IMPROVED METHODOLOGY FOR WAVE ENERGY RESOURCE ASSESSMENT

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Over the last decade the interest in harvesting energy from waves has increased considerably as part of a global shift to power the grid using renewable resources. Harnessing this form of energy is still at the early stages where spatial and temporal wave information is required for permitting, planning, and design. Many wave resource assessments have been conducted in the USA and around the world but there is no unified methodology; making it difficult to compare resource assessment results based on different methods. In this study, we evaluated the previous methods used in past studies and propose a new methodology to accurately perform wave resource assessments. In particular, the potential resource concept is introduced in this new method to account for energy recovery as a function of energy extraction rate. The total available energy for harvest thus consists of three components – remote, local and potential resources. The new method was tested in an idealized ocean basin and the US West Coast exclusive economic zone (EEZ) to demonstrate its consistency and accuracy for assessing wave energy resource for the US. The model tests were performed using the third-generation wave action model Wavewatch III®. Spectral and source term information were collected at a high density inside the US EEZ. Both the directionality and origin (i.e. region where waves were generated) of the wave resource are quantified by performing a complete wave energy assessment that distinguishes between the remote and local sources. The local wave resource is computed directly from the energy exchange that results in wave growth between the atmosphere and the ocean. Finally, the recovery potential of the waves after energy extraction is assessed by reducing the wave energy flux at the EEZ boundaries.