VALIDATION OF A 2D DEPTH-AVERAGED RIGID-LID MODEL AGAINST VELOCITY MEASUREMENTS FOR A HIGH-AMPLITUDE MEANDERING FLUME

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The hydrodynamic model STREMR (Bernard, 1993) provides discrete solution of the incompressible Navier–Stokes equations for 2D depth-averaged flow. It includes a k-epsilon two-equation turbulence model and a correction to account for secondary flows in meandering streams. The model imposes a rigid-lid approximation for the free surface which requires the specification of the water surface elevation; this assumption implies that only steady and subcritical flow conditions can be modeled. Corrections to account for recirculating flows and the effect of sidewalls are also present. The discretization of the equations is based on a Finite Volume (FV) method, in which a stair-stepped (piecewise constant) discretization of the flow depth is adopted.
The model is here validated against experiments performed in a high-amplitude Kinoshita flume at the University of Illinois, carried out for steady flow and flat bed. Three different width-to-depth ratios are considered. The effect of different values of width-to-depth ratios on mean flow structure, the impact of secondary flow on s treamwise momentum distribution in high-curvature high-amplitude configurations, the importance of water surface superelevation, and possible effects on sediment transport and bank erosion are investigated and discussed.