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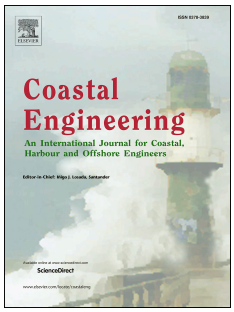

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In situ observations and simulations of coastal wave field transformation by wave energy converters

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Abstract

Wave energy is a potential emerging contributor to future global low-emission energy needs. If wave energy is to become a significant part of renewable energy portfolios, then wave energy converters (WECs) will need to be installed in large numbers in array configurations. The environmental effects of wave energy extraction to date has relied on physical (i.e., tank) and numerical modelling studies.

In this study, a network of in situ wave measurement devices were deployed around an array of three submerged point absorber WECs, operating intermittently, each with a nominal 240 kW peak capacity. The study site was 3 km offshore (in approximately 24 m water depth) and the field campaign was conducted over approximately one year, with a primary goal of studying 'down-wave' effects of the WECs. The observations were used to calibrate and validate a numerical spectral wave model which can represent frequency-dependent absorption by WECs within the model. For the purpose of a straightforward analysis, we focus on a period when only one WEC was operating. Measurements show a decrease in