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Long-wave runup in Lagrangian framework: application to lake tsunamis LOUIS-ALEXANDRE COUSTON, Univ of California - Berkeley, CHIANG C. MEI, Massachusetts Institute of Technology, MOHAMMAD-REZA ALAM, Univ of California - Berkeley — Coastal settlements and infrastructures are exposed and vulnerable to long waves because such waves can climb up sloping beaches without breaking. Thus accurate long-wave runup predictions are of significant importance for effective mitigation and evacuation. Although numerical models are now routinely used for long-wave propagation, calculating the runup remains an arduous task. Operational and research models usually rely on the Eulerian description of the fluid. Yet, runup processes at sloping shores can involve large horizontal stretches of the fluid domain, thereby requiring a varying number of computational nodes based on ad-hoc criteria. Here we argue that a convenient alternative is the less used Lagrangian coordinates system in which the fluid flow is described by following the trajectory of each fluid particle as an unknown function of the initial position. An immediate advantage of the Lagrangian formulation is that the free-surface and the moving shoreline become explicitly part of the solution and defined by their initial positions. As a case study we consider 3D landslide tsunamis in lakes, and present numerical results that highlight the significance of nonlinearity and wave superposition.

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