Forces on fixed offshore structures: effects of nonlinear irregular wave kinematics

by

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18228

Dissertation submitted in partial fulfilment of

the requirements for the

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CERTIFICATION OF APPROVAL

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Approved by,

_____

(Dr. Mohamed Latheef)

UNIVERSITI TEKNOLOGI PETRONAS
BANDAR SERI ISKANDAR, PERAK
January 2017

CERTIFICATION OF ORIGINALITY

This is to certify that I am responsible for the work submitted in this project, that the original work is my own except as specified in the references and acknowledgements, and that the original work contained herein have not been undertaken or done by unspecified sources or persons.

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MUHAMMAD IZZUDDIN BIN ISMAIL

ABSTRACT

Forces from a nonlinear irregular wave model on a offshore structure are investigated. Comparing the results obtained from the linear wave theory and with the stream function wave theory and investigate the force from fully nonlinear irregular waves is used from the Morison's equation. The predictions of the wave forces is compared. The corresponding force profiles from the stream function theory with the force-profiles of two selected waves from the irregular wave train are compared. The results recommend that the non-linear irregular waves give high value to larger extreme wave forces that those predicted by linear theory. The linear theory which is stream function theory in some issue underestimate the wave forces acting on the offshore structure

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CHAPTER 1

INTRODUCTION

1.1 Background Study

Ocean waves are random and irregular height, period ,length shape and speed of propagation. A actual and real sea state is best explained by a irregular wave model. Summation of many small liner wave components with different amplitude, frequency and direction is a linear irregular wave model. The phases are irregular and random toward each other. A nonlinear irregular wave model allows for differences and summation frequency wave component affect by non-linear interaction between the individual wave components.

Determine the design wave methods or by stochastic methods applying wave spectra will consider wave conditions for structural design purposes. For quasisatatic response of structure, it is sufficient to use deterministic regular waves characterized by corresponding wave period, crest and through height, wave length and period. Statistical method will capable to predict the deterministic wave parameters.

Stochastic modelling of the sea surface and its kinematics by time series is required for structures with significant dynamic response. Wave frequency spectrum is best described sea state with a given significant wave height, a representative frequency , a mean propagation direction and a spreading function. In applications the sea state is usually assumed to be a stationary random process. Three hours has been introduced as a standard time between registrations of sea states when measure waves, but the duration of stationary capable to range from 30 minutes to 10 hours. The wave conditions in a sea state can be divided into two particular conditions which is swell and wind seas . Wind seas are caused by local wind meanwhile swell have no interaction to the local win. Swell usually wave that have travelled out of the the areas where they were generated.

1.2 Problem Statement

A actual and real sea state is best explained by a irregular wave model. Basically engineer will calculated the prediction using regular wave which is easy to executed and for this project, the irregular wave method will be used to calculated the force for the prediction .Comparing the results obtained from the linear wave theory which is using the regular method by using the data from PTS (Petronas Technical Standard) with the condition of worst storm in 100 years with the irregular method and investigate the force from fully nonlinear irregular waves will give actual value for the sea state

1.3 Objectives

A actual and real sea state is best described by a irregular wave model. The main objective of this study is to calculate the force for nonlinear irregular waves to the structure . Below are the details objectives of this study:

I. To compare the differences between regular wave and irregular waves

II. To determine the differences due to various method in calculating kinematics

III. To determine the effects water depth to the wave force

1.4 Scope of Study

This project is conducted to comparing the results obtained from the linear wave theory which is using the regular method by using the data form PTS (Petronas Technical Standards) with the condition of worst storm in 100 years with the irregular method and investigate the force from fully nonlinear irregular waves, Morison's equation is used to calculated the force for the nonlinear irregular waves and regular waves. A actual sea state is best described by a irregular wave model. Basically engineer will calculated the prediction using regular wave which is easy to executed and for this project, the irregular wave method will be used to calculated the force for the prediction.

There are two phases in this project. The first phase of this project is during final year first semester. The focus is more on data collection, literature review and data analysis and interpret . The first phase is very important to provide understanding on overall process and theoretical knowledge for this project. The second phase is during final year second semester. The focus will be on conducting discussion and data analyzing. The results obtained will be documented in final report.

CHAPTER 2

LITERATURE REVIEW

2.1 Wave Force Formations

The main important when designing the structure is the computation of the water wave forces on an offshore structure. Task involving between the complexity of the interaction with the structure make its as a difficult situation. The effects on the offshore structure ,the random nature of the ocean waves and the incomplete of even some of the highly nonlinear wave theories to explain it become more difficult and hard as we start to investigated and examined. Furthermore, our understanding about the interaction phenomenon through analytical studies, laboratory experiments and at-sea measurements are reasonably accurate in predicting wave impacts on a a variety of offshore structures agreeing with some of the theories available today.

Throughout the year, the development of offshore structure is increasing and there is a lot of variety offshore structure. One of the common used by the industrial is piled jacket-type platforms which is consists of small tubular members. Its also composed with large volume gravity platforms which consists of large members coupled with smaller braces, semisubmersibles, tension legged platforms with large vertical, horizontal and diagonal circular or square cylinders and arctic structures. The variety formulations for wave forces are apply to the this type and size of the members in an offshore structure.

Wave forces on offshore structures are calculated in three different ways:

- Morison equation
- Froude-Krylov theory
- Diffraction theory

The Morison equation is to be linearly combination between the inertia forces and drag forces. The combination involve an inertia which called as mass coefficient and a drag coefficient which can be determined by experiment. The drag force gives significant value to application of morison equation. This is normally happen when the structure diameter is small compared to the water wave length.

The Froude-Krylov can be applied when the drag force is less and the inertia force give significant values while the structure diameter is still relatively small.
It use the pressure area method and utilize the incident wave pressure on the surface of the structure to give the force value. The benefit of this method is that for some of the symmetric objects , the force produce may be in a closed form and the it easy to find the force coefficients.

The current structure is expected to adapt the wave field in the area of the structure when the wave length is compare to the size of the structure. In this case, the evaluation of the wave can be proceed when the diffraction of the waves from the surface of the structure are taken into account. This called as theory for diffraction or generally known as diffraction theory. The solution commonly involving between numerical technique and the associated boundary conditions to solve the Laplace equation while in closed form solution.

A simple dimensional analysis is perform first in order to determine which are three a methods are applicable. F, known as the force of the wave act to structure while D, is the diameter of a vertical cylinder or the column of the structure. Both of this can be written as the following function

$$f = \psi\,(t, T, D, L, u_0\,, \rho, \upsilon \qquad (2.1)$$

Based on function above the t is time ,T is wave period, L is wave length, u_0 is maximum horizontal water particle velocity, ρ is mass density of water and υ is kinematic viscosity. From the velocity , the water particle acceleration can be obtained. In linear wave theory $\dot{u}_0\ is\ \omega u_0$ where $\omega\ is\ \frac{2\pi}{T}$. In a M-L-T system, the Buckingham Pi theorem will result five dimensionless quantities for eight variables. Then, dimensionless force can be expressed as a function of four non dimensional quantities

$$\frac{f}{\rho u_0^2} = \psi(\frac{t}{T}, \frac{u_0 T}{D}, \frac{u_0 D}{\upsilon}\ , \frac{\pi D}{L} \qquad (2.2)$$

Based on the function above the t/T is dimensionless time, $\frac{u_0 T}{D}$ is Keulegan-Carpenter parameter (KC), $\frac{u_0 D}{\upsilon}$ is Reynolds number, and $\frac{\pi D}{L}$ is diffraction parameter,

The importance of drag force can be expressed by using the KC number while the the importance of diffraction effect can be express using diffraction parameter. The diameter of the structure is one of the characteristic when determine the KC number while diffraction parameter is the ratio between the diameter of the structure and wave length. When the diffraction parameter is big means that the KC number is small and when the diffraction parameter is small means that the KC number is big. Thus, small drag effects means the diffraction effect is big and when the drag effects is big means the diffraction is negligible.

2.2 Morison Equation

The Morison Equation was introduced and developed by was Morison, O'Brien, Johnson, and Shaaf (1950) in explaining the horizontal wave forces acting on a vertical cylindrical pile which scale from the bottom of the ocean through the free surface. Morison, et al. proposed that the force exerted from uninterrupted surface waves on a vertical cylindrical pile which expand from the bottom through the free surface from the figure below is consists of two important components which is inertia and drag.

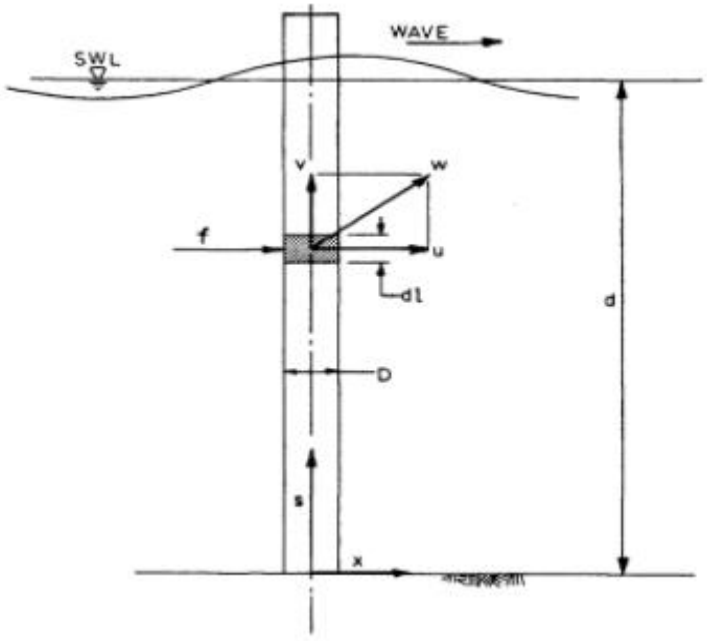


Figure 2.1: Wave forces acting on diameter cylinder

2.3 Development of Morison Equation

When water particle moving in a wave, it carries a momentum. This approved the principle concept of the inertia force. The particle will accelerates and decelerates when passing around the vertical cylinder. This shows that the application of a force acting on the cylinder increase the momentum. The increment of force acting on a small segment of the cylinder needed to accomplish in order to proportional to the acceleration at the mid of the cylinder

$$df_{\mathrm{i}} = C_M \rho \frac{\pi}{4} D^2 \frac{du}{dt} ds \qquad (2.3)$$

Based on function above the df_{i} is inertia force on the segment ds of the vertical cylinder while D is the cylinder diameter and du/dt is the local water particle acceleration at the centerline of the cylinder . While C_M is the inertia coefficient. For a uniformly accelerated flow the inertia coefficient can be equal to 2.

The presence of a wake region on the downstream side of the cylinder is the principal cause of the drag force components. The differential is created by the region between the downstream and upstream of the cylinder at a given amount of time which is that downstream region is low pressure compare to the pressure of upstream. Based on the theory, the water particle motion under a wave oscillate within the wave period. Therefore, the downstream side of the cylinder repeat every half cycle and a after half a cycle, a mirror image is created. The differential pressure due to different region causes a force to be exerted in the water particle velocity.

