

## High-definition topography monitoring after riverbed cultivation in the Echi River, central Japan

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Natural processes of erosion and deposition on riverbeds are generally limited in Japan due to large-scale public constructions including dams and banks. As a result of the construction of dams, sediment transport may dramatically decrease in the downstream area, and the river ecosystem can also be affected. To make sediment move more vigorously, we cultivated the armored gravel riverbed with heavy machinery. We then explore the effects of riverbed cultivation by monitoring the topographic changes with high-frequency and high-definition measurements (HF-HD measurements), whereas conventional measurement technologies do not compensate spatial resolution and temporal resolution to capture the topographic change. Using UAS (Unmanned Aerial Vehicle) and SfM-MVS (Structure-from-Motion -Multi-view Stereo) photogrammetry, we found the transportation of the fixed gravels were occurring after cultivating the riverbed in 2017. The temporal and spatial resolutions of the HF-HD topographic data was approximately 2 months and 10 cm, respectively. In July 2018, water flow at 130 m<sup>3</sup>/s was discharged from the upstream dam, and we confirmed that a part of the gravels in the cultivated area was eroded and replaced with new sediments (Fig. 1). These observations indicate that riverbed monitoring using UAV and SfM - MVS can be a practical tool for proper management of riverbeds. Applying this result, we will further clarify the relationships between the water quantity discharged from the dam and the riverbed topographic changes.

キーワード：高精細地形情報、河床耕耘、UAV、SfM多視点ステレオ写真測量、愛知川

Keywords: High-definition topographic data, riverbed cultivation, UAV, SfM-MVS photogrammetry, Echi river

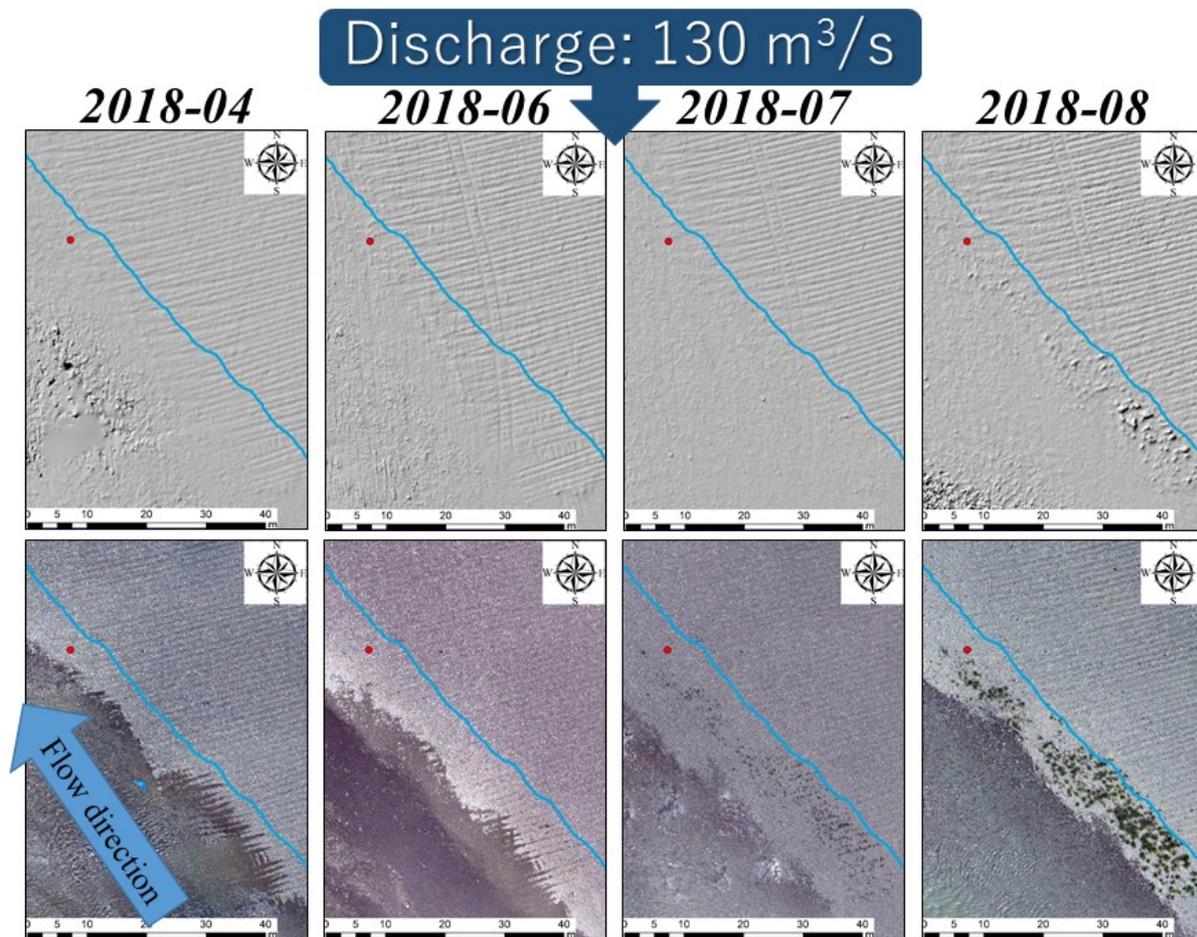


Fig.1. Hillshade images and ortho images of cultivated area.