Supplementary information for "RDycore-sediment v1.0: A two-dimensional sediment transport model for Earth system modeling"

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Figure S1-S7

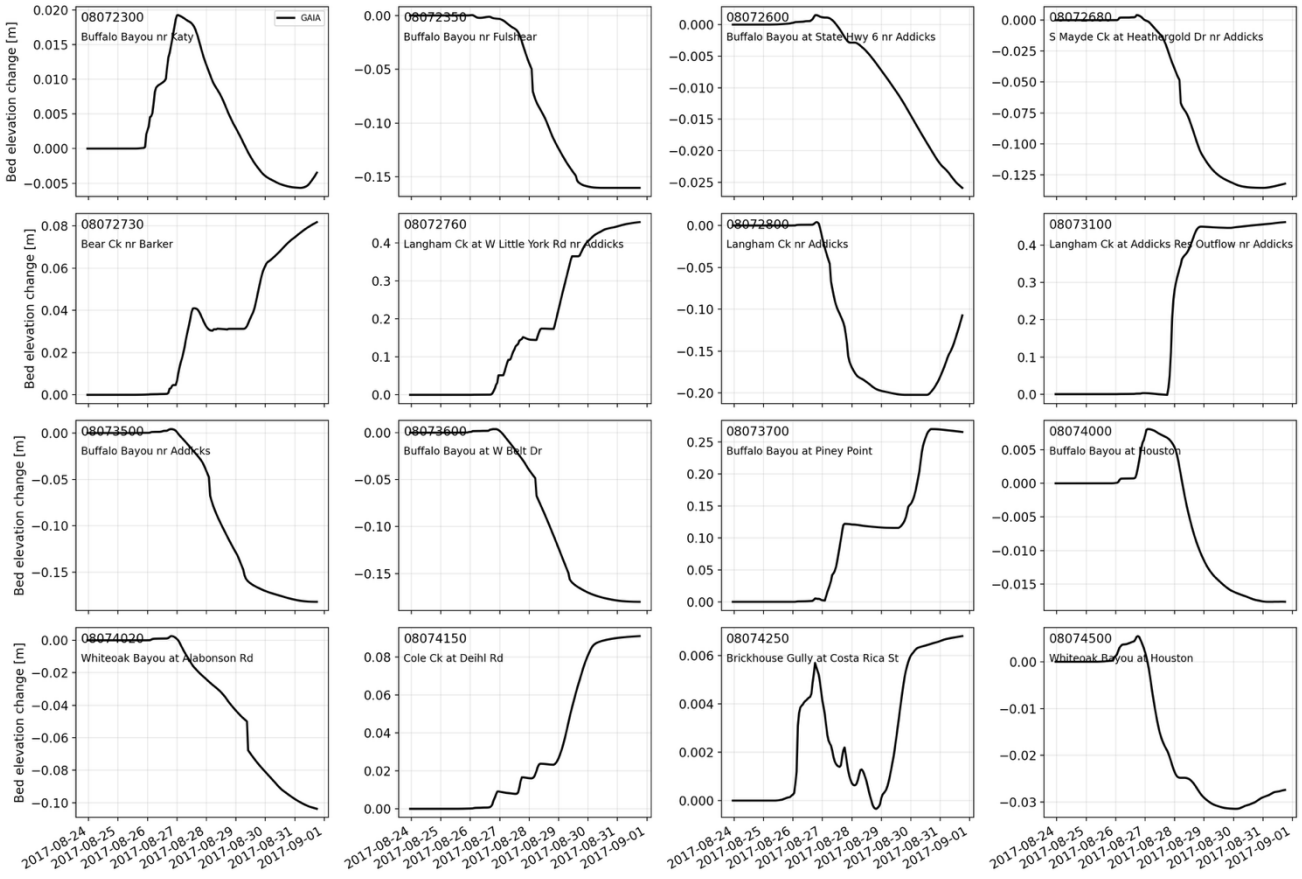

Figure S1: Cumulative bed elevation change simulated by TELEMAC/GAIA at the 16 USGS gauge locations during the Hurricane Harvey Houston simulation. Positive values indicate net bed aggradation or deposition, and negative values indicate net bed degradation or erosion.

