NON-GAUSSIAN STATISTICS IN OCEAN OBSERVATION AND MODELING

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The Gaussian distribution is generally assumed in ocean analysis and prediction as an easy way of modeling the probability density function (PDF) of experimental and modeling data. The one-dimensional Gaussian distribution is determined by just two parameters: the mean and the standard deviation of the data. The high-order moments are given (skewness: 0; kurtosis: 3). When we refer to ocean data (either observed or modeled) by its mean and variance, we are in fact compressing the original data. We delete all additional information possibly hidden in the data set. But we gain simplicity. Since the skewness of ocean observed and modeled data is usually not zero (either positive or negative), it is naturally to choose the Weibull distribution as the first step in extending from the Gaussian into non-Gaussian statistics. This is because the Weibull distribution can represent variety of distributional shapes from negatively to positively skewed. The stochastic theory for ocean surface current dynamics also leads to the Weibull distribution.

In this study, the Weibull distribution is proved more realistic in ocean analysis and prediction such as analysis of near ocean surface current and significant wave height data as well as numerical modeling in wave prediction. Use of the Weibull distribution will improve ocean analysis and prediction.