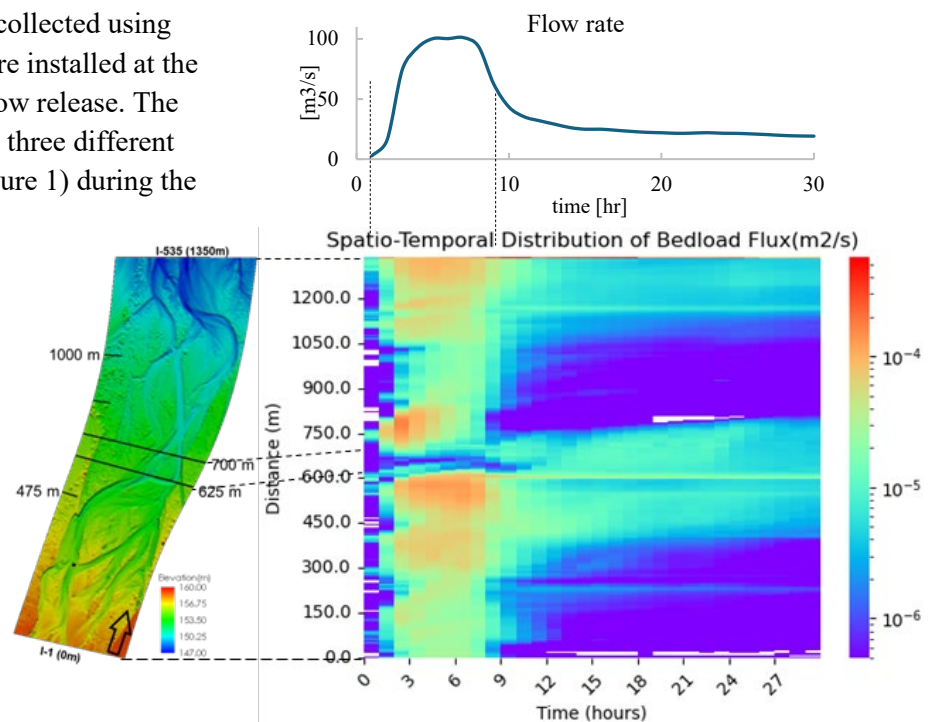


Fig. 2. Top) flowrate. Bottom left) study domain. Bottom right) Flux spatio-temporal distribution in (m²/s)