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ANALYSIS OF WAVE CLIMATES AND RESOURCE CHARACTERIZATION IN THE NEARSHORE REGION OF US WEST COAST

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The US West Coast is one of the top regions in the U.S. with an energetic wave energy resource and great potential for early market WEC development. Large regional wave resource assessments based on wave hindcasts with coarser grid resolution generally lack of accuracy in the nearshore areas that are most promising for wave energy development. This study presents an analysis of wave resource characterization in the nearshore areas along the U.S. West Coast using nearshore field measurements and long-term high resolution wave model hindcasts. Wave hindcast was generated using a nested-grid modeling approach with WaveWatchIII (WWIII) and Unstructured Simulating Waves Nearshore (UNSWAN). Model validation was conducted using measured data from more than 20 wave buoys maintained by National Data Buoy Center, as well as from three recently deployed nearshore buoys along the Oregon and California coasts. Analysis based on model hindcast was conducted to evaluate the transformation of wave energy from offshore to nearshore regions and spatial variations along the entire West Coast. In particular, energy dissipation as a function of nearshore geometry, such as distance, water depth and bottom slope, is investigated. Inter-annual and seasonal variations of wave characteristics along the entire West Coast was analyzed. Complex wave climates along the West Coast, including unimodal and multimodal sea-states, were investigated and quantified statistically. Outcomes of this study will provide insight on the wave energy potential and increase the confidence of investors in WEC development at early market West Coast sites, particularly in the nearshore.

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