M.S.120. SHAHUL HAMEED, T.S.–Spectral and Statistical characteristics of Shoaling Waves off Alleppey–west coast of India–1989– Dr. M. Baba

The present study is conducted with wave records collected systematically from a shallow water location along the Alleppey Coast. Waves are recorded at 3 hourly intervals using a pressure type recorder. The transducer is installed at 3.5 m below the MWL at a station having depth of about 5.5 m. Data Collected during a 4-year period (1980-84) is utilised to determine the wave climate at this location. From the analysis of these records the yearly variation in wave climate is found to be not significant. Hence the data covering a complete year is selected for the detailed study of the spectral and statistical characteristics of the shoaling waves. The wave spectra are computed using the FFT algorithm and the height, period and their joint distributions are derived using the zero-up-crossing method of analysis.

The wave climate at this location is influenced by the south-west monsoonal winds. During May-September the waves are characterised by larger heights associated with comparatively shorter periods an narrow spectrum.

Multi-peakedness observed in almost all the spectra at this shallow water location is due to the co-existence of wave trains of different characteristics. Hence the secondary peaks are not at the higher harmonics of the peak frequency, as observed in some other shallow water locations. The spectral peakedness parameter Qp does not show any characteristic properties with the wave climate.

The average spectra for different energy ranges show dependence of slope of the high frequency side of the spectrum on energy.

A new spectral model (PMK spectrum) is developed for the prediction of shallow water waves following the theories of Pierson-Moskowitz (1964) and Kitaigorodskii et al. (1975), and is calibrated with the observed spectra. The observed spectra are also compared with Kitaigorodski et al.'s model with Jensen's modification, the TMA model in its original form and with a few modifications, the Wallops model and the GLERL model (Liu, 1983).

The shallow water dispersion relationship of Kitaigorodskii et al. (1975) is a useful tool to transform the deep water spectral models to the shallow waters. The models derived using this relationship are able to predict the shallow water spectrum correctly when suitable scale parameters are used. Those which are functions of the total energy are found to be good scale parameters.

The models which depend entirely on the peak frequency simulate the spectrum correctly at high energy cases (Hs $\geqslant$ 2.5 m) only. The TMA model in its original form (with 5 free parameters) simulate the shallow water spectra in a large number of cases. This model is particularly useful for high energy cases where Hs is of the order of 1.4 m and above. The peak energy density is predicted correctly by this model, but the total energy is overestimated, especially in the low energy cases.

The short-term distributions of wave heights computed from the data are compared with the distribution functions of Rayleigh, Goda, Weibull, Gluhovskii, Ibrageemov, Tayfun, Longuet-Higgins (1975 and 1983 models) and CNEXO in the original form and with the modification suggested by Vincent (1984). The depth-dependent models simulate the observed distributions better than the others.

Among the presently available ones, Tayfun's model is the only one capable of simulating it satisfactorily in a large number of cases.

The joint distribution of zero-crossing wave heights and periods deviate from symmetry. Though the shape of the distribution resembles with CNEXO and Longuet-Higgins' modified forms, the modes are incorrectly placed by these models. The Rayleighean models fail to simulate the joint distribution in most of the cases. Tayfun's model predicts the modes of the distribution close to the observed. Best results are obtained with this model in the Hs range of 0.25-1.75 m. The Tayfun's model can be used for the low fair weather waves and the modified CNEXO model can be used for the high energy monsoonal waves, to determine the joint distribution.