TRACKING OF RIVER SURFACE FEATURES BY SPACE TIME IMAGEING

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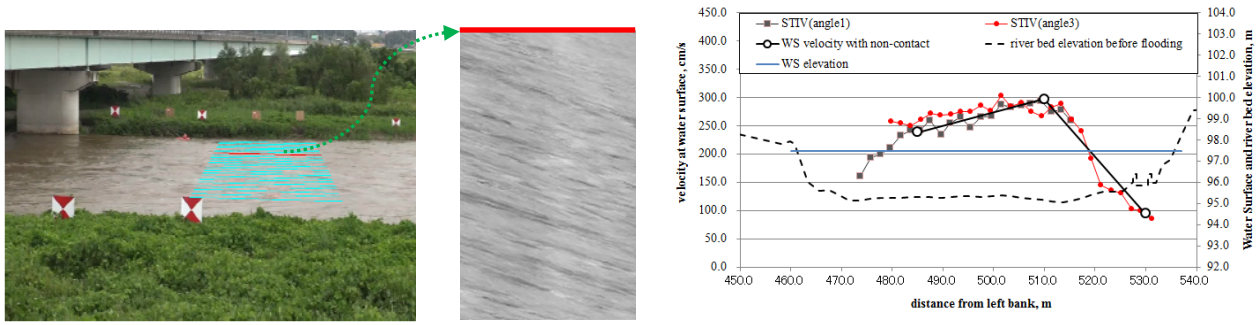
ABSTRACT: River surface exhibits various features depending on flow conditions. In a still condition, water surface becomes flat and reflects the surrounding light like a mirror; on the other hand, with increasing the flow the water surface begins to show complicated features by turbulence effects but the surface pattern follow the flow as can be detected on a river surface. However, such water surface features have not been investigated in detail nor used for practical purposes in the past. In this paper, the technique of space time image velocimetry (STIV) developed by Fujita et al. (2007) was applied to the 2011 flood of the Kinu River to examine the accuracy and efficiency of the method. River surface features during the flood were observed with two high-density video cameras installed on both sides of the river. A view from the right bank, the angle 1, is shown in Fig.1(a) together with search lines for STIV. An example of a space time image (STI) for a red search line drawn in Fig.1(a) is presented in Fig.(b). The horizontal and vertical scales are 10m and 20 seconds, respectively. From the STI, we can observe that the surface features are advected almost at a constant speed along the search line despite the striped patterns discontinue after they travel for a short time. It can also be noted that large scale inclined patterns appear at a period of about two seconds, which can be related to water surface turbulence. Fig.1(c) compares surface velocity distributions observed from two angles and the three data (blank circles) measured by a radio wave velocity meter installed at the bridge. The three data sets agree fairly well with each other and this fact ensures the accuracy of the imaging technique for river flow measurements. River flow discharges estimated from surface velocity distributions showed a good agreement with discharges measured by ADCP.



(a) Flood water surface (b) STI (c) velocity distributions

Fig. 1 Water surface feature in river flood;(a) surface features of the Kinu River and search lines for STIV, (b) STI for the red line in (a), (c) water surface velocity distributions obtained by STIV and radio wave velocity meter

References

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