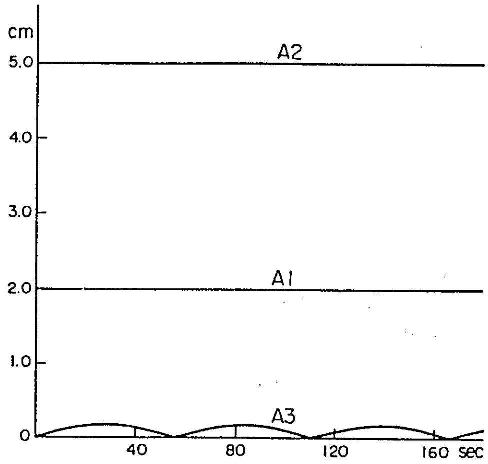

Fig. -3-3 (a)
Solution of the Zakharov equation ($\gamma=1.800$)
Initial values : $A_1=2.0$cm
$A_2=5.0$cm
$A_3=0.0$cm

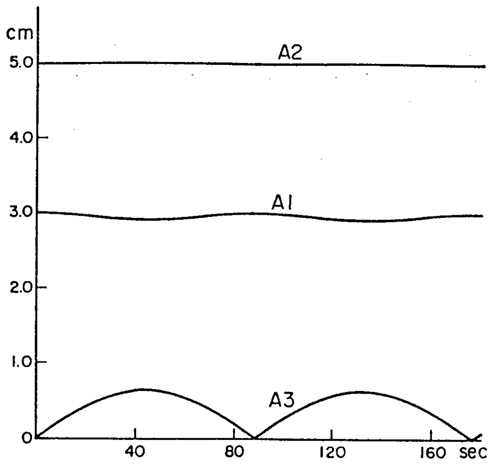

Fig. -3-3 (b)
Solution of the Zakharov equation ($\gamma=1.800$)
Initial values : $A_1=3.0$cm
$A_2=5.0$cm
$A_3=0.0$cm

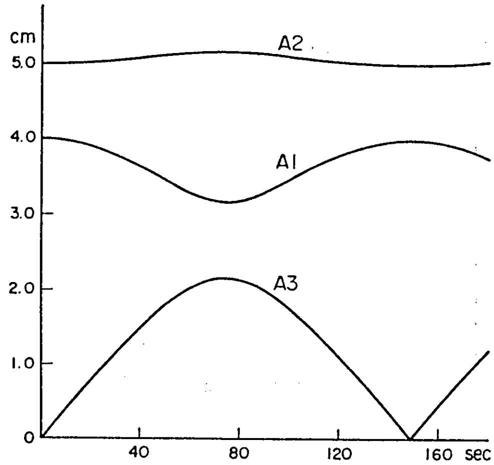

Fig. -3-3 (c)
Solution of the Zakharov equation ($\gamma=1.800$)
Initial values : $A_1=4.0$cm
$A_2=5.0$cm
$A_3=0.0$cm
Resonant growth occurs strongly in contrast to the corresponding case in Fig-3-2.

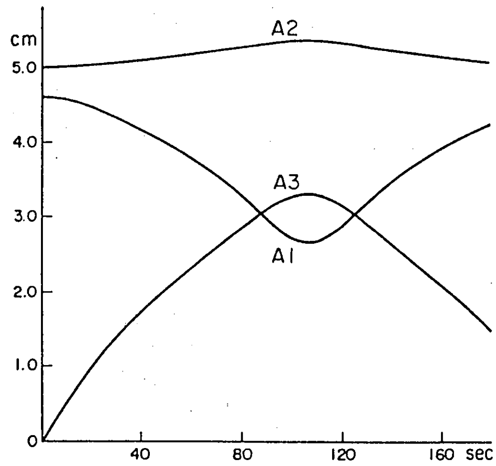

Fig. -3-3 (d)
Solution of the Zakharov equation ($\gamma=1.800$)
Initial values : $A_1=4.6$cm
$A_2=5.0$cm
$A_3=0.0$cm
The critical case of interaction.

