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NUMERICAL MODELING OF WAVE-INDUCED BEACH WATERTABLE FLUCTUATIONS AND BED MORPHOLOGY

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Summary. Understanding the interactions between wave motion, near-shore watertable fluctuations and beach morphology is crucial in order to predict correctly transport processes at the ocean/groundwater interface, such as solute transport near the beach face and beach evolution due to erosion and accretion. Despite the numerous studies conducted in the recent years, the dynamics and characteristics associated to sediment transport and bed morphology coupled with coastal groundwater and wave motion are not completely understood. This is primarily due to a lack of appropriate mathematical descriptions of different areas and the inherent difficulties in coupling free-surface and groundwater flows. In this work we developed a novel numerical tool coupling two existing software packages. The near-shore ocean hydrodynamics were simulated using a numerical model, which solves the Navier-Stokes equations using a volume of fluid technique. In this context, the k-ε turbulent model was used to predict the turbulent stresses. The governing equations were solved using a finite difference method. The groundwater flow was simulated using the finite-difference variable-density groundwater flow model SEAWAT-2000. The two models were joined using a two-way coupling scheme that uses the infiltration/exfiltration fluxes to modify the shape of the beach face. Results obtained from the numerical simulations were compared to published experimental data. Furthermore, the simulator was used to conduct a sensitivity analysis and predict how different beach configurations affect the evolution of the ocean/groundwater interface.