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A study on turbulence flow and pressure due to hydraulic jump

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The hydraulic jump occurs depending on conditions of upstream and downstream and makes large vortexes in itself of which flow is complex and fluctuates. Recently, the abnormal climate and gain of the impervious area increase the variation in river discharge. It can result in exerting the pressure that is over the acceptable load at the bottom in the downstream of a weir and increasing the fluctuation of the pressure due to the hydraulic jump. Those can provoke damages because of negative pressure, erosion of materials, local scour, and excess of the design load. Thus, this study aims at making use of the design in river-bed maintenance structures such as riprap and an apron considering by the pressure fluctuations. We simulated the hydraulic jump phenomenon through a hydraulic model experiment and examined the relationship between hydraulic factors and the pressure in the range of the hydraulic jump. Specifically, the hydraulic jump is generated by installing a weir upstream in the channel and measured the velocity of the flow by using particle image velocimetry (PIV) and bubble image velocimetry (BIV) to identify the characteristics of turbulence in the section of the hydraulic jump. Also, this study measured the pressure at the bottom along to the flow. As a result, the main factors of the pressure fluctuations are derived by statistical analysis such as determining the correlation between the pressure and the factors. In the subsequent study, it will be suggested to expect the pressure fluctuations at the bottom by using surrounding hydraulic factors in hydraulic jump through an elaborate analysis.

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