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Experimental investigation of the hydrodynamic performance of the ISWEC 1:20 scaled device

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ISWEC (Inertial Sea Wave Energy Converter) is an offshore pitching floating device designed to exploit wave energy through the gyroscopic effects of a spinning flywheel. The annual productivity of the ISWEC is strictly connected to the hydrodynamic performance of the floater, that represents the first step in the energy conversion chain. The hydrodynamic performance can be described by the nondimensional Response Amplitude Operator (RAO). An ISWEC 1:20 scaled model has been tested in the Federico II towing tank in Naples. Experimental campaign has been performed in regular waves for 3 different wave steepness 1/100, 1/50 and 1/35 in order to identify the pitch RAO and underline the effects of nonlinearities for higher wave steepness. A comparison between experimental results and a linear potential flow theory RAO has been carried out. Free decay tests have been analysed for both pitch and roll to identify the linear and quadratic damping terms and their impact on hydrodynamic performances of the device. Furthermore, the behaviour of the device has been investigated in irregular waves, defined as Jonswap spectrum. Conclusions are commenting the differences between numerical and experimental results and the impact of nonlinearities on hydrodynamic performances.

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