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Normalized and Equilibrium Spectra of Wind Waves in Lake Michigan

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ABSTRACT

An empirical spectral equation for fetch-limited deep-water wind waves was derived by applying similarity analysis to wind and wave data recorded at the Lake Michigan Research Tower near Muskegon, Mich., during the autumn of 1967. The field data indicates that both the equilibrium range coefficient, β in $S(\omega) = \beta g^2 \omega^{-5}$ and the dimensionless peak-frequency parameter, $\omega_m U_*/g$, vary with Fo, where Fo $= gF/U_*^2$ is the dimensionless fetch parameter with respect to fetch F and friction velocity U_*. The equation produces reasonably good results in estimating actual wave spectra, provided sufficient duration is achieved in the wind field. The equation also indicates that a fully-developed state will not be reached at a steady wind speed as the very low-frequency waves grow continuously with increasing fetch.

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