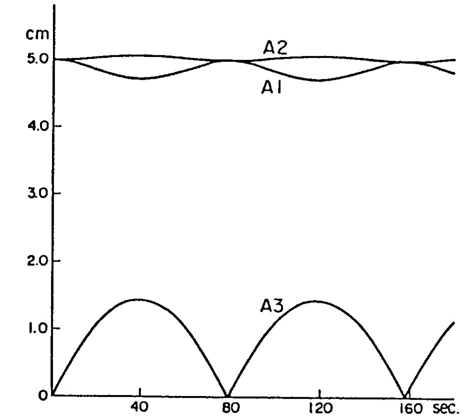

Fig. -3-3 (e)
Solution of the Zakharov equation ($\gamma=1.800$)
Initial values : $A_1=5.0$cm
$A_2=5.0$cm
$A_3=0.0$cm

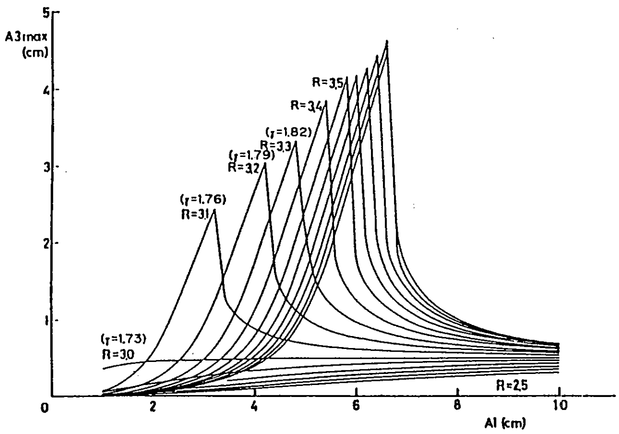

Fig. -3-4
Maximum amplitude A_{3max} v. s. A_1 ($A_2=5$cm)
Dependence of resonant growth of tertiary waves on the primary wave ampritude is shown taking γ as a parameter. There are sharp peaks at off-resonance cases.

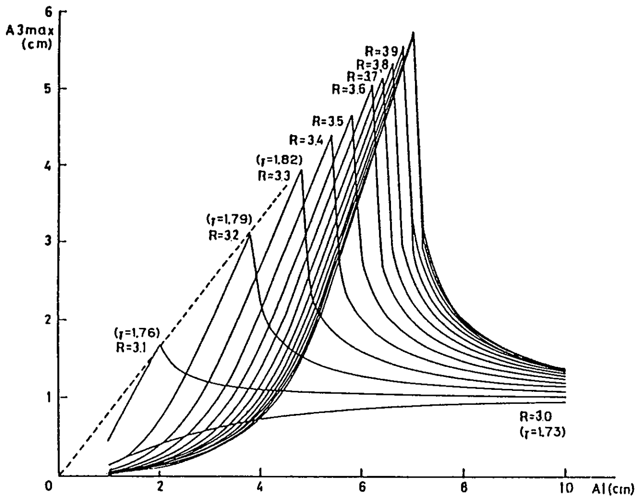

Fig. -3-5
Maximum amplitude A_{3max} v. s. A_1 ($A_2=10$cm)
------- : Limiting line A^{M}_{3max} (3-10)
Upper bounds of resonant wave growth is verified by the numerical experiment.

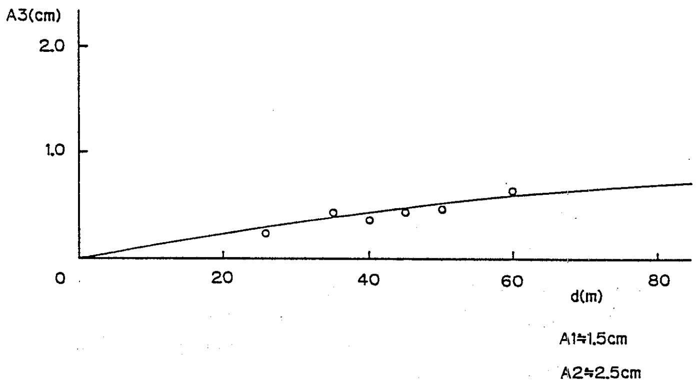

Fig. -3-6 (a)
Evolution of tertiary wave A_3
——— : Theory (Zakharov)
○ : Experiment (cm)
$\gamma=1.72$ (near resonant case)