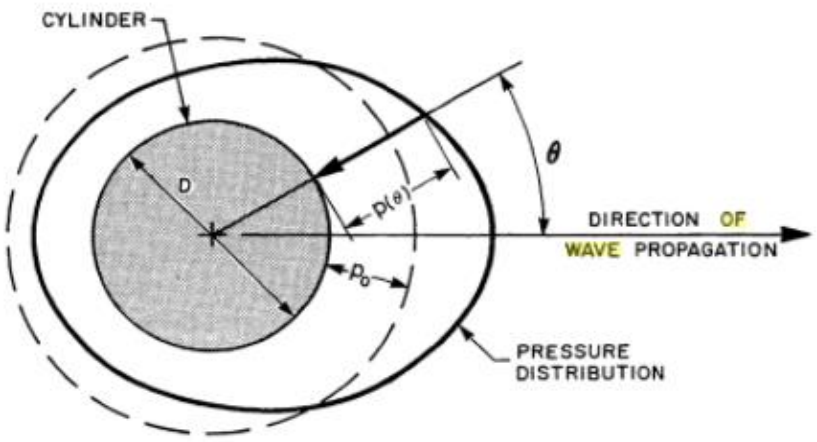


Figure 2.2: Pressure distribution through the vertical cylinder in waves

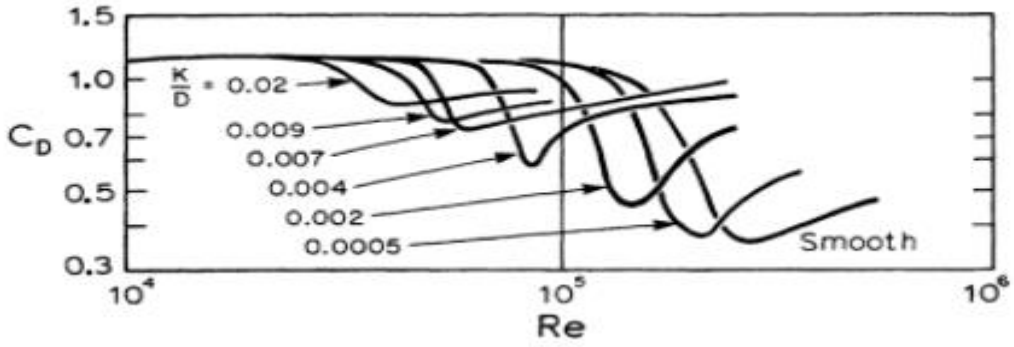


Figure 2.3: Drag coefficient versus Reynolds number

The square of the water particle velocity is proportional with the drag force from the Morison equation. The absolute value of the water particle velocity is include in order to ensure the drag force is same direction the velocity.

$$df_D = \frac{1}{2} C_D \rho D |u| u ds \qquad (2.4)$$

Based on the function above the df_D is drag force on an incremental segment, ds, of the cylinder while u is instantaneous water particle velocity and C_D is drag coefficient. In a uniform flow, the value of (steady) drag coefficient $\bar{C}_D$ is dependent on the cylinder roughness and Reynolds number. For rough cylinders and smooth cylinder , its values obtained from experiments are given in Figure 2.3. The value of drag coefficient increased by the cylinder roughness.. In the case of the oscillatory flow this value is hard to obtain .

Combining the inertia and drag components of force, the Morison equation is written as

$$f = C_M A_I \frac{du}{dt} + C_D A_D |u| u \qquad (2.5)$$

In which f = force per unit length of the vertical cylinder

$$A_I = \rho \frac{\pi}{4} D^2 \qquad (2.6)$$

And

$$A_D = \rho \frac{1}{2} D \qquad (2.7)$$

The above equation (2.5) gives the forces on unit length of a vertical cylinder. Assuming that the cylinders expands from the ocean floor the SWL (Figure 2.1), the total force on the cylinder is given by the integral the equation below

$$F = \int_0^d f \, ds = \int_0^d [C_M A_I \frac{du}{dt} + C_D A_D |u| u] \, ds \qquad (2.8)$$

The Empricial is the original Morison equation. Thus, it can be questioned its application to a complex time dependant separated flow. However , is not applicable to derive new formulations to give best explaination the flow phenomena. The method to improve the Morison equation in terms of aligning the measured data by adding higher (odd) harmonic terms is described by Sarpkaya and Isaacson (1981). The reliability of original Morison equation has been approved in predicting wave force on small members . The small discrepancy might not be considered as important and in the current of many other uncertainties in designing the structure.

CHAPTER 3

METHODOLOGY

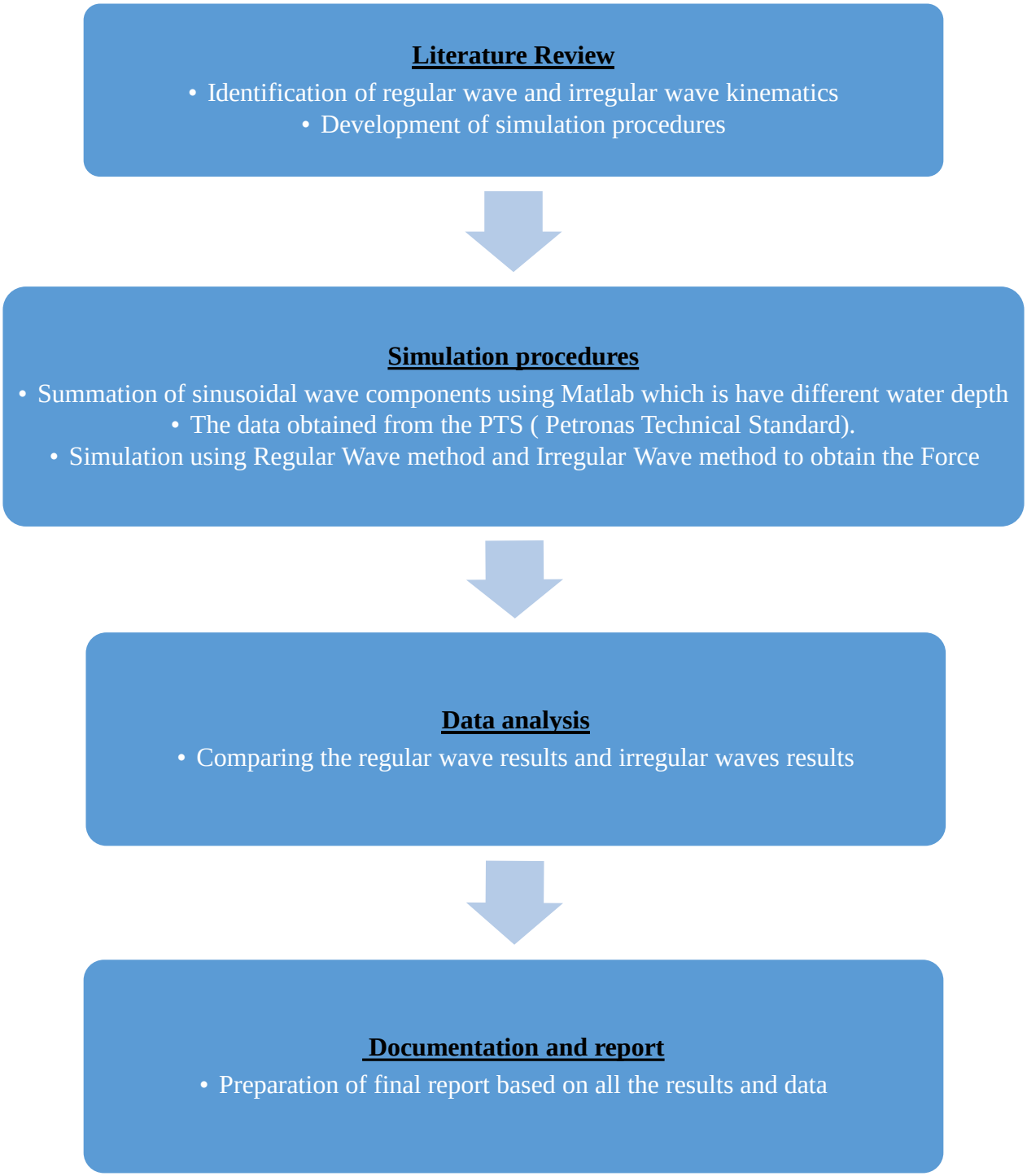
3.1 Project Flow

The process flow for this project is as below:

3.2 Project Methodology

3.2.1 Overview

The overview of methodology for this project is as below:



3.2.2 Simulation

3.2.2.1 Simulation of regular wave

The purpose of the Simulation is to explore the total forces on the cylinder with different wave height , wave period and water depth. For the regular wave ,The wave characteristic can obtain from the Petronas Technical Standards (PTS) with condition worst storm in 100 years. The table below shows example wave characteristic from Peninsular Malaysia Operation.

WAVE	Units	Operating Criteria	100- year Storm Event
Hs	m	4.38	5.77
Tz	sec	6.91	8.06
Tp	sec	9.74	11.37
Hmax	m	8.44	11.65
Tass	sec	8.38	9.64

Table 3.1: Peninsular Malaysia Operation (PMO) (Water depth 70m)

The following below is equation from the Morison equation in order to calculate the total forces acting on the vertical cylinder

$$F = C_d \frac{1}{2} \rho D \int_0^d u^2 dz + C_m \frac{\pi D^4}{4} \rho \int_0^d \frac{du}{dt} dz \qquad (3.1)$$

Based on function above ρ is mass density of fluid (kg/m3) = 1000 kg/m3, D is diameter of cylinder (m) = 0.5 m, u is fluid particle velocity (m/s), du/dt is fluid particle acceleration (m/s2), Cd is drag coefficient and Cm is mass coefficient.

In computing global wave forces on the structure with Morrison's equation, drag and mass coefficients for tubular members shall be determined as functions of wave and current parameters and surface roughness, size and orientation as per API code requirement with the following criteria:

	Tubular Members	Non-Tubular Members
Drag Coefficient Cd	1.0	2.0
Mass Coefficient Cm	2.0	2.0

Table 3.2: Drag coefficient and mass coefficient for the following members

Based on the Morison Equation ,the horizontal velocity which is u and the particle acceleration is du/dt are shown in function below.

$$u = \frac{\mathrm{a}\omega \cosh k\,(y+d)}{\sinh\,(kd)} \sin\,(\omega t - kx) \qquad (3.2)$$

$$\frac{du}{dt} = \frac{\mathrm{a}\omega^2 \cosh k\,(y+d)}{\sinh\,(kd)} \cos(\omega t - kx) \qquad (3.3)$$

In which a is wave height, ω is wave frequency = = $\frac{2\pi}{T}$, k is wave number = $\frac{\omega^2}{g}$, y is length from the free surface , t is wave period and x is length in x direction.

From the data above , the force for the regular wave is calculated into two condition which is 80m water depth and 180m water depth to compare to the force in irregular wave.