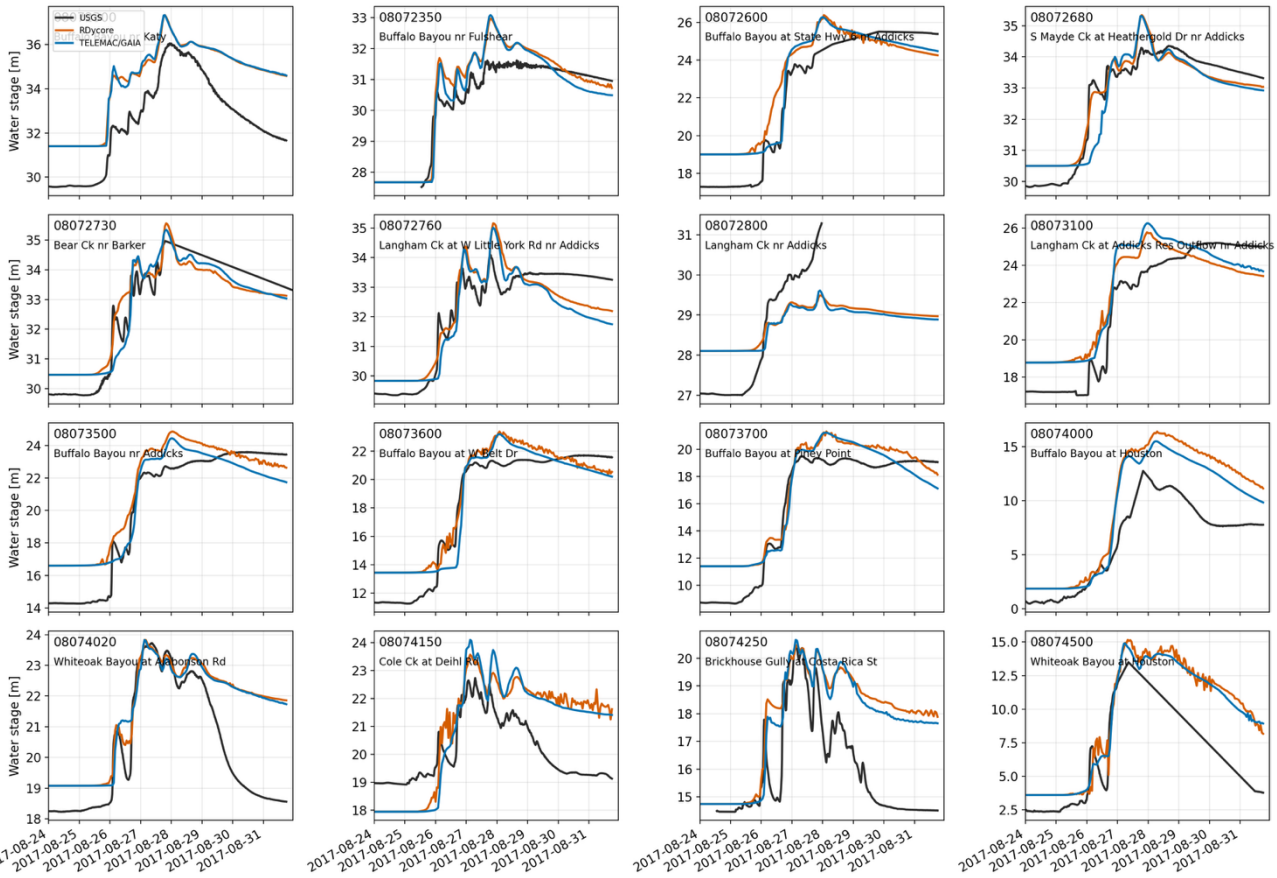

Figure S2: Water-stage comparison at 16 USGS gauge locations during the Hurricane Harvey Houston simulation. The RDycore simulation was performed without hydrostatic reconstruction.

