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Computational simulations of the interaction of water waves with pitching flap-type ocean wave energy converters[1] ASHISH PATHAK, MEHDI RAESSI, Univ of Mass - Dartmouth — Using an in-house computational framework, we have studied the interaction of water waves with pitching flap-type ocean wave energy converters (WECs). The computational framework solves the full 3D Navier-Stokes equations and captures important effects, including the fluid-solid interaction, the nonlinear and viscous effects. The results of the computational tool, is first compared against the experimental data on the response of a flap-type WEC in a wave tank, and excellent agreement is demonstrated. Further simulations at the model and prototype scales are presented to assess the validity of the Froude scaling. The simulations are used to address some important questions, such as the validity range of common WEC modeling approaches that rely heavily on the Froude scaling and the inviscid potential flow theory. Additionally, the simulations examine the role of the Keulegan-Carpenter (KC) number, which is often used as a measure of relative importance of viscous drag on bodies exposed to oscillating flows. The performance of the flap-type WECs is investigated at various KC numbers to establish the relationship between the viscous drag and KC number for such geometry. That is of significant importance because such relationship only exists for simple geometries, e.g., a cylinder.

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Ashish Pathak
Univ of Mass - Dartmouth

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