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Formulating the shear stress distribution in circular open channels based on the Renyi entropy

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Abstract

The principle of maximum entropy is employed to derive the shear stress distribution by maximizing the Renyi entropy subject to some constraints and by assuming that dimensionless shear stress is a random variable. A Renyi entropy-based equation can be used to model the shear stress distribution along the entire wetted perimeter of circular channels and circular channels with flat beds and deposited sediments. A wide range of experimental results for 12 hydraulic conditions with different Froude numbers (0.375 to 1.71) and flow depths (20.3 to 201.5 mm) were used to validate the derived shear stress distribution. For circular channels, model performance enhanced with increasing flow depth (mean relative error (*RE*) of 0.0414) and only deteriorated slightly at the greatest flow depth (*RE* of 0.0573). For circular channels with flat