NONLINEAR DETERMINISTIC WAVE FORECASTING MODEL FOR WAVE POWER HARNESSING SYSTEMS

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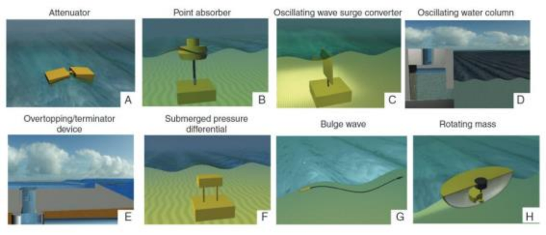
Grand Water Research Institute (GWRI) Auditorium
Zoom link: https://technion.zoom.us/j/94426095577



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Abstract

In recent years, the search for new sources of renewable energy drives an extended research effort of the feasibility of large offshore water waves energy converters (WECs). While long-term macro-scale water waves forecasting has been extensively researched, one of the limiting factors is the lack of local-scale deterministic wave forecasting models, which can significantly improve the efficiency of the design and operation of WECs, usually installed along coastal areas of shallow 'finite' depth.

To address the outstanding challenge, a novel methodology for deterministic forecasts of water waves was developed, allowing for weak nonlinearities in finite depth wavefields. This model is based on dispersion cross-corrections between modes in the wavefield, calculated using the Zakharov equation formulation. These values can be precomputed based on measured surface fluctuations power density spectra, and therefore come at no real-time additional computational cost compared to linear theory.

Additionally, a comprehensive validation of the new methodology will be presented, both for the unidirectional case using waves flume measurements, and for the general directional case, backed by numerical HOS simulations. All verifications were performed over a wide range of wavefield parameters, addressing a large number of real-life near shore wave regimes.

A discussion will follow, presenting the current status of the investigation, its potential and challenges and future engineering opportunities.