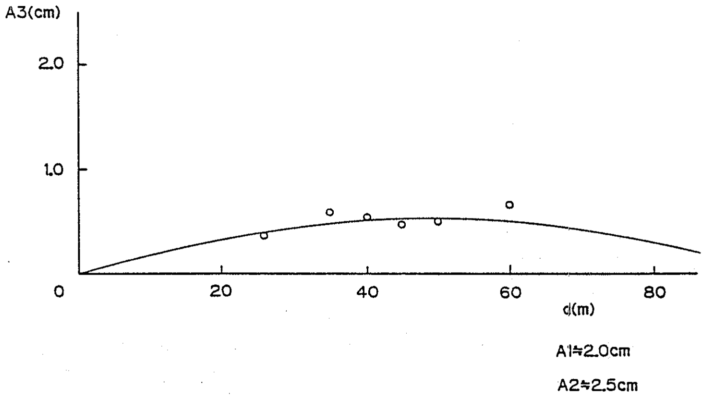

Fig. -3-6 (b)
Evolution of tertiary wave A_3
——— : Theory (Zakharov)
○ : Experiment (cm)
$\gamma=1.72$ (near resonant case)

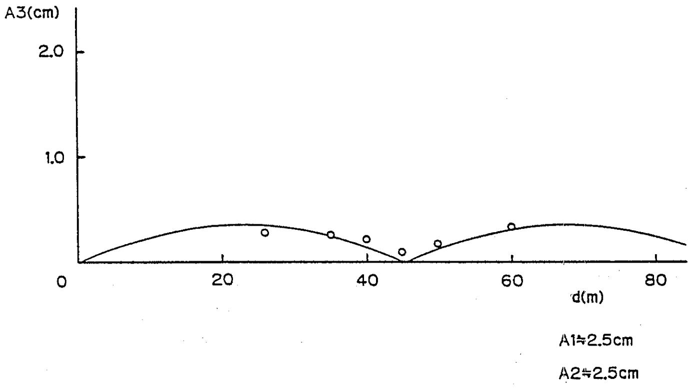

Fig. -3-6 (c)
Evolution of tertiary wave A_3
——— : Theory (Zakharov)
○ : Experiment (cm)
$\gamma=1.72$ (near resonant case)

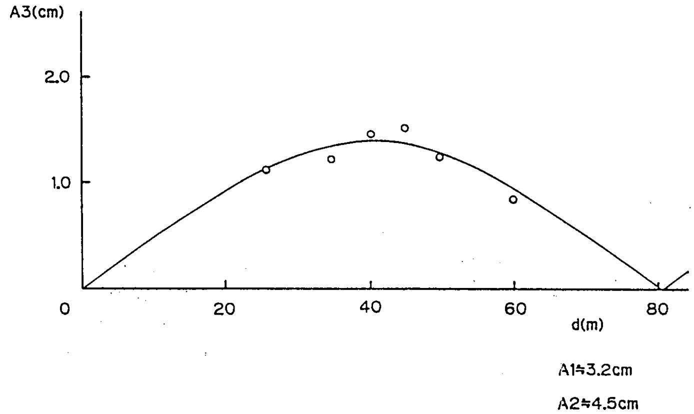

Fig. -3-7 (a)
Evolution of tertiary wave A_3
——— : Theory (Zakharov)
○ : Experiment (cm)
$\gamma=1.79$ (off resonant case)

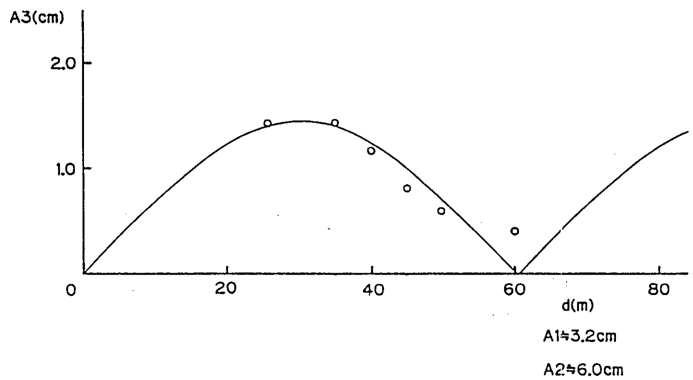

Fig. -3-7 (b)
Evolution of tertiary wave A_3
——— : Theory (Zakharov)
○ : Experiment (cm)
$\gamma=1.79$ (off resonant case)

