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Simulations of quasi-steady breaking waves: flow structure[1]
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Quasi-steady breaking waves are prominent and highly observable features in civil, environmental, ocean and naval engineering applications with direct impact on turbulent dissipation and air-sea interaction. We present high-resolution 3D direct numerical and implicit large eddy simulations of quasi-steady breaking waves of flow over a lifting body. The numerical method is Cartesian-grid based utilizing conservative Volume of Fluid (cVOF) for interface capturing and Boundary Data Immersion Method (BDIM) for the body geometry. We show the instantaneous and mean flow structure in the liquid bulk and air-water mixed-region over a range breaking strengths and orientations with the inflow. Our particular interest lies in understanding the near-surface shear layer and air entrainment for these waves in comparison to ship wakes and hydraulic jumps.

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