

## SEA STATE CHARACTERIZATION FOR ENVIRONMENTAL RISK ASSESSMENT

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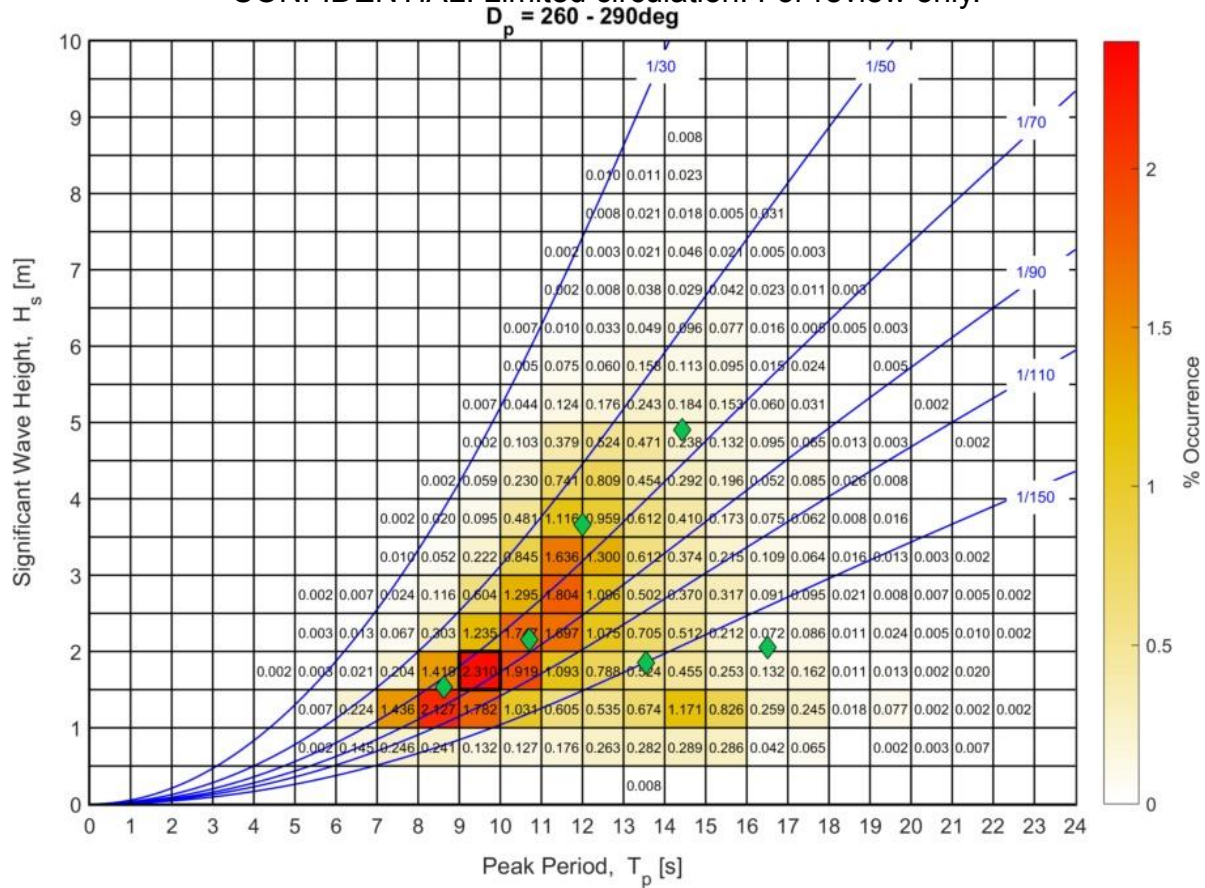
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Robust tools to evaluate site characteristics and the potential environmental effects of marine and hydrokinetic energy (MHK) devices are necessary for the successful development of the marine renewable energy industry. Sandia National Laboratories and Integral Consulting have developed SNL-SWAN, a modified version of the open source model SWAN (Simulating WAVes Nearshore) along with associated methodologies to assess impacts of wave energy converter (WEC) arrays. SNL-SWAN coupled with a hydrodynamic and sediment transport model such as Delft3D, developed by Deltares Inc, allows for the direct investigation of WEC array effects on the physical environment [1].

Environmental impact analysis of a WEC farm requires characterization of the environmental conditions at the site of interest to determine the 'risk' associated with specific wave conditions. This effort represents a holistic approach to site assessments that incorporates a joint probability distribution (JPD) to capture wave dynamics over the course of an average year. Here, a seven-year wave record [2] is analyzed to yield a multi-dimensional wave occurrence distribution based on significant wave height, peak period and direction (Figure 1). Discrete wave events are then chosen that represent a comprehensive set of conditions over the record in a probabilistic sense. The discrete events are then modeled using Delft3D-SNL-SWAN and results are appropriately scaled by the probability of occurrence to develop risk potential. An example of this sea state selection methodology and the Delft3D-SNL-SWAN results for one case using specific WEC devices in an array will be presented.



**FIGURE 1. AN EXAMPLE JPDF FOR SEVEN YEARS OF DATA IN THE DIRECTION VECTOR 260°-290°, ALONG WITH REPRESENTATIVE SEA STATES SELECTED FROM A CLUSTER ANALYSIS.**

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#### REFERENCES

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