3.2.2.2 Simulation of irregular wave

The simulation for irregular wave, the wave characteristic data can obtain from the Universiti Teknologi Petronas with 80m water depth and 180m water depth condition in order to compare with the regular results. The table below shows the data for velocity , acceleration and elevation for each time period

80m water depth

AX

8193x1024 double

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
1	-0.0064	-0.0064	-0.0064	-0.0064	-0.0064	-0.0064	-0.0064	-0.0064	-0.0064	-0.0064	-0.0064	-0.0064	-0.0064	-0.0064	-0.0064	-0.0064	-0.0064	-0.0064	-0.0064	-0.0064	-0.0064	-0.0064	-0.0064	-0.0064
2	-0.0055	-0.0055	-0.0055	-0.0055	-0.0055	-0.0055	-0.0055	-0.0055	-0.0055	-0.0055	-0.0055	-0.0055	-0.0055	-0.0055	-0.0055	-0.0055	-0.0055	-0.0055	-0.0055	-0.0055	-0.0055	-0.0055	-0.0055	-0.0055
3	-0.0034	-0.0034	-0.0034	-0.0034	-0.0034	-0.0034	-0.0034	-0.0034	-0.0034	-0.0034	-0.0034	-0.0034	-0.0034	-0.0034	-0.0034	-0.0034	-0.0034	-0.0034	-0.0034	-0.0035	-0.0035	-0.0035	-0.0035	-0.0035
4	-3.2099e-04	-3.2104e-04	-3.2119e-04	-3.2144e-04	-3.2179e-04	-3.2224e-04	-3.2278e-04	-3.2343e-04	-3.2418e-04	-3.2502e-04	-3.2597e-04	-3.2702e-04	-3.2816e-04	-3.2941e-04	-3.3076e-04	-3.3220e-04	-3.3375e-04	-3.3540e-04	-3.3714e-04	-3.3899e-04	-3.4094e-04	-3.4299e-04	-3.4514e-04	-3.4738e-04
5	0.0033	0.0033	0.0033	0.0033	0.0033	0.0033	0.0033	0.0033	0.0033	0.0033	0.0033	0.0033	0.0033	0.0033	0.0033	0.0033	0.0033	0.0033	0.0033	0.0033	0.0033	0.0033	0.0033	0.0033
6	0.0069	0.0069	0.0069	0.0069	0.0069	0.0069	0.0069	0.0069	0.0069	0.0069	0.0069	0.0069	0.0069	0.0069	0.0069	0.0069	0.0069	0.0069	0.0069	0.0069	0.0069	0.0069	0.0069	0.0069
7	0.0094	0.0094	0.0094	0.0094	0.0094	0.0094	0.0094	0.0094	0.0094	0.0094	0.0094	0.0094	0.0094	0.0094	0.0094	0.0094	0.0095	0.0095	0.0095	0.0095	0.0095	0.0095	0.0095	0.0095
8	0.0104	0.0104	0.0104	0.0104	0.0104	0.0104	0.0104	0.0104	0.0104	0.0104	0.0104	0.0104	0.0104	0.0104	0.0104	0.0104	0.0104	0.0104	0.0104	0.0104	0.0104	0.0105	0.0105	0.0105
9	0.0094	0.0094	0.0094	0.0094	0.0094	0.0094	0.0094	0.0094	0.0094	0.0094	0.0094	0.0094	0.0094	0.0094	0.0094	0.0094	0.0094	0.0094	0.0094	0.0094	0.0094	0.0094	0.0094	0.0094
10	0.0064	0.0064	0.0064	0.0064	0.0064	0.0064	0.0064	0.0064	0.0064	0.0064	0.0064	0.0064	0.0064	0.0064	0.0064	0.0064	0.0064	0.0064	0.0064	0.0064	0.0064	0.0064	0.0064	0.0064
11	0.0019	0.0019	0.0019	0.0019	0.0019	0.0019	0.0019	0.0019	0.0019	0.0019	0.0019	0.0019	0.0019	0.0019	0.0019	0.0019	0.0019	0.0019	0.0019	0.0019	0.0019	0.0019	0.0019	0.0019
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19	0.0021	0.0021	0.0021	0.0021	0.0021	0.0021	0.0021	0.0021	0.0021	0.0021	0.0021	0.0021	0.0021	0.0022	0.0022	0.0022	0.0022	0.0022	0.0022	0.0022	0.0022	0.0022	0.0022	0.0022
20	0.0069	0.0069	0.0069	0.0069	0.0069	0.0069	0.0069	0.0069	0.0069	0.0069	0.0069	0.0069	0.0069	0.0069	0.0069	0.0069	0.0069	0.0069	0.0069	0.0069	0.0069	0.0069	0.0069	0.0069
21	0.0102	0.0102	0.0102	0.0102	0.0102	0.0102	0.0102	0.0102	0.0102	0.0102	0.0102	0.0102	0.0102	0.0102	0.0102	0.0102	0.0102	0.0102	0.0102	0.0102	0.0102	0.0102	0.0102	0.0102
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23	0.0105	0.0105	0.0105	0.0105	0.0105	0.0105	0.0105	0.0105	0.0105	0.0105	0.0105	0.0105	0.0105	0.0105	0.0105	0.0105	0.0105	0.0105	0.0105	0.0105	0.0105	0.0105	0.0105	0.0105
24	0.0079	0.0079	0.0079	0.0079	0.0079	0.0079	0.0079	0.0079	0.0079	0.0079	0.0079	0.0079	0.0079	0.0079	0.0079	0.0079	0.0079	0.0079	0.0079	0.0079	0.0079	0.0079	0.0079	0.0079
25	0.0041	0.0041	0.0041	0.0041	0.0041	0.0041	0.0041	0.0041	0.0041	0.0041	0.0041	0.0041	0.0041	0.0041	0.0041	0.0041	0.0041	0.0041	0.0041	0.0041	0.0041	0.0041	0.0041	0.0041
26	1.7249e-04	1.7244e-04	1.7230e-04	1.7207e-04	1.7174e-04	1.7132e-04	1.7081e-04	1.7020e-04	1.6950e-04	1.6871e-04	1.6782e-04	1.6684e-04	1.6577e-04	1.6460e-04	1.6334e-04	1.6198e-04	1.6054e-04	1.5899e-04	1.5736e-04	1.5563e-04	1.5380e-04	1.5189e-04	1.4987e-04	1.4777e-04
27	-0.0033	-0.0033	-0.0033	-0.0033	-0.0033	-0.0033	-0.0033	-0.0033	-0.0033	-0.0033	-0.0033	-0.0033	-0.0033	-0.0033	-0.0033	-0.0033	-0.0033	-0.0033	-0.0033	-0.0033	-0.0033	-0.0033	-0.0033	-0.0033
28	-0.0056	-0.0056	-0.0056	-0.0056	-0.0056	-0.0056	-0.0056	-0.0056	-0.0056	-0.0056	-0.0056	-0.0056	-0.0056	-0.0056	-0.0056	-0.0056	-0.0056	-0.0056	-0.0056	-0.0056	-0.0056	-0.0056	-0.0056	-0.0056
29	-0.0066	-0.0066	-0.0066	-0.0066	-0.0066	-0.0066	-0.0066	-0.0066	-0.0066	-0.0066	-0.0066	-0.0066	-0.0066	-0.0066	-0.0066	-0.0066	-0.0066	-0.0066	-0.0066	-0.0066	-0.0066	-0.0066	-0.0066	-0.0066
30	-0.0063	-0.0063	-0.0063	-0.0063	-0.0063	-0.0063	-0.0063	-0.0063	-0.0063	-0.0063	-0.0063	-0.0063	-0.0063	-0.0063	-0.0063	-0.0063	-0.0063	-0.0064	-0.0064	-0.0064	-0.0064	-0.0064	-0.0064	-0.0064
31	-0.0051	-0.0051	-0.0051	-0.0051	-0.0051	-0.0051	-0.0051	-0.0051	-0.0051	-0.0051	-0.0051	-0.0051	-0.0051	-0.0051	-0.0051	-0.0051	-0.0051	-0.0051	-0.0051	-0.0051	-0.0051	-0.0051	-0.0051	-0.0051
32	-0.0035	-0.0035	-0.0035	-0.0035	-0.0035	-0.0035	-0.0035	-0.0035	-0.0035	-0.0035	-0.0035	-0.0035	-0.0035	-0.0035	-0.0035	-0.0035	-0.0035	-0.0035	-0.0035	-0.0035	-0.0035	-0.0035	-0.0035	-0.0035
33	-0.0019	-0.0019	-0.0019	-0.0019	-0.0019	-0.0019	-0.0019	-0.0019	-0.0018	-0.0018	-0.0018	-0.0018	-0.0018	-0.0018	-0.0018	-0.0018	-0.0018	-0.0018	-0.0018	-0.0018	-0.0018	-0.0018	-0.0018	-0.0018
34	-6.1779e-04	-6.1774e-04	-6.1760e-04	-6.1737e-04	-6.1705e-04	-6.1663e-04	-6.1612e-04	-6.1551e-04	-6.1482e-04	-6.1403e-04	-6.1315e-04	-6.1217e-04	-6.1111e-04	-6.0995e-04	-6.0869e-04	-6.0735e-04	-6.0591e-04	-6.0438e-04	-6.0275e-04	-6.0103e-04	-5.9922e-04	-5.9731e-04	-5.9532e-04	-5.9322e-04
35	5.2554e-05	5.2591e-05	5.2703e-05	5.2890e-05	5.3152e-05	5.3488e-05	5.3899e-05	5.4385e-05	5.4946e-05	5.5581e-05	5.6291e-05	5.7076e-05	5.7936e-05	5.8871e-05	5.9880e-05	6.0965e-05	6.2124e-05	6.3359e-05	6.4668e-05	6.6053e-05	6.7512e-05	6.9046e-05	7.0656e-05	7.2341e-05
36	2.0314e-04	2.0316e-04	2.0322e-04	2.0331e-04	2.0345e-04	2.0362e-04	2.0384e-04	2.0409e-04	2.0438e-04	2.0472e-04	2.0509e-04	2.0549e-04	2.0594e-04	2.0643e-04	2.0696e-04	2.0752e-04	2.0812e-04	2.0877e-04	2.0945e-04	2.1017e-04	2.1093e-04	2.1173e-04	2.1257e-04	2.1345e-04
37	5.3382e-05	5.3379e-05	5.3370e-05	5.3355e-05	5.3334e-05	5.3307e-05	5.3274e-05	5.3235e-05	5.3190e-05	5.3140e-05	5.3083e-05	5.3020e-05	5.2951e-05	5.2876e-05	5.2795e-05	5.2708e-05	5.2615e-05	5.2516e-05	5.2411e-05	5.2299e-05	5.2182e-05	5.2059e-05	5.1929e-05	5.1794e-05