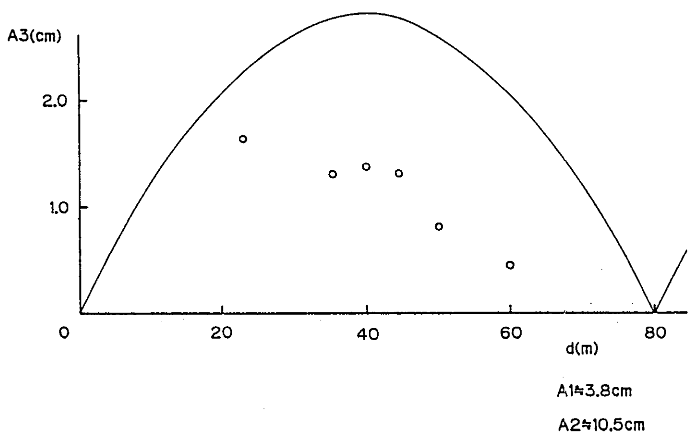

Fig. -3-7 (c)
Evolution of tertiary wave A_3
——— : Theory (Zakharov)
○ : Experiment (cm)
$\gamma=1.79$ (off resonant case)

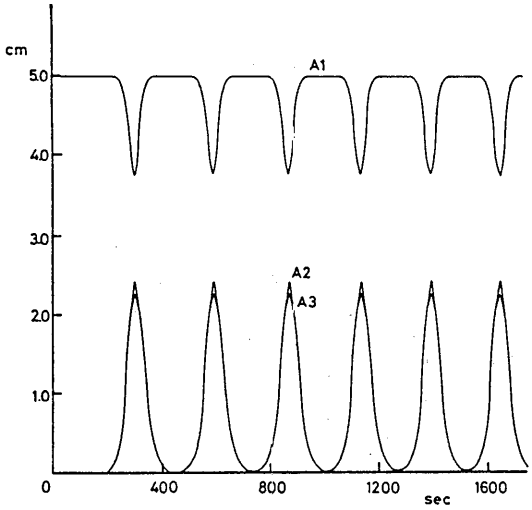

Fig. -3-8
Long-time evolution of a wave train A_1 with its side bands A_2 and A_3
Side band components rise up intermittently.
The recurrence takes place in a very long time instead of disintegration of wave train.

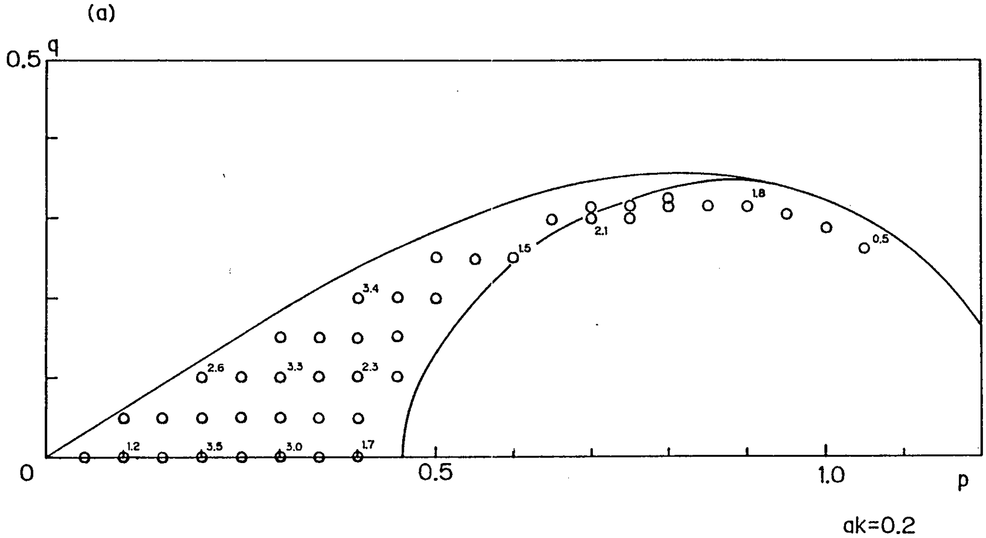

Fig. -3-9 (a)
Domains of instability (wave-number space)
Wave steepness ak = 0. 2
The solid curve is the instability boundary calculated by McLean (1892).

