[042_114]Reports of Research Institute for Applied Mechanics

出版情報：Reports of Research Institute for Applied Mechanics. 42 (114), 1996-12. 九州大学応用力学研究所
バージョン：
権利関係：

Summaries of Papers Published in Bulletin of Research Institute for Applied Mechanics (Japanese) No. 80, 1996

Stability of weakly nonlinear capillary gravity waves of permanent form near the fourth harmonic resonance

By Yuki KATO, Makoto OKAMURA and Masayuki OIKAWA

Weakly nonlinear envelope equations that describe the interaction of a fundamental mode and its fourth harmonic of two dimensional capillary gravity waves on deep water, are derived. Stability of progressive waves of permanent form is investigated by using these equations. It is found that the waves in which the fundamental mode and its fourth harmonic are of the same order are unstable. Modulational instability for the fourth harmonic is found in the third order approximation. New instability related to the fourth harmonic resonance is found in the fourth order approximation.

Three-dimensional instability of nonlinear capillary gravity waves of permanent form

By Yuki KATO, Makoto OKAMURA and Masayuki OIKAWA

Three-dimensional stability of two-dimensional nonlinear progressive capillary gravity waves of permanent form is investigated numerically in the case that the fourth harmonic resonance exists. It is found that instability regions appear around the linear resonance curves related to a fundamental wave and the fourth harmonic wave. Any two kinds of the instability regions do not overlap in the wave number plane of disturbance. The two regions are frequently reconnected.

Study of the Water Material Circulation in the Japan Sea.

By Masaki TAKEMATSU, Jong-Hwan YOON, Cheol-Ho KIM
and Zentaro NAGANO

The long-term current measurements from summer in 1993 to summer in 1995 detected the persitent strong current in the mid and deep layer from fall. Misterious is that from March to May after the strong monsoon season the persitent strong current exceeding 30 cm/c sometimes appears.

Numerical model calculations reproduced successfully the characteristic features; the surface and intermediate layer circulations, the Tsushima Currents characterized by meanders and warm-cold eddies, Liman Current, North Korean Current, the behavior of the low salinity intermediate layer water and south-westward under-current along the Japanese coast.

Development of an Observation Robot 「Flying Fish」 for Comprehensive Measurements of Ocean Environment

By Wataru KOTERAYAMA, Masahiko NAKAMURA
and Satoru YAMAGUCHI

A pitch, roll and depth controllable towed vehicle housing an acoustic Doppler current profiler (ADCP), CO_2 analyzer and sensors for measuring temperature, salinity, dissolved oxygen, PH, turbidity, chlorophyll has been developed and named as "FLYING FISH".

Flying Fish enables us to obtain the space continuous data of physical and chemical properties in the ocean upper mixed layer efficiently. Its maximum submerged depth is 200 m. The length is 3.84 m, breadth 2.26 m, height 1.4 m, weight in air 1400 kg and weight in water is about 0 kg.

The numerical simulations based on the six degree freedom motion equations for underwater vehicle and lumped mass method for the towing cable were carried out in order to design mechanical parts of the control system and estimate the accuracy of motion control of Flying Fish. Field experiments were conducted to confirm the performance of Flying Fish and accuracy of numerical simulations. Results of field experiments and numerical simulations are compared.

Comparison of sea-level fluctuations off Shikoku derived from satellite altimeter and tide gauge

By Hiroshi UCHIDA and Shiro IMAWAKI

Sea-level fluctuations off Shikoku for three years derived from the TOPEX/POSEIDON altimeter and a coastal tide gauge at Cape Ashizuri are compared. Comparison of instantaneous sea-level fluctuations for 76 data pairs shows a correlation coefficient of 0.99 and rms (root-mean-square) difference of 6.9 cm. Comparison of long-term fluctuations with tides removed shows a correlation coefficient of 0.78 and rms difference of 7.2 cm. Comparison is improved when the difference of the two observation positions is partly taken into account; a correlation coefficient is 0.84 and rms difference is 6.0 cm.

Wavelet Analysis of the Flying Fish data collected in the CREAMS'94 cruise

By Takashi SETOH, Alexander OSTROVSKII, Shin-ichiro UMATANI and Wataru KOTERAYAMA

This study concerns with variations of bio-physical parameters observed by the new Flying Fish towed vehicle in the Japan Sea in July 1994. The orthonormal wavelet transform technique is used for analysis of the distributions of the dissolved oxygen, chlorophyll, and temperature in the upper sea mixed layer at the section between Hokkaido Island and the Russia coast. The time series are decomposed on the wavelet components of different scales of resolution and then the conventional statistical multivariative analysis is used to relate the spatio-temporal variability of the wavelet components at the individual scales. An interesting phenomenon was observed in the relationships between the oxygen and temperature or chlorophyll. It is found that the oxygen distributions hinged on the chlorophyll concentration only at certain scales during the afternoon observations in the relatively cold region near the Russia coast. Our findings imply that the size of the chlrophyll-rich water patches could be about 5-15 km in the northern Japan Sea in July, 1994.

High Heat Load Properties of TiC dispersed Mo Alloys

By Kazutoshi TOKUNAGA, Yasushi MIURA, Naoaki YOSHIDA, Hiroaki KURISHITA, Yuji KITSUNAI and Hideo KAYANO

High heat load experiment of TiC dispersed Mo alloys using electron beams was carried out to evaluate the heat load resistance as high heat flux materials such as the divertor tiles. As a results, although characteristic damage and gas emission of the TiC dispersed Mo alloys around the melting point are inferior to the PM-Mo but, those of the Mo-0.5 wt%TiC and Mo-1.0 wt%TiC under the temperature of about 2000°C was superior to polycrystalline Mo. Thus, their materials are expected to be suited to be high heat flux materials used under recrystallization temperature. Results also indicates that it is necessary to release internal strain energy induced by manufacture process in order to decrease damage by grain growth and crack formation at high temperature, which was caused by migration of grain boundary and stress, respectively. Characterization of microstructure produced by roll process during manufacture is required to design improvement of the thermal conductivity.