Table 3.3: Acceleration data for 80m water depth

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8193x1024 double

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
1	-4.6285e-04	-4.6285e-04	-4.6284e-04	-4.6282e-04	-4.6280e-04	-4.6278e-04	-4.6275e-04	-4.6271e-04	-4.6267e-04	-4.6262e-04	-4.6257e-04	-4.6251e-04	-4.6244e-04	-4.6237e-04	-4.6230e-04	-4.6221e-04	-4.6213e-04	-4.6203e-04	-4.6194e-04	-4.6183e-04	-4.6172e-04	-4.6160e-04	-4.6148e-04	-4.6136e-04
2	-8.4084e-04	-8.4085e-04	-8.4085e-04	-8.4085e-04	-8.4085e-04	-8.4086e-04	-8.4086e-04	-8.4087e-04	-8.4087e-04	-8.4088e-04	-8.4089e-04	-8.4090e-04	-8.4091e-04	-8.4092e-04	-8.4093e-04	-8.4094e-04	-8.4096e-04	-8.4097e-04	-8.4099e-04	-8.4100e-04	-8.4102e-04	-8.4104e-04	-8.4106e-04	-8.4108e-04
3	-0.0011	-0.0011	-0.0011	-0.0011	-0.0011	-0.0011	-0.0011	-0.0011	-0.0011	-0.0011	-0.0011	-0.0011	-0.0011	-0.0011	-0.0011	-0.0011	-0.0011	-0.0011	-0.0011	-0.0011	-0.0011	-0.0011	-0.0011	-0.0011
4	-0.0012	-0.0012	-0.0012	-0.0012	-0.0012	-0.0012	-0.0012	-0.0012	-0.0012	-0.0012	-0.0012	-0.0012	-0.0012	-0.0012	-0.0012	-0.0012	-0.0012	-0.0013	-0.0013	-0.0013	-0.0013	-0.0013	-0.0013	-0.0013
5	-0.0012	-0.0012	-0.0012	-0.0012	-0.0012	-0.0012	-0.0012	-0.0012	-0.0012	-0.0012	-0.0012	-0.0012	-0.0012	-0.0012	-0.0012	-0.0012	-0.0012	-0.0012	-0.0012	-0.0012	-0.0012	-0.0012	-0.0012	-0.0012
6	-8.3349e-04	-8.3350e-04	-8.3353e-04	-8.3358e-04	-8.3365e-04	-8.3374e-04	-8.3384e-04	-8.3397e-04	-8.3412e-04	-8.3428e-04	-8.3447e-04	-8.3467e-04	-8.3490e-04	-8.3514e-04	-8.3540e-04	-8.3569e-04	-8.3599e-04	-8.3631e-04	-8.3665e-04	-8.3702e-04	-8.3740e-04	-8.3780e-04	-8.3822e-04	-8.3866e-04
7	-3.1772e-04	-3.1773e-04	-3.1775e-04	-3.1778e-04	-3.1783e-04	-3.1790e-04	-3.1798e-04	-3.1807e-04	-3.1818e-04	-3.1830e-04	-3.1844e-04	-3.1859e-04	-3.1875e-04	-3.1893e-04	-3.1912e-04	-3.1933e-04	-3.1955e-04	-3.1979e-04	-3.2004e-04	-3.2030e-04	-3.2058e-04	-3.2088e-04	-3.2118e-04	-3.2151e-04
8	3.1233e-04	3.1233e-04	3.1232e-04	3.1231e-04	3.1229e-04	3.1227e-04	3.1224e-04	3.1220e-04	3.1217e-04	3.1212e-04	3.1207e-04	3.1202e-04	3.1196e-04	3.1190e-04	3.1183e-04	3.1175e-04	3.1167e-04	3.1159e-04	3.1150e-04	3.1140e-04	3.1130e-04	3.1119e-04	3.1108e-04	3.1097e-04
9	9.4197e-04	9.4197e-04	9.4198e-04	9.4200e-04	9.4202e-04	9.4205e-04	9.4209e-04	9.4213e-04	9.4218e-04	9.4224e-04	9.4230e-04	9.4238e-04	9.4245e-04	9.4254e-04	9.4263e-04	9.4272e-04	9.4283e-04	9.4294e-04	9.4306e-04	9.4318e-04	9.4331e-04	9.4345e-04	9.4359e-04	9.4374e-04
10	0.0014	0.0014	0.0014	0.0014	0.0014	0.0014	0.0014	0.0014	0.0014	0.0014	0.0014	0.0014	0.0014	0.0014	0.0014	0.0014	0.0014	0.0014	0.0014	0.0014	0.0014	0.0014	0.0014	0.0014
11	0.0017	0.0017	0.0017	0.0017	0.0017	0.0017	0.0017	0.0017	0.0017	0.0017	0.0017	0.0017	0.0017	0.0017	0.0017	0.0017	0.0017	0.0017	0.0017	0.0017	0.0017	0.0017	0.0017	0.0017
12	0.0017	0.0017	0.0017	0.0017	0.0017	0.0017	0.0017	0.0017	0.0017	0.0017	0.0017	0.0017	0.0017	0.0017	0.0017	0.0017	0.0017	0.0017	0.0017	0.0017	0.0017	0.0017	0.0017	0.0017
13	0.0013	0.0013	0.0013	0.0013	0.0013	0.0013	0.0013	0.0013	0.0013	0.0013	0.0013	0.0013	0.0013	0.0013	0.0013	0.0013	0.0013	0.0013	0.0013	0.0013	0.0013	0.0013	0.0013	0.0013
14	6.9083e-04	6.9083e-04	6.9086e-04	6.9089e-04	6.9094e-04	6.9101e-04	6.9109e-04	6.9118e-04	6.9129e-04	6.9141e-04	6.9155e-04	6.9170e-04	6.9186e-04	6.9204e-04	6.9224e-04	6.9244e-04	6.9267e-04	6.9291e-04	6.9316e-04	6.9342e-04	6.9370e-04	6.9400e-04	6.9431e-04	6.9463e-04
15	-7.2358e-05	-7.2358e-05	-7.2357e-05	-7.2355e-05	-7.2353e-05	-7.2350e-05	-7.2346e-05	-7.2342e-05	-7.2338e-05	-7.2332e-05	-7.2326e-05	-7.2319e-05	-7.2312e-05	-7.2304e-05	-7.2296e-05	-7.2286e-05	-7.2276e-05	-7.2266e-05	-7.2255e-05	-7.2243e-05	-7.2231e-05	-7.2217e-05	-7.2204e-05	-7.2189e-05
16	-8.3674e-04	-8.3675e-04	-8.3677e-04	-8.3680e-04	-8.3685e-04	-8.3690e-04	-8.3697e-04	-8.3706e-04	-8.3715e-04	-8.3726e-04	-8.3738e-04	-8.3752e-04	-8.3766e-04	-8.3782e-04	-8.3800e-04	-8.3818e-04	-8.3838e-04	-8.3859e-04	-8.3881e-04	-8.3905e-04	-8.3930e-04	-8.3956e-04	-8.3984e-04	-8.4012e-04
17	-0.0015	-0.0015	-0.0015	-0.0015	-0.0015	-0.0015	-0.0015	-0.0015	-0.0015	-0.0015	-0.0015	-0.0015	-0.0015	-0.0015	-0.0015	-0.0015	-0.0015	-0.0015	-0.0015	-0.0015	-0.0015	-0.0015	-0.0015	-0.0015
18	-0.0018	-0.0018	-0.0018	-0.0018	-0.0018	-0.0018	-0.0018	-0.0018	-0.0018	-0.0018	-0.0018	-0.0018	-0.0018	-0.0018	-0.0018	-0.0018	-0.0018	-0.0018	-0.0018	-0.0018	-0.0018	-0.0018	-0.0018	-0.0018
19	-0.0018	-0.0018	-0.0018	-0.0018	-0.0018	-0.0018	-0.0018	-0.0018	-0.0018	-0.0018	-0.0018	-0.0018	-0.0018	-0.0018	-0.0018	-0.0018	-0.0018	-0.0018	-0.0018	-0.0019	-0.0019	-0.0019	-0.0019	-0.0019
20	-0.0016	-0.0016	-0.0016	-0.0016	-0.0016	-0.0016	-0.0016	-0.0016	-0.0016	-0.0016	-0.0016	-0.0016	-0.0016	-0.0016	-0.0016	-0.0016	-0.0016	-0.0016	-0.0016	-0.0016	-0.0016	-0.0016	-0.0016	-0.0016
21	-0.0010	-0.0010	-0.0010	-0.0010	-0.0010	-0.0010	-0.0010	-0.0010	-0.0010	-0.0010	-0.0010	-0.0010	-0.0010	-0.0010	-0.0010	-0.0010	-0.0010	-0.0010	-0.0010	-0.0010	-0.0010	-0.0010	-0.0010	-0.0010
22	-3.2986e-04	-3.2986e-04	-3.2985e-04	-3.2984e-04	-3.2983e-04	-3.2981e-04	-3.2979e-04	-3.2976e-04	-3.2973e-04	-3.2970e-04	-3.2966e-04	-3.2961e-04	-3.2957e-04	-3.2952e-04	-3.2946e-04	-3.2940e-04	-3.2934e-04	-3.2927e-04	-3.2920e-04	-3.2912e-04	-3.2905e-04	-3.2896e-04	-3.2887e-04	-3.2878e-04
23	3.6494e-04	3.6495e-04	3.6497e-04	3.6501e-04	3.6506e-04	3.6513e-04	3.6521e-04	3.6531e-04	3.6542e-04	3.6555e-04	3.6570e-04	3.6586e-04	3.6603e-04	3.6622e-04	3.6643e-04	3.6665e-04	3.6688e-04	3.6713e-04	3.6740e-04	3.6768e-04	3.6798e-04	3.6829e-04	3.6862e-04	3.6896e-04
24	9.4661e-04	9.4662e-04	9.4665e-04	9.4671e-04	9.4678e-04	9.4688e-04	9.4700e-04	9.4714e-04	9.4731e-04	9.4749e-04	9.4770e-04	9.4793e-04	9.4818e-04	9.4845e-04	9.4874e-04	9.4906e-04	9.4940e-04	9.4976e-04	9.5014e-04	9.5054e-04	9.5097e-04	9.5142e-04	9.5189e-04	9.5238e-04
25	0.0013	0.0013	0.0013	0.0013	0.0013	0.0013	0.0013	0.0013	0.0013	0.0013	0.0013	0.0013	0.0013	0.0013	0.0013	0.0013	0.0013	0.0013	0.0013	0.0013	0.0013	0.0013	0.0013	0.0013
26	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015
27	0.0014	0.0014	0.0014	0.0014	0.0014	0.0014	0.0014	0.0014	0.0014	0.0014	0.0014	0.0014	0.0014	0.0014	0.0014	0.0014	0.0014	0.0014	0.0014	0.0014	0.0014	0.0014	0.0014	0.0014
28	0.0011	0.0011	0.0011	0.0011	0.0011	0.0011	0.0011	0.0011	0.0011	0.0011	0.0011	0.0011	0.0011	0.0011	0.0011	0.0011	0.0011	0.0011	0.0011	0.0011	0.0011	0.0011	0.0011	0.0011
29	6.8488e-04	6.8488e-04	6.8487e-04	6.8486e-04	6.8484e-04	6.8481e-04	6.8478e-04	6.8474e-04	6.8470e-04	6.8465e-04	6.8459e-04	6.8453e-04	6.8447e-04	6.8439e-04	6.8432e-04	6.8423e-04	6.8414e-04	6.8405e-04	6.8395e-04	6.8384e-04	6.8372e-04	6.8361e-04	6.8348e-04	6.8335e-04
30	2.7417e-04	2.7417e-04	2.7415e-04	2.7412e-04	2.7408e-04	2.7403e-04	2.7397e-04	2.7390e-04	2.7381e-04	2.7372e-04	2.7361e-04	2.7349e-04	2.7336e-04	2.7322e-04	2.7307e-04	2.7291e-04	2.7273e-04	2.7255e-04	2.7235e-04	2.7214e-04	2.7192e-04	2.7169e-04	2.7145e-04	2.7120e-04
31	-8.8276e-05	-8.8283e-05	-8.8303e-05	-8.8336e-05	-8.8382e-05	-8.8441e-05	-8.8514e-05	-8.8600e-05	-8.8699e-05	-8.8811e-05	-8.8937e-05	-8.9075e-05	-8.9227e-05	-8.9392e-05	-8.9571e-05	-8.9762e-05	-8.9967e-05	-9.0185e-05	-9.0416e-05	-9.0661e-05	-9.0919e-05	-9.1190e-05	-9.1474e-05	-9.1772e-05
32	-3.5870e-04	-3.5871e-04	-3.5872e-04	-3.5875e-04	-3.5879e-04	-3.5885e-04	-3.5891e-04	-3.5899e-04	-3.5908e-04	-3.5918e-04	-3.5929e-04	-3.5941e-04	-3.5954e-04	-3.5969e-04	-3.5985e-04	-3.6002e-04	-3.6020e-04	-3.6040e-04	-3.6060e-04	-3.6082e-04	-3.6105e-04	-3.6129e-04	-3.6154e-04	-3.6181e-04
33	-5.2411e-04	-5.2412e-04	-5.2413e-04	-5.2415e-04	-5.2417e-04	-5.2421e-04	-5.2425e-04	-5.2430e-04	-5.2435e-04	-5.2441e-04	-5.2448e-04	-5.2456e-04	-5.2465e-04	-5.2474e-04	-5.2484e-04	-5.2495e-04	-5.2506e-04	-5.2518e-04	-5.2531e-04	-5.2545e-04	-5.2560e-04	-5.2575e-04	-5.2591e-04	-5.2607e-04
34	-5.9860e-04	-5.9860e-04	-5.9861e-04	-5.9861e-04	-5.9862e-04	-5.9862e-04	-5.9863e-04	-5.9864e-04	-5.9866e-04	-5.9867e-04	-5.9869e-04	-5.9870e-04	-5.9872e-04	-5.9874e-04	-5.9877e-04	-5.9879e-04	-5.9882e-04	-5.9884e-04	-5.9887e-04	-5.9890e-04	-5.9894e-04	-5.9897e-04	-5.9901e-04	-5.9904e-04
35	-6.1325e-04	-6.1325e-04	-6.1324e-04	-6.1323e-04	-6.1322e-04	-6.1320e-04	-6.1318e-04	-6.1316e-04	-6.1313e-04	-6.1310e-04	-6.1306e-04	-6.1302e-04	-6.1298e-04	-6.1294e-04	-6.1289e-04	-6.1283e-04	-6.1278e-04	-6.1272e-04	-6.1265e-04	-6.1258e-04	-6.1251e-04	-6.1243e-04	-6.1236e-04	-6.1227e-04
36	-6.0299e-04	-6.0298e-04	-6.0297e-04	-6.0295e-04	-6.0293e-04	-6.0290e-04	-6.0286e-04	-6.0281e-04	-6.0275e-04	-6.0269e-04	-6.0262e-04	-6.0254e-04	-6.0246e-04	-6.0237e-04	-6.0227e-04	-6.0216e-04	-6.0205e-04	-6.0193e-04	-6.0180e-04	-6.0166e-04	-6.0152e-04	-6.0137e-04	-6.0121e-04	-6.0104e-04
37	-5.9418e-04	-5.9417e-04	-5.9416e-04	-5.9414e-04	-5.9411e-04	-5.9407e-04	-5.9402e-04	-5.9397e-04	-5.9390e-04	-5.9383e-04	-5.9375e-04	-5.9366e-04	-5.9356e-04	-5.9346e-04	-5.9334e-04	-5.9322e-04	-5.9308e-04	-5.9294e-04	-5.9279e-04	-5.9264e-04	-5.9247e-04	-5.9229e-04	-5.9211e-04	-5.9192e-04

