

Bed variation analysis using the sediment transport formula considering the effect of river width and cross-sectional form in the Ishikari River mouth

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Abstract For river management, it is important to estimate the sediment discharge rate and the degree of bed variations during floods. Many of the previous sediment transport formulae have been proposed based on results by experimental channels. Therefore, they cannot estimate well the sediment discharge rate in rivers because of the complicated channel shapes and bed forms. It is necessary to calculate the sediment discharge rate appropriately to improve the accuracy of bed variation analysis. Fukuoka (2010) thought that stable cross-sectional scales of alluvial rivers (such as width and depth) are determined by physical quantities which indicate characteristics of basins (such as discharge, river bed slope and river bed material). He then derived formulae between dimensionless quantities of width, depth and discharge using field observed data by dimensional analysis. Based on the above analysis, he also derived the bed load formula considering the effect of river width and cross-sectional form using field observed data. In this study, we develop a bed variation analysis with the Fukuoka's bed load formula to calculate the 1981 flood of the Ishikari River that caused large bed scouring at the river mouth. We compare calculated results between the bed load formula of Fukuoka (2010) and the previous formulae of Ashida & Michiue (1972) and Sato *et al.* (1958) for the amount of bed load discharge rates during the flood and the bed forms after the flood. As a result, the cross-sectional bed forms at meandering channel are well reproduced when we use the bed load formulae of Fukuoka (2010) and Sato *et al.* (1958). This indicates that these bed load formulae can calculate the amount of bed load discharge rate appropriately in the case of the Ishikari River mouth.

Key words Fukuoka's bed load formula; bed variation analysis; Fukuoka's equation; river mouth