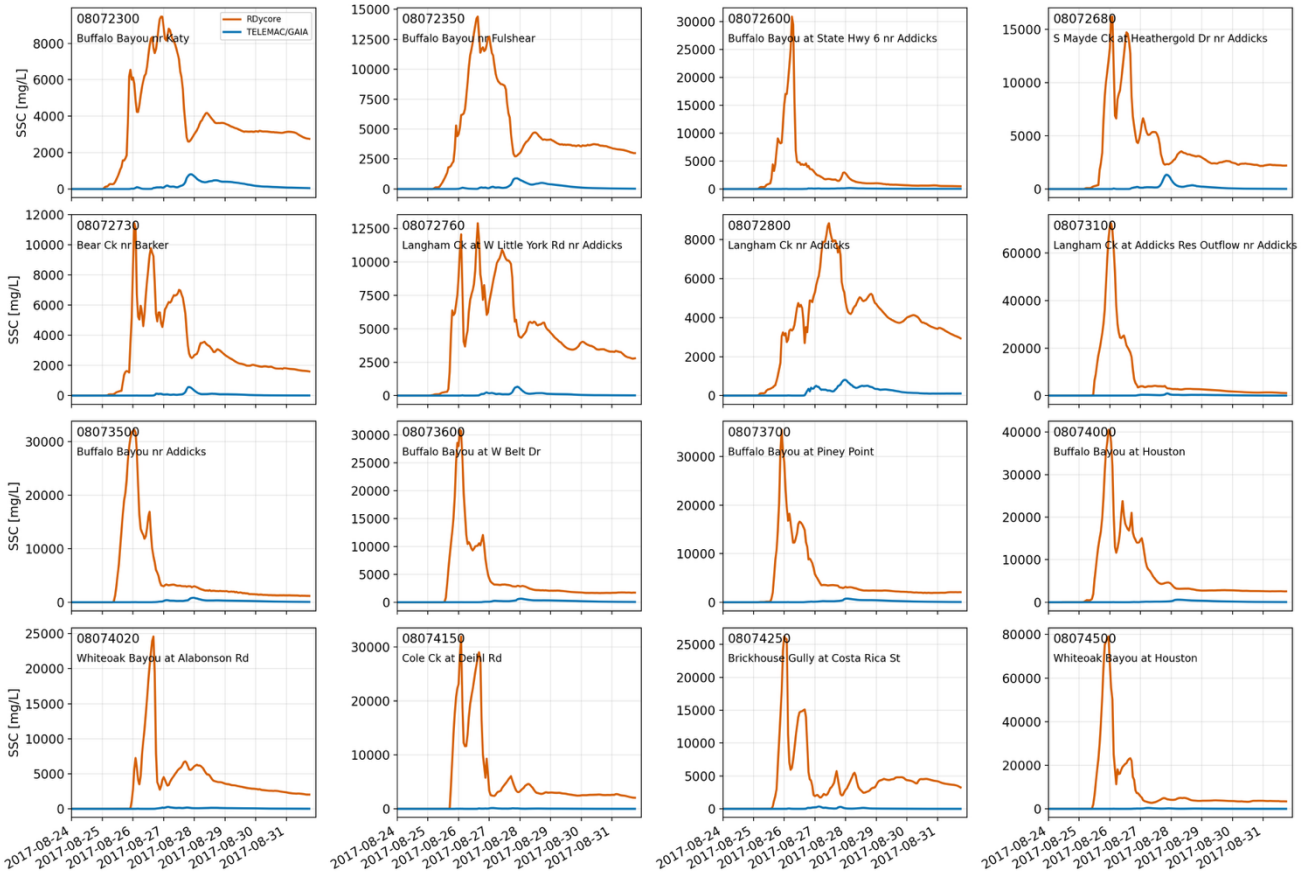

Figure S3: Suspended sediment concentration (SSC) comparison at 16 USGS gauge locations during the Hurricane Harvey Houston simulation. The RDycore simulation was performed without hydrostatic reconstruction.