Table 3.4: Velocity data for 80m water depth

Z

8193x1024 double

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
1	-0.8000	-0.7992	-0.7984	-0.7976	-0.7968	-0.7960	-0.7953	-0.7945	-0.7937	-0.7929	-0.7921	-0.7913	-0.7905	-0.7897	-0.7889	-0.7881	-0.7874	-0.7866	-0.7858	-0.7850	-0.7842	-0.7834	-0.7826	-0.7818
2	-0.8000	-0.7992	-0.7984	-0.7976	-0.7968	-0.7960	-0.7953	-0.7945	-0.7937	-0.7929	-0.7921	-0.7913	-0.7905	-0.7897	-0.7889	-0.7881	-0.7874	-0.7866	-0.7858	-0.7850	-0.7842	-0.7834	-0.7826	-0.7818
3	-0.8000	-0.7992	-0.7984	-0.7976	-0.7968	-0.7961	-0.7953	-0.7945	-0.7937	-0.7929	-0.7921	-0.7913	-0.7905	-0.7897	-0.7890	-0.7882	-0.7874	-0.7866	-0.7858	-0.7850	-0.7842	-0.7834	-0.7827	-0.7819
4	-0.8000	-0.7992	-0.7984	-0.7976	-0.7969	-0.7961	-0.7953	-0.7945	-0.7937	-0.7929	-0.7922	-0.7914	-0.7906	-0.7898	-0.7890	-0.7882	-0.7875	-0.7867	-0.7859	-0.7851	-0.7843	-0.7835	-0.7828	-0.7820
5	-0.8000	-0.7992	-0.7984	-0.7977	-0.7969	-0.7961	-0.7953	-0.7946	-0.7938	-0.7930	-0.7922	-0.7915	-0.7907	-0.7899	-0.7891	-0.7884	-0.7876	-0.7868	-0.7860	-0.7853	-0.7845	-0.7837	-0.7829	-0.7822
6	-0.8000	-0.7992	-0.7985	-0.7977	-0.7969	-0.7962	-0.7954	-0.7946	-0.7939	-0.7931	-0.7923	-0.7916	-0.7908	-0.7900	-0.7893	-0.7885	-0.7877	-0.7870	-0.7862	-0.7854	-0.7847	-0.7839	-0.7831	-0.7824
7	-0.8000	-0.7992	-0.7985	-0.7977	-0.7969	-0.7962	-0.7954	-0.7947	-0.7939	-0.7931	-0.7924	-0.7916	-0.7908	-0.7901	-0.7893	-0.7886	-0.7878	-0.7870	-0.7863	-0.7855	-0.7847	-0.7840	-0.7832	-0.7825
8	-0.8000	-0.7992	-0.7985	-0.7977	-0.7969	-0.7962	-0.7954	-0.7946	-0.7939	-0.7931	-0.7923	-0.7915	-0.7908	-0.7900	-0.7892	-0.7885	-0.7877	-0.7869	-0.7862	-0.7854	-0.7846	-0.7839	-0.7831	-0.7823
9	-0.8000	-0.7992	-0.7984	-0.7977	-0.7969	-0.7961	-0.7953	-0.7945	-0.7938	-0.7930	-0.7922	-0.7914	-0.7906	-0.7898	-0.7891	-0.7883	-0.7875	-0.7867	-0.7859	-0.7852	-0.7844	-0.7836	-0.7828	-0.7820
10	-0.8000	-0.7992	-0.7984	-0.7976	-0.7968	-0.7960	-0.7952	-0.7944	-0.7937	-0.7929	-0.7921	-0.7913	-0.7905	-0.7897	-0.7889	-0.7881	-0.7873	-0.7865	-0.7857	-0.7849	-0.7841	-0.7833	-0.7825	-0.7818
11	-0.8000	-0.7992	-0.7984	-0.7976	-0.7968	-0.7960	-0.7952	-0.7944	-0.7936	-0.7928	-0.7920	-0.7912	-0.7904	-0.7896	-0.7888	-0.7880	-0.7872	-0.7864	-0.7856	-0.7848	-0.7840	-0.7832	-0.7824	-0.7816
12	-0.8000	-0.7992	-0.7984	-0.7976	-0.7968	-0.7960	-0.7952	-0.7944	-0.7936	-0.7928	-0.7920	-0.7912	-0.7904	-0.7896	-0.7888	-0.7880	-0.7872	-0.7864	-0.7856	-0.7848	-0.7840	-0.7832	-0.7824	-0.7816
13	-0.8000	-0.7992	-0.7984	-0.7976	-0.7968	-0.7960	-0.7952	-0.7944	-0.7936	-0.7928	-0.7921	-0.7913	-0.7905	-0.7897	-0.7889	-0.7881	-0.7873	-0.7865	-0.7857	-0.7849	-0.7841	-0.7833	-0.7825	-0.7817
14	-0.8000	-0.7992	-0.7984	-0.7976	-0.7968	-0.7960	-0.7953	-0.7945	-0.7937	-0.7929	-0.7921	-0.7913	-0.7905	-0.7897	-0.7889	-0.7881	-0.7874	-0.7866	-0.7858	-0.7850	-0.7842	-0.7834	-0.7826	-0.7818
15	-0.8000	-0.7992	-0.7984	-0.7977	-0.7969	-0.7961	-0.7953	-0.7945	-0.7937	-0.7930	-0.7922	-0.7914	-0.7906	-0.7898	-0.7890	-0.7883	-0.7875	-0.7867	-0.7859	-0.7851	-0.7843	-0.7836	-0.7828	-0.7820
16	-0.8000	-0.7992	-0.7985	-0.7977	-0.7969	-0.7961	-0.7954	-0.7946	-0.7938	-0.7930	-0.7923	-0.7915	-0.7907	-0.7899	-0.7892	-0.7884	-0.7876	-0.7868	-0.7861	-0.7853	-0.7845	-0.7837	-0.7830	-0.7822
17	-0.8000	-0.7992	-0.7985	-0.7977	-0.7969	-0.7962	-0.7954	-0.7946	-0.7939	-0.7931	-0.7923	-0.7916	-0.7908	-0.7900	-0.7893	-0.7885	-0.7877	-0.7870	-0.7862	-0.7854	-0.7847	-0.7839	-0.7831	-0.7824
18	-0.8000	-0.7992	-0.7985	-0.7977	-0.7969	-0.7962	-0.7954	-0.7946	-0.7939	-0.7931	-0.7924	-0.7916	-0.7908	-0.7901	-0.7893	-0.7885	-0.7878	-0.7870	-0.7862	-0.7855	-0.7847	-0.7839	-0.7832	-0.7824
19	-0.8000	-0.7992	-0.7985	-0.7977	-0.7969	-0.7962	-0.7954	-0.7946	-0.7939	-0.7931	-0.7923	-0.7916	-0.7908	-0.7900	-0.7893	-0.7885	-0.7877	-0.7869	-0.7862	-0.7854	-0.7846	-0.7839	-0.7831	-0.7823
20	-0.8000	-0.7992	-0.7985	-0.7977	-0.7969	-0.7961	-0.7954	-0.7946	-0.7938	-0.7930	-0.7923	-0.7915	-0.7907	-0.7899	-0.7892	-0.7884	-0.7876	-0.7868	-0.7861	-0.7853	-0.7845	-0.7837	-0.7830	-0.7822
21	-0.8000	-0.7992	-0.7984	-0.7976	-0.7969	-0.7961	-0.7953	-0.7945	-0.7937	-0.7929	-0.7922	-0.7914	-0.7906	-0.7898	-0.7890	-0.7882	-0.7875	-0.7867	-0.7859	-0.7851	-0.7843	-0.7835	-0.7828	-0.7820
22	-0.8000	-0.7992	-0.7984	-0.7976	-0.7968	-0.7960	-0.7952	-0.7944	-0.7937	-0.7929	-0.7921	-0.7913	-0.7905	-0.7897	-0.7889	-0.7881	-0.7873	-0.7865	-0.7857	-0.7849	-0.7841	-0.7833	-0.7825	-0.7818
23	-0.8000	-0.7992	-0.7984	-0.7976	-0.7968	-0.7960	-0.7952	-0.7944	-0.7936	-0.7928	-0.7920	-0.7912	-0.7904	-0.7896	-0.7888	-0.7880	-0.7872	-0.7864	-0.7856	-0.7848	-0.7840	-0.7832	-0.7824	-0.7816
24	-0.8000	-0.7992	-0.7984	-0.7976	-0.7968	-0.7960	-0.7952	-0.7944	-0.7936	-0.7928	-0.7920	-0.7912	-0.7905	-0.7897	-0.7889	-0.7881	-0.7873	-0.7865	-0.7857	-0.7849	-0.7841	-0.7833	-0.7825	-0.7817
25	-0.8000	-0.7992	-0.7984	-0.7976	-0.7969	-0.7961	-0.7953	-0.7945	-0.7937	-0.7929	-0.7921	-0.7913	-0.7906	-0.7898	-0.7890	-0.7882	-0.7874	-0.7866	-0.7858	-0.7851	-0.7843	-0.7835	-0.7827	-0.7819
26	-0.8000	-0.7992	-0.7984	-0.7977	-0.7969	-0.7961	-0.7953	-0.7945	-0.7938	-0.7930	-0.7922	-0.7914	-0.7907	-0.7899	-0.7891	-0.7883	-0.7875	-0.7868	-0.7860	-0.7852	-0.7844	-0.7836	-0.7829	-0.7821
27	-0.8000	-0.7992	-0.7984	-0.7977	-0.7969	-0.7961	-0.7953	-0.7946	-0.7938	-0.7930	-0.7922	-0.7914	-0.7907	-0.7899	-0.7891	-0.7883	-0.7876	-0.7868	-0.7860	-0.7852	-0.7845	-0.7837	-0.7829	-0.7821
28	-0.8000	-0.7992	-0.7984	-0.7977	-0.7969	-0.7961	-0.7953	-0.7945	-0.7938	-0.7930	-0.7922	-0.7914	-0.7907	-0.7899	-0.7891	-0.7883	-0.7875	-0.7868	-0.7860	-0.7852	-0.7844	-0.7836	-0.7829	-0.7821
29	-0.8000	-0.7992	-0.7984	-0.7977	-0.7969	-0.7961	-0.7953	-0.7945	-0.7938	-0.7930	-0.7922	-0.7914	-0.7907	-0.7899	-0.7891	-0.7883	-0.7875	-0.7868	-0.7860	-0.7852	-0.7844	-0.7836	-0.7829	-0.7821
30	-0.8000	-0.7992	-0.7984	-0.7977	-0.7969	-0.7961	-0.7953	-0.7946	-0.7938	-0.7930	-0.7922	-0.7915	-0.7907	-0.7899	-0.7891	-0.7883	-0.7876	-0.7868	-0.7860	-0.7852	-0.7845	-0.7837	-0.7829	-0.7821
31	-0.8000	-0.7992	-0.7984	-0.7977	-0.7969	-0.7961	-0.7953	-0.7946	-0.7938	-0.7930	-0.7922	-0.7914	-0.7907	-0.7899	-0.7891	-0.7883	-0.7876	-0.7868	-0.7860	-0.7852	-0.7844	-0.7837	-0.7829	-0.7821
32	-0.8000	-0.7992	-0.7984	-0.7977	-0.7969	-0.7961	-0.7953	-0.7945	-0.7937	-0.7930	-0.7922	-0.7914	-0.7906	-0.7898	-0.7890	-0.7883	-0.7875	-0.7867	-0.7859	-0.7851	-0.7844	-0.7836	-0.7828	-0.7820
33	-0.8000	-0.7992	-0.7984	-0.7976	-0.7969	-0.7961	-0.7953	-0.7945	-0.7937	-0.7929	-0.7921	-0.7914	-0.7906	-0.7898	-0.7890	-0.7882	-0.7874	-0.7867	-0.7859	-0.7851	-0.7843	-0.7835	-0.7827	-0.7819
34	-0.8000	-0.7992	-0.7984	-0.7977	-0.7969	-0.7961	-0.7953	-0.7945	-0.7937	-0.7930	-0.7922	-0.7914	-0.7906	-0.7898	-0.7890	-0.7883	-0.7875	-0.7867	-0.7859	-0.7851	-0.7844	-0.7836	-0.7828	-0.7820
35	-0.8000	-0.7992	-0.7984	-0.7977	-0.7969	-0.7961	-0.7953	-0.7945	-0.7938	-0.7930	-0.7922	-0.7914	-0.7907	-0.7899	-0.7891	-0.7883	-0.7875	-0.7868	-0.7860	-0.7852	-0.7844	-0.7836	-0.7829	-0.7821
36	-0.8000	-0.7992	-0.7984	-0.7977	-0.7969	-0.7961	-0.7953	-0.7945	-0.7938	-0.7930	-0.7922	-0.7914	-0.7906	-0.7898	-0.7891	-0.7883	-0.7875	-0.7867	-0.7859	-0.7852	-0.7844	-0.7836	-0.7828	-0.7820
37	-0.8000	-0.7992	-0.7984	-0.7976	-0.7968	-0.7961	-0.7953	-0.7945	-0.7937	-0.7929	-0.7921	-0.7913	-0.7905	-0.7898	-0.7890	-0.7882	-0.7874	-0.7866	-0.7858	-0.7850	-0.7842	-0.7835	-0.7827	-0.7819

