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Investigation of the influence of the bay shape on bottom sediment transport under large-amplitude long waves

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Long waves in shallow water zones lead to sea water level rise and fall, strong currents, forces (drag, impact, uplift, etc.), morphological changes (erosion, deposition), dynamic water pressure, as well as resonant oscillations. As a result, ground materials under the wave action move, and scour/erosion/deposition patterns can be observed in the region. Ports and harbors as enclosed basins are the main examples of coastal structures that usually encounter natural hazards with small or huge damaging scales. Morphological changes are one of the important phenomena in the basins under short and long wave attack. Tsunamis as long waves lead to sedimentation in the basins, and therefore, in this study, the relation to the current pattern is noticed to determine sedimentation modes. Accordingly, we present a methodology based on the computation of the instantaneous Rouse number to investigate the long wave motion and to calculate the respective sedimentation. This study aims to investigate the effects of the incident wave period on an L-type harbor sedimentation with a flat bathymetry using a numerical tool, NAMI DANCE, which solves non-linear shallow water equations. The results showed that the corner points on the bending part of the basin are always the critical points where water surface elevation and current velocity amplify in the exterior and interior corners, respectively. This phenomenon is more obvious in wave amplification. Comparing the maximum current velocity results with the minimum Rouse number results, one can conclude that the pattern of sediment motion in the mentioned two critical corner points and in the whole basin depends on both the current pattern and magnitude.

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