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Turbulence Scale in Compound Channel

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The study of turbulence in a compound channel would address the nature of sediment transport and bank erosion activity. The study would also give insights of embankment and levee breaches at the time of high flood. Experimental investigations were conducted on two compound channels of 31° and 45° bank angle in the laboratory flume to study the turbulence scale. Velocity data were recorded with Nortek Velocimeter at seven different locations (3 locations at the upstream, 3 locations at the downstream and 1 location at the middle) of the compound channel. Turbulence scale like Taylor microscale (λ_T) estimates the length scale of the inertial sub-range. The Taylor scale is calculated as:

$$\lambda_T = \left(\frac{15\vartheta \overline{u'^2}}{\varepsilon} \right)^{0.5}$$

$$\varepsilon = \frac{15\vartheta}{U^2} \overline{\left(\frac{\delta u}{\delta t} \right)^2}$$

The Taylor microscale analysis showed dominance in the main channel for 45° bank angle as compared to 31° bank angle. In the location of slope midpoint and floodplain region of the compound channel, Taylor microscale was more dominant for 31° bank angle. Another important observation in both the compound channels (31° and 45° bank angle) is the dominance of Taylor microscale at the upstream section of the channel as compared to the downstream part of the channel. The results from the study would help us to get a better understanding of the role of turbulence in the morphological changes in a compound channel with different bank angles.