

Wind-wave-current coupling simulation in OpenFOAM and evolution of flow field

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ABSTRACT

There is a complex coupling relationship between wind, waves, and currents. Studying the coupled effects of wind, waves, and currents through experiments and field measurements is costly and inefficient, making it difficult to capture the interaction mechanisms among wind, waves, and currents. Therefore, CFD-based numerical simulation is a common method for conducting such research. This study, based on the wave generation module of OpenFOAM-v2206, investigated its operational logic and carried out further development to expand its functionalities, enabling CFD simulation of viscous wind-wave-current coupling. To improve convergence and computational efficiency, custom surface roughness height and surface roughness index were introduced. Using this module, multiple combinations of wind, wave, and current parameters were calculated, and the evolution characteristics of waves and currents under the influence of wind were analyzed.

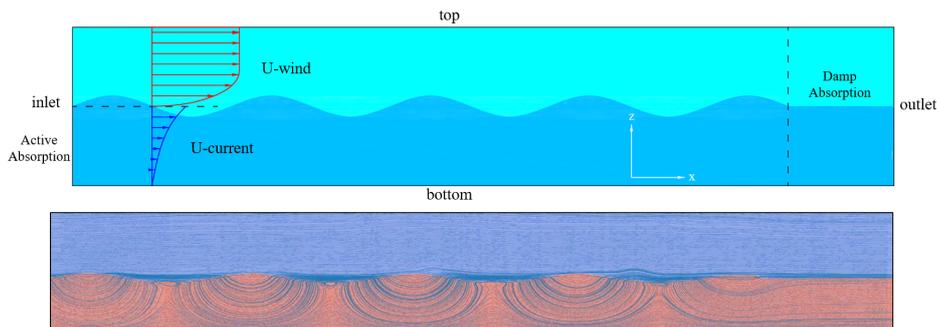


Fig. 1 Computational layout and a simple result for Wind-wave-current coupling simulation

REFERENCES

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Liu J, Liu Z, Guo A, Li H. "Experimental study on the evolution of mechanically generated waves mixed with space non-uniform wind-driven waves", *Ocean Engineering*, 2023, 232, 109129.