(b)

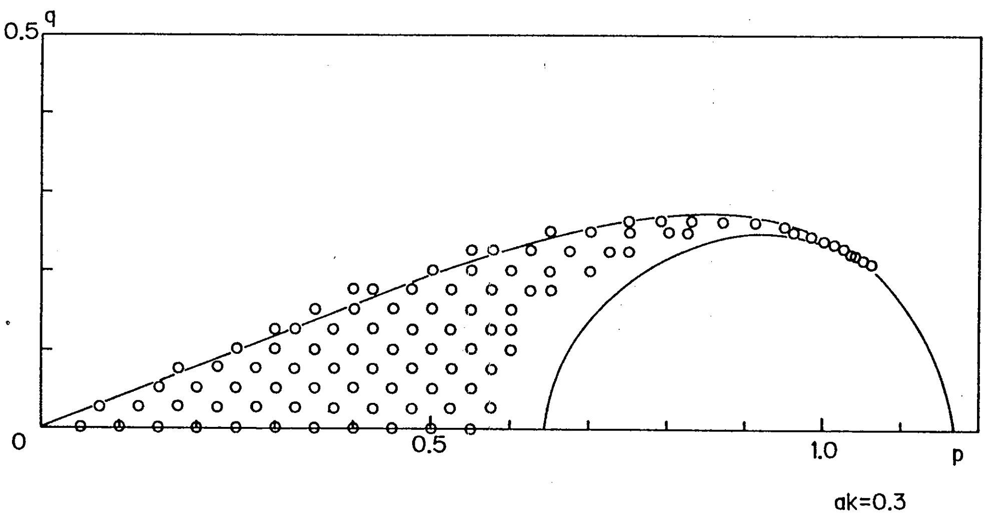

Fig. -3-9 (b)
Domains of instability (wave-number space)
Wave steepness ak = 0.3
The solid curve is the instability boundary calculated by McLean (1892).

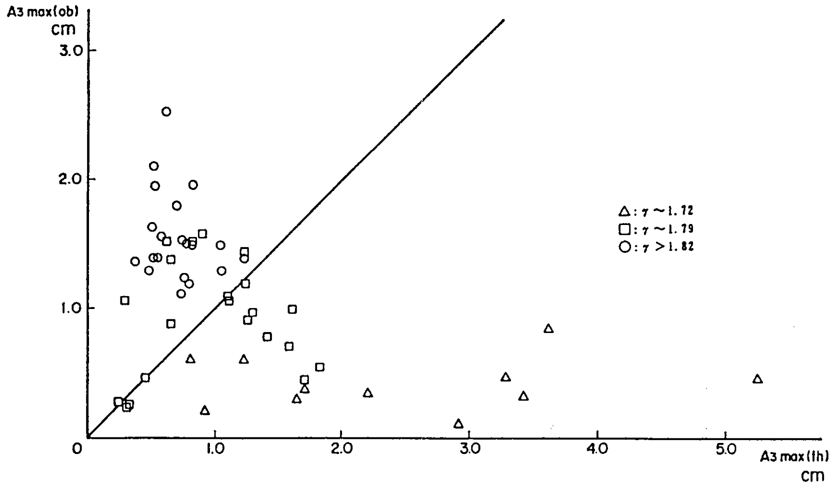

Fig. -4-1
Plot of the observed maximum amplitude of tertiary waves with respect to the theoretical maximum of A_3
A_{3max} (ob) : Experiments
A_{3max} (th) : Theory (Longuet-Higgins)

