Abstract View

Volume 5, Issue 4 (October 1975)

Journal of Physical Oceanography
Article: pp. 750–760 | Abstract | PDF (686K)

Observations of the Directional Spectrum of Ocean Waves Using a Cloverleaf Buoy

Hisashi Mitsuyasu, Fukuzo Tasai, Toshiko Suhara, Shinjiro Mizuno, Makoto Ohkusu, Tadao Honda, and Kunio Rikiishi

Research Institute for Applied Mechanics, Kyushu University, Fukuoka, Japan

(Manuscript received August 26, 1974, in final form April 24, 1975)

DOI: 10.1175/1520-0485(1975)005<0750:OOTDSO>2.0.CO;2

ABSTRACT

Analysis of the directional spectra of typical sets of surface wave data obtained in the open sea as well as a bay using a cloverleaf buoy system are reported.

It is shown that the directional wave spectrum can be approximated by the product of the frequency spectrum and a unimodal angular distribution with mean direction approximately equal to that of the wind, and that various forms of frequency spectra exist, even in relatively simple wave systems, depending on their generating conditions. Ocean waves at fairly short dimensionless fetches show spectral forms with very narrow spectral width, which are similar to those of laboratory wind waves. On the other hand, the spectral forms for ocean waves at very long dimensionless fetches are quite similar to the Pierson-Moskowitz spectra, which are considered, within our present data, to be the wave spectra with the largest spectral width. Finally, there exist many ocean waves at moderate dimensionless fetches, which show spectral forms with in terminate spectral widths lying between the above two extremes. However, a definite relationship between the spectral width and the dimensionless fetch has not been obtained in the present study.

Concerning the angular distribution, it is shown that the shape of the angular distribution is dependent on the frequency of the spectral component even in a simple wave system in a generating area, although the mean directions ot the spectral components are independent of the frequency and approximately equal to the wind direction. The angular distribution is very narrow for frequencies near the dominant peak of the frequency spectrum, whereas it widens rapidly toward high and low frequencies. Thus, the major energy- containing frequency components propagate in almost the same direction as the wind with the least angular spreading.

Finally, it is shown that a similarity law is satisfied for the angular distributions, and an idealized form of the angular distribution function is derived for practical purposes.

top

Headquarters: 45 Beacon Street Boston, MA 02108-3693
DC Office: 1120 G Street, NW, Suite 800 Washington DC, 20005-3826
amsinfo@ametsoc.org Phone: 617-227-2425 Fax: 617-742-8718
Allen Press, Inc. assists in the online publication of *AMS* journals.