Table 3.5: Elevation data for 80m water depth

The table above the acceleration, velocity and elevation for each time period in 80m water depth. The column represent the acceleration , velocity and elevation while for the row represent the wave period. The difference between row is 1/66 seconds.

180m water depth

AX

8193x1024 double

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
1	-4.6708e-04	-4.6709e-04	-4.6712e-04	-4.6716e-04	-4.6721e-04	-4.6729e-04	-4.6737e-04	-4.6748e-04	-4.6760e-04	-4.6774e-04	-4.6789e-04	-4.6806e-04	-4.6825e-04	-4.6845e-04	-4.6867e-04	-4.6891e-04	-4.6916e-04	-4.6942e-04	-4.6971e-04	-4.7001e-04	-4.7032e-04	-4.7066e-04	-4.7101e-04	-4.7137e-04
2	-4.7721e-04	-4.7722e-04	-4.7724e-04	-4.7728e-04	-4.7734e-04	-4.7741e-04	-4.7750e-04	-4.7761e-04	-4.7773e-04	-4.7786e-04	-4.7802e-04	-4.7819e-04	-4.7838e-04	-4.7858e-04	-4.7880e-04	-4.7903e-04	-4.7928e-04	-4.7955e-04	-4.7984e-04	-4.8014e-04	-4.8045e-04	-4.8079e-04	-4.8114e-04	-4.8150e-04
3	-4.2846e-04	-4.2847e-04	-4.2849e-04	-4.2852e-04	-4.2857e-04	-4.2863e-04	-4.2871e-04	-4.2880e-04	-4.2891e-04	-4.2903e-04	-4.2916e-04	-4.2931e-04	-4.2947e-04	-4.2965e-04	-4.2984e-04	-4.3004e-04	-4.3026e-04	-4.3049e-04	-4.3074e-04	-4.3100e-04	-4.3128e-04	-4.3157e-04	-4.3187e-04	-4.3219e-04
4	-3.2739e-04	-3.2739e-04	-3.2741e-04	-3.2743e-04	-3.2747e-04	-3.2751e-04	-3.2757e-04	-3.2764e-04	-3.2771e-04	-3.2780e-04	-3.2789e-04	-3.2800e-04	-3.2812e-04	-3.2824e-04	-3.2838e-04	-3.2853e-04	-3.2868e-04	-3.2885e-04	-3.2903e-04	-3.2922e-04	-3.2942e-04	-3.2962e-04	-3.2984e-04	-3.3007e-04
5	-1.8707e-04	-1.8707e-04	-1.8708e-04	-1.8709e-04	-1.8711e-04	-1.8713e-04	-1.8716e-04	-1.8719e-04	-1.8723e-04	-1.8727e-04	-1.8732e-04	-1.8737e-04	-1.8743e-04	-1.8749e-04	-1.8756e-04	-1.8763e-04	-1.8771e-04	-1.8779e-04	-1.8788e-04	-1.8797e-04	-1.8807e-04	-1.8817e-04	-1.8828e-04	-1.8839e-04
6	-2.5303e-05	-2.5303e-05	-2.5302e-05	-2.5301e-05	-2.5298e-05	-2.5296e-05	-2.5292e-05	-2.5288e-05	-2.5283e-05	-2.5278e-05	-2.5272e-05	-2.5265e-05	-2.5258e-05	-2.5250e-05	-2.5242e-05	-2.5233e-05	-2.5223e-05	-2.5213e-05	-2.5202e-05	-2.5190e-05	-2.5178e-05	-2.5165e-05	-2.5151e-05	-2.5137e-05
7	1.3778e-04	1.3779e-04	1.3780e-04	1.3781e-04	1.3783e-04	1.3786e-04	1.3789e-04	1.3793e-04	1.3797e-04	1.3802e-04	1.3808e-04	1.3814e-04	1.3821e-04	1.3829e-04	1.3837e-04	1.3845e-04	1.3855e-04	1.3864e-04	1.3875e-04	1.3886e-04	1.3898e-04	1.3910e-04	1.3923e-04	1.3936e-04
8	2.8234e-04	2.8234e-04	2.8236e-04	2.8238e-04	2.8242e-04	2.8247e-04	2.8252e-04	2.8259e-04	2.8267e-04	2.8276e-04	2.8285e-04	2.8296e-04	2.8308e-04	2.8321e-04	2.8335e-04	2.8350e-04	2.8366e-04	2.8384e-04	2.8402e-04	2.8421e-04	2.8441e-04	2.8463e-04	2.8485e-04	2.8508e-04
9	3.9128e-04	3.9128e-04	3.9130e-04	3.9134e-04	3.9138e-04	3.9144e-04	3.9152e-04	3.9160e-04	3.9170e-04	3.9182e-04	3.9194e-04	3.9208e-04	3.9224e-04	3.9240e-04	3.9258e-04	3.9278e-04	3.9298e-04	3.9320e-04	3.9344e-04	3.9368e-04	3.9394e-04	3.9422e-04	3.9451e-04	3.9481e-04
10	4.5235e-04	4.5236e-04	4.5238e-04	4.5242e-04	4.5247e-04	4.5253e-04	4.5261e-04	4.5271e-04	4.5282e-04	4.5294e-04	4.5308e-04	4.5323e-04	4.5340e-04	4.5358e-04	4.5377e-04	4.5398e-04	4.5421e-04	4.5445e-04	4.5470e-04	4.5497e-04	4.5525e-04	4.5555e-04	4.5586e-04	4.5619e-04
11	4.5951e-04	4.5951e-04	4.5953e-04	4.5957e-04	4.5962e-04	4.5968e-04	4.5975e-04	4.5984e-04	4.5995e-04	4.6006e-04	4.6019e-04	4.6034e-04	4.6050e-04	4.6067e-04	4.6085e-04	4.6105e-04	4.6127e-04	4.6149e-04	4.6173e-04	4.6199e-04	4.6226e-04	4.6254e-04	4.6284e-04	4.6315e-04
12	4.1337e-04	4.1338e-04	4.1340e-04	4.1342e-04	4.1346e-04	4.1352e-04	4.1358e-04	4.1365e-04	4.1374e-04	4.1383e-04	4.1394e-04	4.1406e-04	4.1419e-04	4.1433e-04	4.1449e-04	4.1465e-04	4.1483e-04	4.1501e-04	4.1521e-04	4.1542e-04	4.1564e-04	4.1588e-04	4.1612e-04	4.1638e-04
13	3.2095e-04	3.2095e-04	3.2096e-04	3.2098e-04	3.2101e-04	3.2104e-04	3.2108e-04	3.2113e-04	3.2119e-04	3.2125e-04	3.2133e-04	3.2141e-04	3.2150e-04	3.2159e-04	3.2169e-04	3.2180e-04	3.2192e-04	3.2205e-04	3.2218e-04	3.2232e-04	3.2247e-04	3.2263e-04	3.2279e-04	3.2297e-04
14	1.9444e-04	1.9444e-04	1.9445e-04	1.9445e-04	1.9446e-04	1.9448e-04	1.9450e-04	1.9452e-04	1.9454e-04	1.9457e-04	1.9460e-04	1.9463e-04	1.9467e-04	1.9471e-04	1.9475e-04	1.9480e-04	1.9484e-04	1.9490e-04	1.9495e-04	1.9501e-04	1.9507e-04	1.9514e-04	1.9521e-04	1.9528e-04
15	4.9591e-05	4.9590e-05	4.9588e-05	4.9584e-05	4.9579e-05	4.9573e-05	4.9565e-05	4.9556e-05	4.9546e-05	4.9534e-05	4.9521e-05	4.9506e-05	4.9490e-05	4.9472e-05	4.9453e-05	4.9433e-05	4.9411e-05	4.9388e-05	4.9363e-05	4.9337e-05	4.9309e-05	4.9280e-05	4.9250e-05	4.9218e-05
16	-9.6390e-05	-9.6393e-05	-9.6401e-05	-9.6415e-05	-9.6434e-05	-9.6458e-05	-9.6488e-05	-9.6524e-05	-9.6565e-05	-9.6611e-05	-9.6663e-05	-9.6721e-05	-9.6784e-05	-9.6852e-05	-9.6926e-05	-9.7005e-05	-9.7090e-05	-9.7180e-05	-9.7276e-05	-9.7378e-05	-9.7485e-05	-9.7597e-05	-9.7715e-05	-9.7839e-05
17	-2.2692e-04	-2.2692e-04	-2.2693e-04	-2.2695e-04	-2.2698e-04	-2.2702e-04	-2.2707e-04	-2.2713e-04	-2.2719e-04	-2.2726e-04	-2.2734e-04	-2.2743e-04	-2.2753e-04	-2.2764e-04	-2.2776e-04	-2.2788e-04	-2.2801e-04	-2.2815e-04	-2.2830e-04	-2.2846e-04	-2.2863e-04	-2.2881e-04	-2.2899e-04	-2.2919e-04
18	-3.2792e-04	-3.2792e-04	-3.2794e-04	-3.2796e-04	-3.2800e-04	-3.2805e-04	-3.2810e-04	-3.2817e-04	-3.2825e-04	-3.2834e-04	-3.2844e-04	-3.2855e-04	-3.2867e-04	-3.2880e-04	-3.2894e-04	-3.2909e-04	-3.2925e-04	-3.2943e-04	-3.2961e-04	-3.2980e-04	-3.3001e-04	-3.3022e-04	-3.3045e-04	-3.3068e-04
