Time-averaged hydrodynamic equations for mobile-bed conditions

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ABSTRACT

The objective of this paper is to expand the framework of the conventional Reynolds-Averaged Navier-Stokes equations for the study of mobile-boundary flows. The temporal averaging concept is discussed first, including relevant definitions and theorems. Time-averaged continuity, momentum, mass-transport and stress balance equations are then derived. These new equations contain additional terms that represent the mobile-boundary effects. Potential applications of the proposed equations include flow-biota interactions and sediment dynamics, among others.