

# **Statistics of Amplitude and Fluid Velocity of Large and Rare Waves in the Ocean**

**LT IL H. Suh, USN**

Prof. Jerome H. Milgram
-------------------------

Thesis Supervisor
-------------------

The understanding of large and rare waves in the ocean is becoming more important as these rare events are turning into more common observances. In order to design a marine structure or vehicle to withstand such a potentially devastating phenomenon, the designer must have knowledge of extreme waves with return periods of 50 and 100 years. Based on satellite radar altimeter data, researchers have successfully predicted extreme significant wave heights with the return periods of 50 and 100 years. This thesis extends their research further by estimating the most probable extreme wave heights and other wave statistics based on spectral analysis. The same technique used for extreme significant wave height prediction is applied to extrapolation of corresponding mean wave periods, and they are used to construct two parameter spectra representing storm sea conditions. The prediction of the most probable extreme wave heights as well as other statistical data is based on linear theory and short term order statistics. There exists sufficient knowledge of second order effects on wave generation, and it could be applied to a logical progression of the approach in this thesis. However, because this greatly increases computation time, and the kinematics of deep sea spilling breakers are not yet fully understood for which substantial new research is required, the nonlinear effects are not included in this thesis. Spectral analysis can provide valuable statistical information in addition to extreme wave height data, and preliminary results show good agreement with other prediction methods including wave simulation based on the Pierson-Moskowitz spectrum.