19	-3.8932e-04	-3.8933e-04	-3.8934e-04	-3.8937e-04	-3.8941e-04	-3.8946e-04	-3.8952e-04	-3.8959e-04	-3.8968e-04	-3.8977e-04	-3.8987e-04	-3.8999e-04	-3.9012e-04	-3.9025e-04	-3.9040e-04	-3.9056e-04	-3.9073e-04	-3.9092e-04	-3.9111e-04	-3.9131e-04	-3.9153e-04	-3.9175e-04	-3.9199e-04	-3.9224e-04
20	-4.0598e-04	-4.0598e-04	-4.0600e-04	-4.0602e-04	-4.0606e-04	-4.0611e-04	-4.0616e-04	-4.0623e-04	-4.0631e-04	-4.0640e-04	-4.0650e-04	-4.0660e-04	-4.0672e-04	-4.0685e-04	-4.0700e-04	-4.0715e-04	-4.0731e-04	-4.0748e-04	-4.0766e-04	-4.0786e-04	-4.0806e-04	-4.0827e-04	-4.0850e-04	-4.0873e-04
21	-3.7793e-04	-3.7793e-04	-3.7795e-04	-3.7797e-04	-3.7800e-04	-3.7804e-04	-3.7809e-04	-3.7814e-04	-3.7821e-04	-3.7828e-04	-3.7837e-04	-3.7846e-04	-3.7856e-04	-3.7867e-04	-3.7879e-04	-3.7892e-04	-3.7905e-04	-3.7920e-04	-3.7935e-04	-3.7951e-04	-3.7968e-04	-3.7986e-04	-3.8005e-04	-3.8025e-04
22	-3.1015e-04	-3.1016e-04	-3.1017e-04	-3.1018e-04	-3.1020e-04	-3.1023e-04	-3.1027e-04	-3.1031e-04	-3.1035e-04	-3.1041e-04	-3.1047e-04	-3.1053e-04	-3.1060e-04	-3.1068e-04	-3.1076e-04	-3.1085e-04	-3.1095e-04	-3.1105e-04	-3.1116e-04	-3.1128e-04	-3.1140e-04	-3.1153e-04	-3.1166e-04	-3.1180e-04
23	-2.1170e-04	-2.1170e-04	-2.1171e-04	-2.1172e-04	-2.1173e-04	-2.1174e-04	-2.1176e-04	-2.1178e-04	-2.1180e-04	-2.1183e-04	-2.1186e-04	-2.1189e-04	-2.1193e-04	-2.1197e-04	-2.1201e-04	-2.1205e-04	-2.1210e-04	-2.1215e-04	-2.1221e-04	-2.1227e-04	-2.1233e-04	-2.1239e-04	-2.1246e-04	-2.1253e-04
24	-9.4514e-05	-9.4514e-05	-9.4514e-05	-9.4513e-05	-9.4513e-05	-9.4512e-05	-9.4512e-05	-9.4511e-05	-9.4510e-05	-9.4509e-05	-9.4508e-05	-9.4506e-05	-9.4505e-05	-9.4503e-05	-9.4502e-05	-9.4500e-05	-9.4498e-05	-9.4496e-05	-9.4493e-05	-9.4491e-05	-9.4489e-05	-9.4486e-05	-9.4483e-05	-9.4480e-05
25	2.8021e-05	2.8022e-05	2.8027e-05	2.8035e-05	2.8046e-05	2.8060e-05	2.8077e-05	2.8098e-05	2.8121e-05	2.8148e-05	2.8178e-05	2.8211e-05	2.8247e-05	2.8286e-05	2.8328e-05	2.8374e-05	2.8422e-05	2.8474e-05	2.8529e-05	2.8587e-05	2.8649e-05	2.8713e-05	2.8781e-05	2.8852e-05
26	1.4255e-04	1.4256e-04	1.4257e-04	1.4258e-04	1.4260e-04	1.4263e-04	1.4266e-04	1.4269e-04	1.4274e-04	1.4278e-04	1.4284e-04	1.4290e-04	1.4296e-04	1.4303e-04	1.4311e-04	1.4319e-04	1.4328e-04	1.4337e-04	1.4347e-04	1.4358e-04	1.4369e-04	1.4380e-04	1.4393e-04	1.4405e-04
27	2.3718e-04	2.3719e-04	2.3720e-04	2.3722e-04	2.3724e-04	2.3728e-04	2.3732e-04	2.3737e-04	2.3742e-04	2.3749e-04	2.3756e-04	2.3764e-04	2.3772e-04	2.3782e-04	2.3792e-04	2.3803e-04	2.3814e-04	2.3827e-04	2.3840e-04	2.3854e-04	2.3868e-04	2.3884e-04	2.3900e-04	2.3917e-04
28	3.0263e-04	3.0264e-04	3.0265e-04	3.0267e-04	3.0270e-04	3.0274e-04	3.0278e-04	3.0284e-04	3.0290e-04	3.0298e-04	3.0306e-04	3.0314e-04	3.0324e-04	3.0335e-04	3.0346e-04	3.0358e-04	3.0372e-04	3.0386e-04	3.0400e-04	3.0416e-04	3.0433e-04	3.0450e-04	3.0468e-04	3.0487e-04
29	3.3310e-04	3.3310e-04	3.3312e-04	3.3314e-04	3.3317e-04	3.3321e-04	3.3325e-04	3.3331e-04	3.3337e-04	3.3345e-04	3.3353e-04	3.3362e-04	3.3371e-04	3.3382e-04	3.3394e-04	3.3406e-04	3.3419e-04	3.3433e-04	3.3448e-04	3.3464e-04	3.3481e-04	3.3498e-04	3.3517e-04	3.3536e-04
30	3.2674e-04	3.2674e-04	3.2676e-04	3.2678e-04	3.2680e-04	3.2684e-04	3.2688e-04	3.2693e-04	3.2699e-04	3.2706e-04	3.2713e-04	3.2721e-04	3.2730e-04	3.2740e-04	3.2750e-04	3.2761e-04	3.2773e-04	3.2786e-04	3.2800e-04	3.2814e-04	3.2829e-04	3.2845e-04	3.2862e-04	3.2879e-04
31	2.8571e-04	2.8572e-04	2.8573e-04	2.8574e-04	2.8576e-04	2.8579e-04	2.8582e-04	2.8587e-04	2.8591e-04	2.8596e-04	2.8602e-04	2.8609e-04	2.8616e-04	2.8624e-04	2.8632e-04	2.8641e-04	2.8651e-04	2.8661e-04	2.8672e-04	2.8684e-04	2.8696e-04	2.8709e-04	2.8722e-04	2.8736e-04
32	2.1582e-04	2.1583e-04	2.1583e-04	2.1584e-04	2.1586e-04	2.1587e-04	2.1590e-04	2.1592e-04	2.1595e-04	2.1599e-04	2.1603e-04	2.1607e-04	2.1612e-04	2.1617e-04	2.1622e-04	2.1628e-04	2.1635e-04	2.1641e-04	2.1648e-04	2.1656e-04	2.1664e-04	2.1672e-04	2.1681e-04	2.1690e-04
33	1.2581e-04	1.2581e-04	1.2581e-04	1.2581e-04	1.2582e-04	1.2583e-04	1.2584e-04	1.2585e-04	1.2586e-04	1.2587e-04	1.2588e-04	1.2590e-04	1.2592e-04	1.2594e-04	1.2596e-04	1.2598e-04	1.2600e-04	1.2603e-04	1.2605e-04	1.2608e-04	1.2611e-04	1.2614e-04	1.2618e-04	1.2621e-04
34	2.6312e-05	2.6311e-05	2.6309e-05	2.6306e-05	2.6302e-05	2.6296e-05	2.6290e-05	2.6282e-05	2.6272e-05	2.6262e-05	2.6250e-05	2.6237e-05	2.6223e-05	2.6208e-05	2.6191e-05	2.6173e-05	2.6154e-05	2.6134e-05	2.6112e-05	2.6089e-05	2.6065e-05	2.6040e-05	2.6013e-05	2.5986e-05
35	-7.1315e-05	-7.1317e-05	-7.1323e-05	-7.1333e-05	-7.1346e-05	-7.1363e-05	-7.1385e-05	-7.1410e-05	-7.1439e-05	-7.1471e-05	-7.1508e-05	-7.1549e-05	-7.1593e-05	-7.1641e-05	-7.1693e-05	-7.1749e-05	-7.1809e-05	-7.1873e-05	-7.1940e-05	-7.2012e-05	-7.2087e-05	-7.2166e-05	-7.2249e-05	-7.2336e-05
36	-1.5629e-04	-1.5630e-04	-1.5630e-04	-1.5632e-04	-1.5634e-04	-1.5637e-04	-1.5640e-04	-1.5644e-04	-1.5648e-04	-1.5654e-04	-1.5659e-04	-1.5666e-04	-1.5672e-04	-1.5680e-04	-1.5688e-04	-1.5697e-04	-1.5706e-04	-1.5716e-04	-1.5727e-04	-1.5738e-04	-1.5749e-04	-1.5762e-04	-1.5775e-04	-1.5788e-04
37	-2.1961e-04	-2.1961e-04	-2.1963e-04	-2.1964e-04	-2.1967e-04	-2.1970e-04	-2.1974e-04	-2.1979e-04	-2.1985e-04	-2.1991e-04	-2.1998e-04	-2.2006e-04	-2.2014e-04	-2.2024e-04	-2.2034e-04	-2.2044e-04	-2.2056e-04	-2.2068e-04	-2.2081e-04	-2.2095e-04	-2.2109e-04	-2.2124e-04	-2.2140e-04	-2.2157e-04