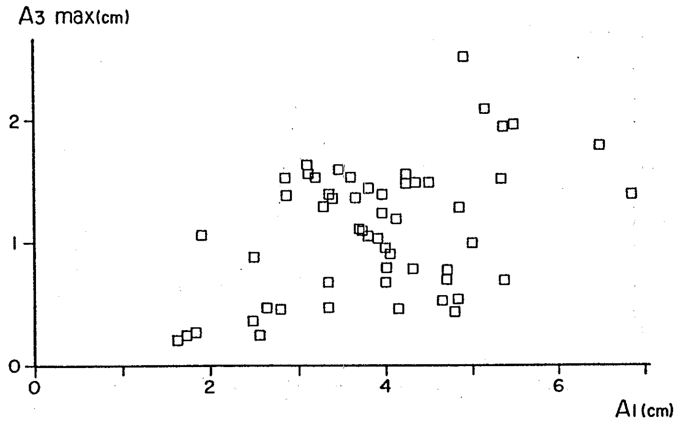

Fig. -4-2
Plot of the observed maximum amplitude A_{3max} with respect to A_1
Various conditions are totally plotted.

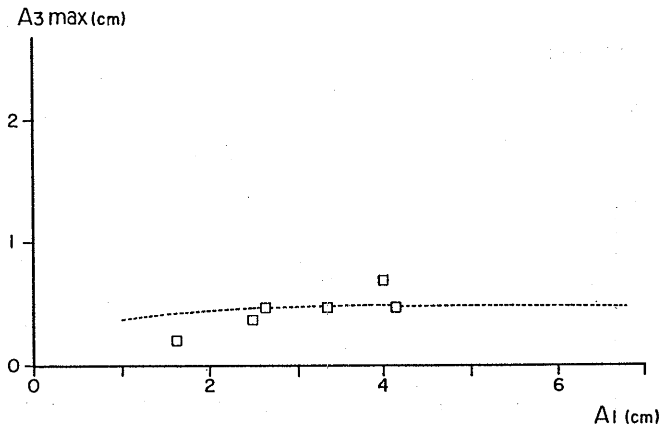

Fig. -4-3
Comparison of observed A_{3max} with Zakharov theory
------- : Theory (Zakharov $\gamma = 1.72$)
□ : Experiment (cm) , $A_2 = 5$cm

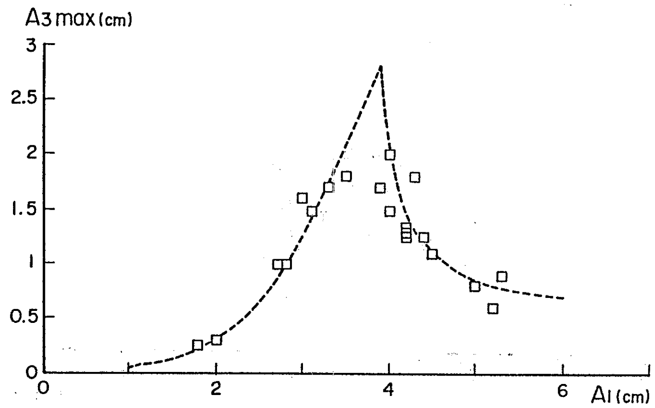

Fig. -4-4
Comparison of observed A_{3max} with Zakharov theory
------- : Theory (Zakharov $\gamma=1.79$)
□ : Experiment (cm) , $A_2=5$cm

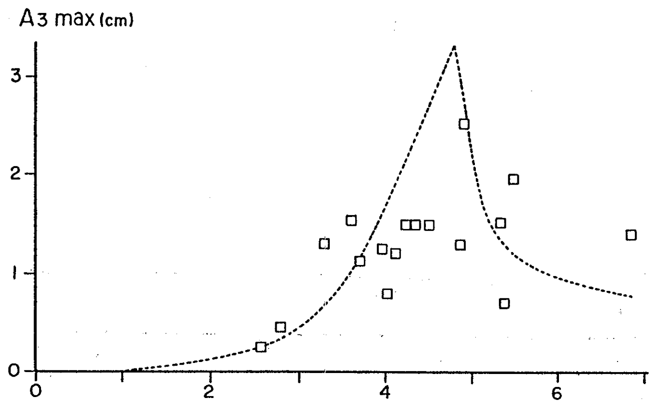

Fig. -4-5
Comparison of observed A_{3max} with Zakharov theory
------- : Theory (Zakharov $\gamma=1.82$)
□ : Experiment (cm) , $A_2=5$cm

