

# A geometrical Green-Naghdi type system for dispersive-like waves in prismatic channels

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## Abstract

We consider 2D free surface gravity waves described by the Saint-Venant equations (shallow water equations) in prismatic channels with periodic bathymetric variations in the transverse direction. Averaged in the transverse direction, the corresponding 1D equations represent a fully nonlinear model describing dispersive effects strictly related to geometrical variations of the channel topography. The model is Galilean invariant and admits a variational formulation under natural assumptions about the channel geometry. It is endowed with an exact energy conservation law, and admits exact travelling wave solutions. The system is recast in two useful forms appropriate for its numerical approximations, whose properties are discussed. Numerical results allow to verify our implementation and validate our model against fully 2D nonlinear shallow water simulations.

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