A Modeling System for Tidally Driven Long-term Morphodynamics

Fortunato, A.B. and Oliveira, A.

Journal of Hydraulic Research, 42/4: 426-434, (2004)

Abstract

A modeling system to simulate tidally driven morphodynamics is developed and assessed. The system couples an existing shallow water model with a new morphological updating model. Four innovative features to improve the accuracy and efficiency of the system are implemented and tested. First, two alternatives are proposed to update the velocity field without running the hydrodynamic model. Both alternatives, based on an assumption on the behavior of friction, are more accurate than the traditional "continuity correction". Second, hydrodynamic results are provided in the frequency domain. The harmonic synthesis of the velocity time series simplifies interpolation and extrapolation of the hydrodynamic model results and the use of different time steps for the various components of the modeling system. Third, the time-integration of the sediment fluxes is performed with a Runge-Kutta method so the time step adapts in space and time to the flow characteristics. Finally, a criterion to determine the need for a new hydrodynamic simulation is derived, based on the importance of the errors introduced by the outdated flow field relative to those introduced by the sand-transport formulae.

Email to: Fortunato, Oliveira
Return to: André Fortunato, Anabela Oliveira