NON LINEAR STATISTICAL MODELING OF SEA WAVE HEIGHTS AND SWELL WAVE HEIGHTS USING MARQUARDT'S PROCEDURE

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Predicting wave heights is an opening to many applications regarding coasts such as fishing, housing, transportation and many marine constructions. In this study sea wave heights (m) and swell wave heights (m) in Galle and Colombo were considered. Sea waves are created under the influence of the wind within the wind field. Swell waves are defined as mature undulations of water in the open ocean after wave energy has left the wave generation region.

Major objectives of this research are to find the best fitted non linear statistical models for sea wave heights and swell wave heights in Galle and also in Colombo. Three hourly data for the period, February 1989 - September 1995 in Galle and three hourly data for the period, November 2001 - September 2007 in Colombo for the sea wave heights and swell wave heights were used for the calibration of the models and validation process.

Non-linear statistical models based on Marquardt's procedure which involves an iterative process that interpolates between the Gauss-Newton algorithm and the method of Gradient descent were developed. Since the plots of observed data of sea wave heights and swell wave heights showed a wave pattern, models were developed using the wave equation by giving initial values for the parameters and by selecting the values for which the parameters converge. Hougaard's measure of skewness and approximated standard error were used to assess the significance of the parameter estimates of the developed non linear models. The best model was selected using the Pseudo R^2 and by observing the graph of the observed data and the predicted data from the fitted model.

According to the results Pseudo- R^2= 98.16% for the fitted model and R^2= 98.24% for the validation data for sea wave heights respectively and for the swell wave heights it was 98.01% and 97.98% in Galle. For Colombo sea wave heights, Pseudo R^2 was 95.40% for the fitted model and 95.42% for the validation data respectively while it was 92.71% and 97.70% for the swell wave heights. The best fitted models were significant (p-value< 0.05) and their parameter estimates were significant (|Hougaard's measure of skewness|<0.1). Thus these developed models could be used to predict the sea wave heights and swell wave heights in Galle and Colombo.