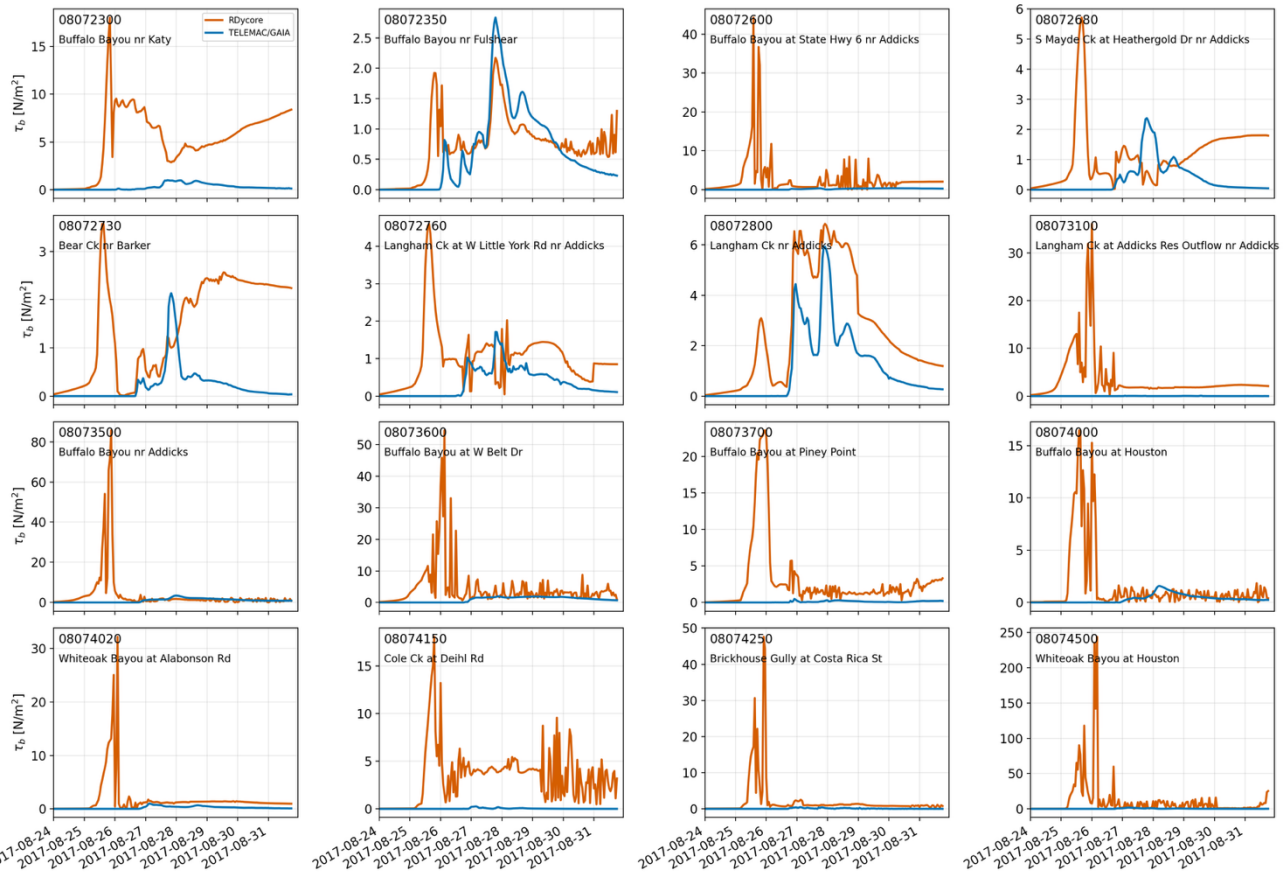

Figure S4: Bottom shear stress comparison at 16 USGS gauge locations during the Hurricane Harvey Houston simulation. The RDycore simulation was performed without hydrostatic reconstruction.

