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פרופסור ויקטור שרירה
המחלקה למתמטיקה
אוניברסיטת קיל
בריטניה

Lecture

הרצאה

MODELLING “FREAK WAVES” IN TRANSIENT SEA STATES FROM FIRST PRINCIPLES

Wind waves in seas and oceans are inherently random. For many engineering applications it is vital to predict probability density function (PDF) of surface elevations along with the basis meteorological forecasting. Despite huge advances in engineering anomalous or “freak” waves remain a major challenge for ships and offshore structures. Often for design one needs to know a priori the “100 year wave” or even the “1000 year wave”. It is likely that special atmospheric conditions, e.g., rapid changes of wind, squalls, etc., affect the probability of anomalous waves; however the evolution of wave statistics of such transient sea states has never been studied. It is extremely difficult to study such transient processes in nature, while so far the modelling lacked the suitable tools. Here we present a mathematical model aimed at finding the wave height distribution for both steady and transient sea states from first principles.

At present the modelling of random oceanic wind waves is based upon the Hasselmann equation and/or its reductions. The Hasselmann equation assumes quasi-stationarity of the random wave fields under consideration. Rapid changes of wind are not uncommon in nature, however, how they affect wave evolution is practically unknown since the Hasselmann equation is invalid for such processes. Here we examine short-lived transient sea states caused by rapid changes of wind using the Generalized Kinetic Equation (GKE) which does not require the quasi-stationarity assumption. The evolution of the spectra, higher momenta and PDF are examined. The focus of the work is a detailed analysis of the fast evolution after an instant the higher change of forcing, and of the subsequent transition to the new quasi-stationary state of a wave field.

The lecture will be held on Monday,
18 January 2016, at 15:00, room 206,
Wolfson Mechanical Engineering Building
Tel-Aviv University, Ramat-Aviv

ההרצאה תתקיים ביום שני,
18 בינואר 2016, בשעה 15:00,
חדר 206, בניין וולפסון להנדסה מכנית,
אוניברסיטת תל-אביב, רמת-אביב

כיבוד קל יוגש לפני ההרצאה
Light refreshments will be served before the lecture