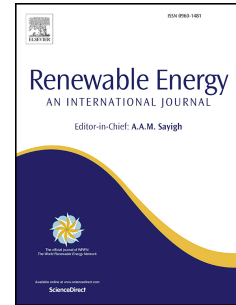


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A Wave Emulator for Ocean Wave Energy, A Froude-scaled Dry Power Take-Off Test Setup

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Abstract

A dry laboratory environment has been developed to test Power Take-Off (PTO) systems for Wave Energy Converters. The costs accompanied by testing a wave energy converter and its PTO at sea are high due to the difficult accessibility of (remote) test locations. Next to easy accessibility, the lab setup provides controllable waves at a relatively lower cost. The setup enables extensive analysis of the dynamics of a PTO during its mechanical towards electrical energy conversion. The scaled setup is designed such that it resembles as close as possible the real system. Froudes similarity law provides easy transformation. The floater and waves are represented by a Wave Emulator, the motion of which is determined by a time series of the wave exciting forces supplemented with the actual hydrodynamic reaction forces due to the motions of the floater. A real-time calculation method is introduced, accounting for the actual PTO actions. Furthermore, the inertia of the floater is represented in the emulators rotary inertia, and a compensation method is proposed enabling an identical normalized PTO load curve as at full scale. Comparison between experimental and simulation results have been performed and good correlation between the movement of setup and simulations has been found.

Keywords: Ocean wave energy, Power take-off (PTO), renewable energy,

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