M.S.93. KURIAN, N.P.–Wave Height and Spectral Transformation in the Shallow Waters of Kerala Coast and their Prediction–1988– Dr. M. Baba

The study of transformation of waves as they propogate from deep water to shallow water is essential in understanding and predicting the shallow water waves. The present thesis is an outcome of the investigation carried out by the author to study the wave height and spectral transformation in the shallow waters of Kerala Coast and to suggest prediction models suitable for this coast. A major handicap in the study of wave transformation has been the lack of synchronized deep and shallow water measured wave data. The study was carried out by making synchronised deep water and nearshore wave measurements at two locations, viz. Alleppey and Trivandrum, which have strikingly dissimilar wave climate, shelf slope and sediment characteristics.

From a study of the wave height transformation, it is found that attenuation of wave height takes place during propogation in the shallow waters. While the attenuation is less off Trivandrum, it is as much as 50% for waves of 2-3 m height off Alleppey. The differences in attenuation between the two locations are found to be due to differences in the energy dissipation by bottom friction which in turn is decided by the bottom slope and bottom roughness. Since bottom slope is found to be the dominant factor in the frictional dissipation, and consequently the attenuation of wave height and energy, it is used as the criterion for categorisation of the Kerala Coast into different zones of wave transformation. Study of spectral transformation also confirmed the energy loss during propogation in the shallow waters. In many cases during high energy conditions, the peak spectral density is found to increase, which may be due to the nonlinear wave-wave interaction. Multipeakedness is generally found both in deep and nearshore spectra. It is concluded that the secondary peaks in the observed nearshore spectra are due to sea waves only.

For the prediction of wave height transformation, the model by Dobson with its subsequent modification by Coleman and Wright to incorporate bottom frictional attenuation was chosen. This model was further modified to facilitate the simultaneous usage of two grids, the coarse offshore and the fine inshore grid. The inclusion of this fine inshore grid enables the accurate computation of wave transformation in the inshore where the effects of transformation are very pronounced. Computed results using this modified programme were compared with measured data and a high correlation of 0.8 is obtained. It is concluded that the programme by Dobson with the suggested modifications is suitable for the Kerala coast when used with a friction factor of 0.02. The extent of influence of bottom friction in the attenuation of wave height and energy was studied using the computed friction coefficient. In addition to Alleppey and Trivandrum, the computations were carried out for Calicut for uniform deep water conditions. The percentage attenuations in wave height for deep water waves of height 2m and period 12 s approaching normal to the coastline are 7%, 52% and 74% respectively at Trivandrum, Alleppey and Calicut. This reaffirm the energy level categorisation of the Kerala Coast made earlier based on the bottom slope, which determines the bottom frictional dissipation. For prediction of nearshore wave spectrum, a spectral transformation model by Hubertz was chosen and modified to incorporate bottom frictional attenuation using the equations of Collins. The computations were carried out here also using offshore and inshore grids of depths. Computed nearshore spectra with a friction factor of 0.01 are found to compare well with the measured spectra. It is concluded that the model by Hubertz with the suggested modifications is suitable for the Kerala coast.