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Modeling of Long Wave Generation and Propagation via Seabed Deformation

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Abstract : This study uses a three-dimensional (3D) fully nonlinear model to simulate the wave generation problem caused by the movement of the seabed. The numerical model is first simplified into two dimensions and then compared with the existing two-dimensional (2D) experimental data and the 2D numerical results of other shallow-water wave models. Results show that this model is different from the earlier shallow-water wave models, with the phase being closer to the experimental results of wave propagation. The results of this study are also compared with those of the 3D experimental results of other researchers. Satisfactory results can be obtained in both the waveform and the flow field. This study assesses the application of the model to simulate the wave caused by the circular (radius r0) terrain rising or falling (moving distance bm). The influence of wave-making parameters r0 and bm are discussed. This study determines that small-range (e.g., r0 = 2, normalized by the static water depth), rising, or sinking terrain will produce significant wave groups in the far field. For large-scale moving terrain (e.g., r0 = 10), uplift and deformation will potentially generate the leading solitary-like waves in the far field.

Keywords : seismic wave, wave generation, far-field waves, seabed deformation
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