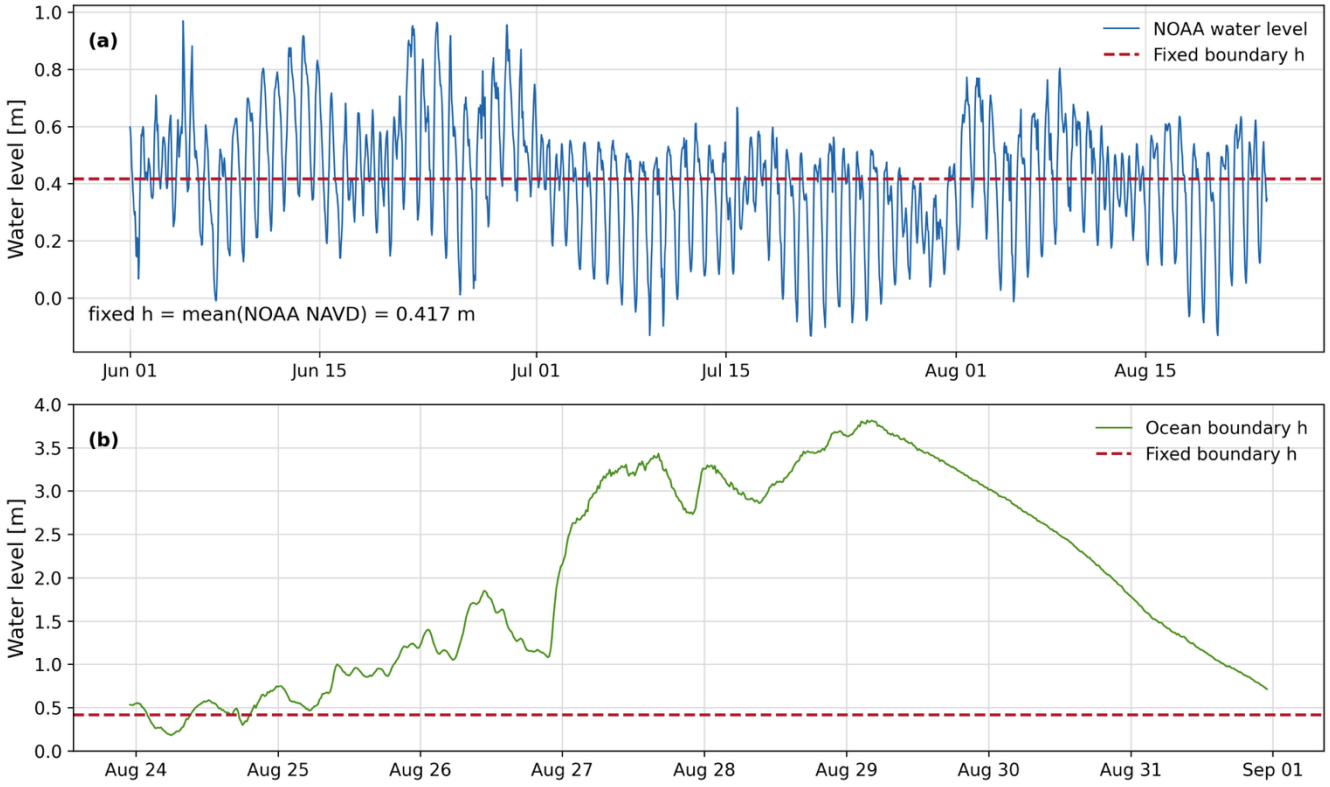

Figure S5: Time series of water level before and during Hurricane Harvey. (a) NOAA-observed water level at 8770777 Manchester, TX before Harvey; the dashed line indicates the still-water level used for the fixed boundary condition. (b) Time-varying water-level boundary condition prescribed in RDycore compared with the fixed-boundary water level.