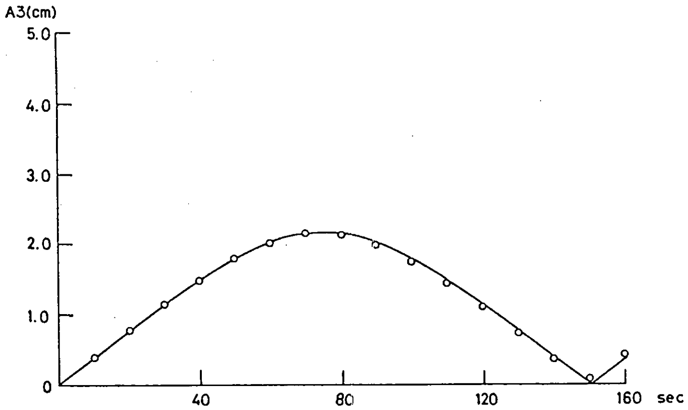

Fig. -A-1

Comparison of analytical solution with the numerical results obtained in Ch3 -an example-

——— : Solution in Appendix IX

○ : Solution in Chapter 3

Initial condition : $A_1=4$cm , $A_2=5$cm , $A_3=0$cm

List of the Related Articles by the Present Author;

(1)Tomita,H. & Sawada,H.(1987) An experimental investigation into non-linear resonant wave interactions in the ship model basin. Proc. IUTAM Sympo.Non-Linear Water Waves.,Springer-Verlag,pp341～348.

(2)Tomita,H.(1987) Etude numerique sur l'interaction resonante entre des vagues d'amplitude finie. La mer,Tome25,pp53～61.

(3)Tomita,H.(1986) On non-linear sea waves and the induced mean flow. J.Oceanogr.Soc.Japan,Vol.42,pp153～160.

(4)Tomita,H.(1985) On non-linear water wave groups and the induced mean flow. Proc.The Ocean Surface Sympo.,D.Reidel Pub.,pp59～64.

(5)Tomita,H.(1988) Ocean Waves and Ship Motions. KOKAI,Vol.96,pp8～16.

(6)Tomita,H.(1988) Wind and wave characteristics in the western North-Pacific Ocean(Part-1). Report of Ship Research Institute,Vol.25,pp. (in printing)

(7)Tomita,H.(1988) Wind and wave characteristics in the western North-Pacific Ocean(Part-2). Report of Ship Research Institute,Vol.25,pp. (in preparation).

(8)Tomita,H.(1985) On mutual effects of large amplitude waves. Proc.46-th Lec.Meeting S.R.I.,pp143～146.

(9)Tomita,H. & Tanizawa,K.(1983) Numerical Investigation into nonlinear water waves by means of the Boundary Element Method. Papers S.R.I., No.69pp1～13.

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実海域における波の方向スペクトルについて
－第1報　計測法の検討－

吉元　博文*

At-Sea Measurements of Directional Wave Spectra
— 1 st Report　Study of the Measuring Technique—

By

Hirofumi YOSHIMOTO

Abstract

At-sea experiment using prot-type floating platform"POSEIDON"is now going on at Japan Sea. This paper describes the measuring technique and the estimating method of the directional wave spectra at sea.

For the estimation of the directional wave spectra, various kinds of measuring devices and data analyzing methods have been proposed.

In this experiment, the three wave probes arranged in a line array are used and the directional wave spectra are estimated by the maximum likelihood method (MLM). Then, the accuracy of MLM was examined by tank tests and numerical simulations. In this tank test, relative wave heights of floating structure models were also measured to estimate the directional wave spectra.

The main results are as follows ;

1) MLM has the high resolution and can detect progressive waves using only three wave probes arrenged in a line array.

2) The directional wave spectra can be also estimated from the relative wave heights of floating structure model.

目次

＊海洋開発工学部
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