Title – Entropy-Based and Traditional Velocity Distribution Equations for Open Channel Flows: An Experimental Analysis in Case of the Adverse Channel Bed Slope Conditions.

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Abstract – Numerous deterministic and probabilistic techniques have been utilized extensively to examine the velocity distributions for open channel flows under the various flow and channel characteristics. It is generally known that traditional approaches such as logarithmic velocity laws and power laws furnish vertical velocity profiles for the wide channels (width-to-depth ratio > 5) only. Also, the accuracy of the traditional methods is highly parameter dependent which, in turn, is evaluated using empirical or semi-empirical relationships only. Owing to the limitations of the conventional approaches, the entropy concept is formulated probabilistically and applies to all aspect ratios (width-to-depth ratio). The prominent entropy types explored to date are Shannon entropy, Tsallis entropy, and Renyi entropy. Recently, Fractional entropy has been demonstrated to study the velocity distributions for the open channel flows. Laboratory measurements have been used to demonstrate the applicability and correctness of all the techniques in adverse channel bed slope conditions (Singh & Khosa, 2022). The measurements comprise the velocity data at the different adverse slope values. Finally, a rigorous comparative analysis for the estimated velocity profiles using the four generally used velocity laws and four entropy-based velocity distributions have been conducted, which showed that the information entropy-based methods are far better than the traditional techniques.

References:

Singh, G., & Khosa, R. (2022). Effect of Channel Bed Slope on Shannon Entropy-Based Velocity Distribution in Open Channel Flow. *EGU General Assembly 2022, Vienna, Austria*. https://doi.org/10.5194/egusphere-egu22-139