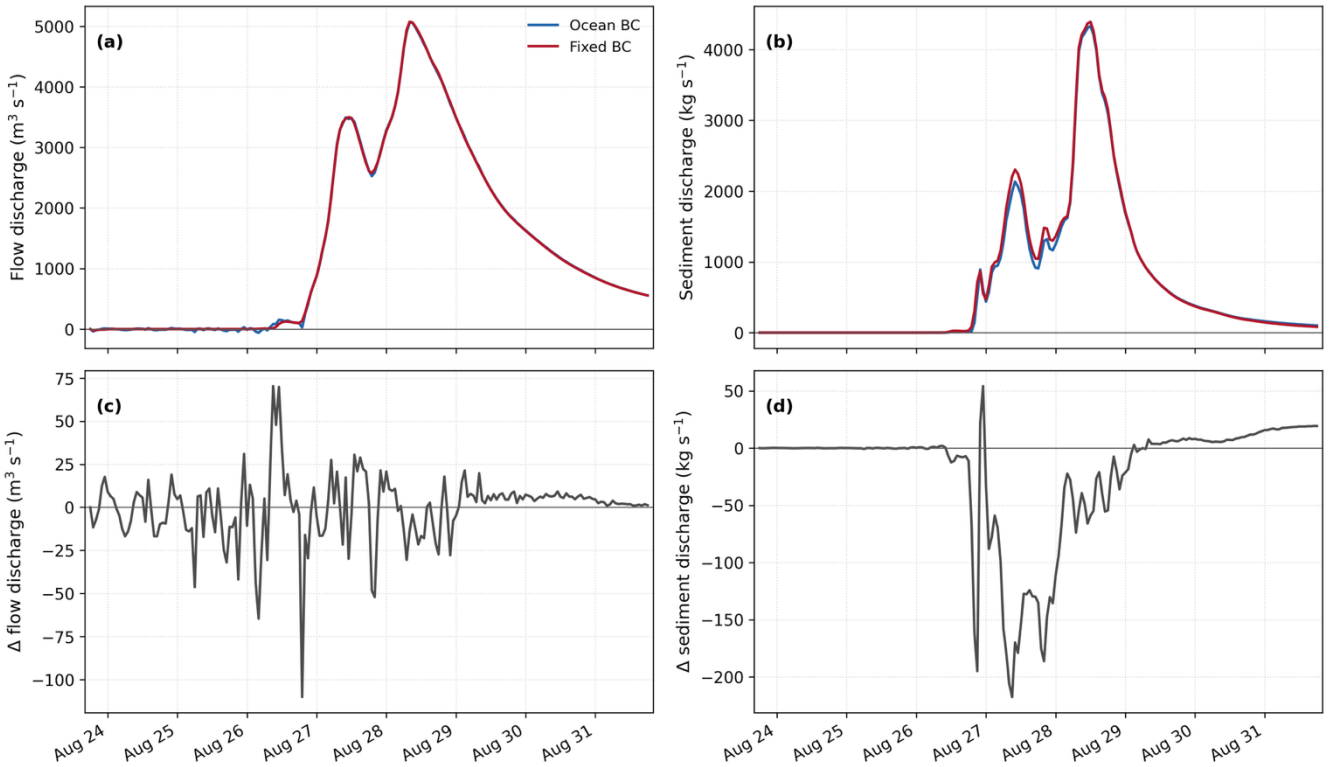

Figure S6: Effect of downstream water-level boundary condition on RDycore-simulated discharge during Hurricane Harvey. Flow discharge and total suspended-sediment discharge are compared between simulations using a time-varying ocean water-level boundary and a fixed downstream water-level boundary. Panels show (a) flow discharge, (b) total sediment discharge summed over all sediment classes, (c) the flow-discharge difference, and (d) the sediment-discharge difference. Differences are computed as ocean-boundary simulation minus fixed-boundary simulation.

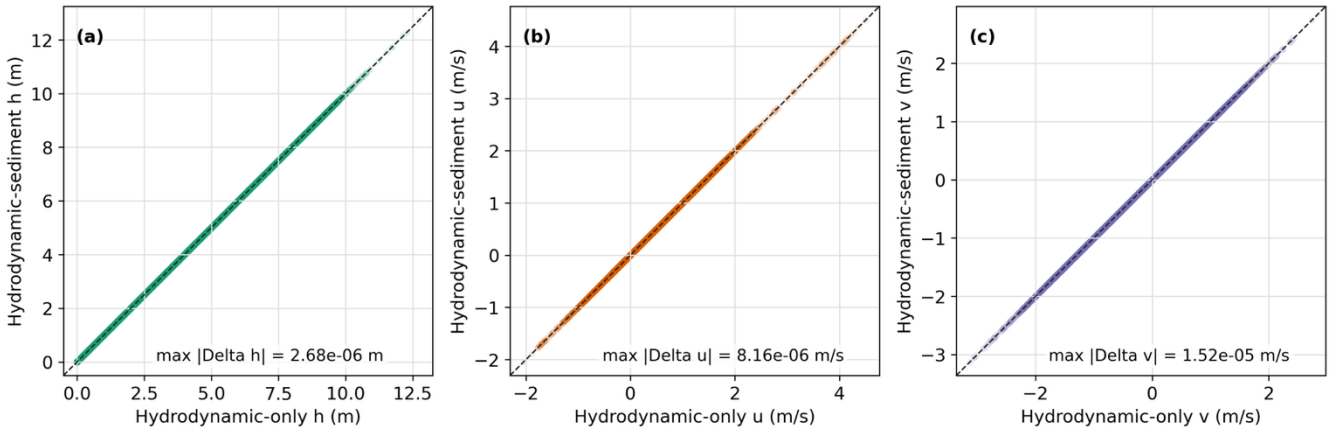

Figure S7: Comparison of RDycore hydrodynamic variables from the hydrodynamic-only simulation and the coupled hydrodynamic-sediment simulation. Panels show scatter plots of cell-wise (a) water depth (h), (b) x-direction velocity (u), and (c) y-direction velocity (v). Dashed 1:1 lines indicate perfect agreement. The annotated domain-maximum differences show that adding sediment transport does not materially alter the hydrodynamic solution.