Table 3.6: Acceleration data for the 180m water depth

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8193x1024 double

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
1	1.8437e-05	1.8437e-05	1.8438e-05	1.8440e-05	1.8442e-05	1.8445e-05	1.8448e-05	1.8453e-05	1.8457e-05	1.8463e-05	1.8469e-05	1.8475e-05	1.8483e-05	1.8491e-05	1.8499e-05	1.8509e-05	1.8518e-05	1.8529e-05	1.8540e-05	1.8552e-05	1.8564e-05	1.8577e-05	1.8591e-05	1.8605e-05
2	-1.1384e-05	-1.1384e-05	-1.1384e-05	-1.1385e-05	-1.1387e-05	-1.1388e-05	-1.1391e-05	-1.1393e-05	-1.1396e-05	-1.1399e-05	-1.1403e-05	-1.1407e-05	-1.1412e-05	-1.1416e-05	-1.1422e-05	-1.1427e-05	-1.1433e-05	-1.1440e-05	-1.1447e-05	-1.1454e-05	-1.1461e-05	-1.1469e-05	-1.1478e-05	-1.1487e-05
3	-3.9982e-05	-3.9983e-05	-3.9985e-05	-3.9988e-05	-3.9993e-05	-3.9999e-05	-4.0006e-05	-4.0015e-05	-4.0025e-05	-4.0037e-05	-4.0049e-05	-4.0063e-05	-4.0079e-05	-4.0096e-05	-4.0114e-05	-4.0133e-05	-4.0154e-05	-4.0177e-05	-4.0200e-05	-4.0225e-05	-4.0251e-05	-4.0279e-05	-4.0308e-05	-4.0338e-05
4	-6.3846e-05	-6.3847e-05	-6.3850e-05	-6.3856e-05	-6.3863e-05	-6.3873e-05	-6.3884e-05	-6.3898e-05	-6.3914e-05	-6.3931e-05	-6.3951e-05	-6.3974e-05	-6.3998e-05	-6.4024e-05	-6.4052e-05	-6.4083e-05	-6.4116e-05	-6.4150e-05	-6.4187e-05	-6.4226e-05	-6.4267e-05	-6.4311e-05	-6.4356e-05	-6.4403e-05
5	-8.0085e-05	-8.0086e-05	-8.0090e-05	-8.0096e-05	-8.0105e-05	-8.0117e-05	-8.0131e-05	-8.0147e-05	-8.0167e-05	-8.0189e-05	-8.0213e-05	-8.0240e-05	-8.0269e-05	-8.0302e-05	-8.0336e-05	-8.0374e-05	-8.0413e-05	-8.0456e-05	-8.0501e-05	-8.0548e-05	-8.0599e-05	-8.0651e-05	-8.0707e-05	-8.0765e-05
6	-8.6782e-05	-8.6783e-05	-8.6787e-05	-8.6794e-05	-8.6803e-05	-8.6815e-05	-8.6830e-05	-8.6848e-05	-8.6868e-05	-8.6891e-05	-8.6916e-05	-8.6945e-05	-8.6975e-05	-8.7009e-05	-8.7046e-05	-8.7085e-05	-8.7126e-05	-8.7171e-05	-8.7218e-05	-8.7268e-05	-8.7321e-05	-8.7376e-05	-8.7434e-05	-8.7495e-05
7	-8.3220e-05	-8.3221e-05	-8.3225e-05	-8.3231e-05	-8.3240e-05	-8.3251e-05	-8.3265e-05	-8.3281e-05	-8.3300e-05	-8.3321e-05	-8.3344e-05	-8.3371e-05	-8.3399e-05	-8.3430e-05	-8.3464e-05	-8.3500e-05	-8.3538e-05	-8.3579e-05	-8.3623e-05	-8.3669e-05	-8.3718e-05	-8.3769e-05	-8.3822e-05	-8.3878e-05
8	-6.9947e-05	-6.9948e-05	-6.9951e-05	-6.9956e-05	-6.9963e-05	-6.9971e-05	-6.9982e-05	-6.9995e-05	-7.0010e-05	-7.0027e-05	-7.0046e-05	-7.0066e-05	-7.0089e-05	-7.0114e-05	-7.0141e-05	-7.0169e-05	-7.0200e-05	-7.0233e-05	-7.0267e-05	-7.0304e-05	-7.0343e-05	-7.0383e-05	-7.0426e-05	-7.0470e-05
9	-4.8674e-05	-4.8674e-05	-4.8676e-05	-4.8679e-05	-4.8683e-05	-4.8689e-05	-4.8696e-05	-4.8704e-05	-4.8713e-05	-4.8724e-05	-4.8735e-05	-4.8748e-05	-4.8763e-05	-4.8778e-05	-4.8795e-05	-4.8813e-05	-4.8832e-05	-4.8852e-05	-4.8874e-05	-4.8897e-05	-4.8921e-05	-4.8946e-05	-4.8973e-05	-4.9001e-05
10	-2.2039e-05	-2.2039e-05	-2.2040e-05	-2.2040e-05	-2.2042e-05	-2.2043e-05	-2.2045e-05	-2.2048e-05	-2.2050e-05	-2.2053e-05	-2.2057e-05	-2.2061e-05	-2.2065e-05	-2.2069e-05	-2.2074e-05	-2.2079e-05	-2.2085e-05	-2.2091e-05	-2.2097e-05	-2.2104e-05	-2.2111e-05	-2.2118e-05	-2.2126e-05	-2.2134e-05
11	6.7424e-06	6.7427e-06	6.7435e-06	6.7448e-06	6.7467e-06	6.7491e-06	6.7520e-06	6.7554e-06	6.7594e-06	6.7639e-06	6.7690e-06	6.7746e-06	6.7807e-06	6.7873e-06	6.7945e-06	6.8022e-06	6.8105e-06	6.8193e-06	6.8286e-06	6.8385e-06	6.8489e-06	6.8598e-06	6.8713e-06	6.8833e-06
12	3.4285e-05	3.4286e-05	3.4288e-05	3.4291e-05	3.4296e-05	3.4302e-05	3.4309e-05	3.4317e-05	3.4327e-05	3.4339e-05	3.4351e-05	3.4365e-05	3.4380e-05	3.4397e-05	3.4415e-05	3.4434e-05	3.4455e-05	3.4477e-05	3.4500e-05	3.4525e-05	3.4551e-05	3.4578e-05	3.4607e-05	3.4637e-05
13	5.7446e-05	5.7447e-05	5.7450e-05	5.7455e-05	5.7461e-05	5.7470e-05	5.7481e-05	5.7493e-05	5.7508e-05	5.7524e-05	5.7543e-05	5.7563e-05	5.7585e-05	5.7609e-05	5.7635e-05	5.7663e-05	5.7693e-05	5.7725e-05	5.7759e-05	5.7795e-05	5.7833e-05	5.7872e-05	5.7914e-05	5.7958e-05
14	7.3691e-05	7.3692e-05	7.3695e-05	7.3701e-05	7.3709e-05	7.3719e-05	7.3732e-05	7.3746e-05	7.3763e-05	7.3783e-05	7.3804e-05	7.3828e-05	7.3854e-05	7.3883e-05	7.3913e-05	7.3946e-05	7.3981e-05	7.4019e-05	7.4059e-05	7.4101e-05	7.4145e-05	7.4192e-05	7.4241e-05	7.4292e-05
15	8.1368e-05	8.1369e-05	8.1372e-05	8.1378e-05	8.1386e-05	8.1397e-05	8.1409e-05	8.1424e-05	8.1442e-05	8.1461e-05	8.1483e-05	8.1508e-05	8.1534e-05	8.1563e-05	8.1594e-05	8.1628e-05	8.1664e-05	8.1702e-05	8.1743e-05	8.1785e-05	8.1831e-05	8.1878e-05	8.1928e-05	8.1980e-05
16	7.9866e-05	7.9867e-05	7.9871e-05	7.9876e-05	7.9883e-05	7.9892e-05	7.9904e-05	7.9917e-05	7.9933e-05	7.9951e-05	7.9970e-05	7.9992e-05	8.0016e-05	8.0042e-05	8.0070e-05	8.0100e-05	8.0133e-05	8.0167e-05	8.0203e-05	8.0242e-05	8.0282e-05	8.0325e-05	8.0370e-05	8.0417e-05
17	6.9643e-05	6.9644e-05	6.9646e-05	6.9650e-05	6.9656e-05	6.9663e-05	6.9672e-05	6.9682e-05	6.9695e-05	6.9708e-05	6.9724e-05	6.9741e-05	6.9759e-05	6.9780e-05	6.9802e-05	6.9825e-05	6.9850e-05	6.9877e-05	6.9905e-05	6.9935e-05	6.9967e-05	7.0000e-05	7.0035e-05	7.0072e-05
18	5.2120e-05	5.2120e-05	5.2122e-05	5.2124e-05	5.2128e-05	5.2133e-05	5.2138e-05	5.2145e-05	5.2152e-05	5.2161e-05	5.2170e-05	5.2181e-05	5.2193e-05	5.2205e-05	5.2219e-05	5.2234e-05	5.2249e-05	5.2266e-05	5.2284e-05	5.2302e-05	5.2322e-05	5.2343e-05	5.2364e-05	5.2387e-05
19	2.9482e-05	2.9482e-05	2.9482e-05	2.9483e-05	2.9484e-05	2.9486e-05	2.9487e-05	2.9490e-05	2.9492e-05	2.9495e-05	2.9498e-05	2.9502e-05	2.9505e-05	2.9509e-05	2.9514e-05	2.9519e-05	2.9524e-05	2.9529e-05	2.9535e-05	2.9541e-05	2.9547e-05	2.9554e-05	2.9561e-05	2.9569e-05
20	4.3906e-06	4.3904e-06	4.3899e-06	4.3890e-06	4.3878e-06	4.3863e-06	4.3844e-06	4.3821e-06	4.3795e-06	4.3766e-06	4.3733e-06	4.3697e-06	4.3657e-06	4.3613e-06	4.3567e-06	4.3516e-06	4.3462e-06	4.3405e-06	4.3344e-06	4.3280e-06	4.3212e-06	4.3141e-06	4.3066e-06	4.2988e-06
21	-2.0331e-05	-2.0331e-05	-2.0333e-05	-2.0335e-05	-2.0338e-05	-2.0343e-05	-2.0348e-05	-2.0354e-05	-2.0361e-05	-2.0370e-05	-2.0379e-05	-2.0389e-05	-2.0400e-05	-2.0412e-05	-2.0425e-05	-2.0439e-05	-2.0453e-05	-2.0469e-05	-2.0486e-05	-2.0504e-05	-2.0523e-05	-2.0542e-05	-2.0563e-05	-2.0585e-05
22	-4.2020e-05	-4.2021e-05	-4.2023e-05	-4.2027e-05	-4.2032e-05	-4.2038e-05	-4.2046e-05	-4.2055e-05	-4.2066e-05	-4.2079e-05	-4.2092e-05	-4.2107e-05	-4.2124e-05	-4.2142e-05	-4.2162e-05	-4.2183e-05	-4.2205e-05	-4.2229e-05	-4.2254e-05	-4.2281e-05	-4.2309e-05	-4.2339e-05	-4.2370e-05	-4.2402e-05
23	-5.8459e-05	-5.8460e-05	-5.8462e-05	-5.8467e-05	-5.8473e-05	-5.8481e-05	-5.8490e-05	-5.8501e-05	-5.8515e-05	-5.8529e-05	-5.8546e-05	-5.8564e-05	-5.8584e-05	-5.8606e-05	-5.8630e-05	-5.8655e-05	-5.8682e-05	-5.8711e-05	-5.8741e-05	-5.8773e-05	-5.8807e-05	-5.8843e-05	-5.8881e-05	-5.8920e-05
24	-6.8091e-05	-6.8092e-05	-6.8095e-05	-6.8100e-05	-6.8106e-05	-6.8114e-05	-6.8124e-05	-6.8136e-05	-6.8150e-05	-6.8165e-05	-6.8183e-05	-6.8202e-05	-6.8223e-05	-6.8246e-05	-6.8270e-05	-6.8297e-05	-6.8325e-05	-6.8355e-05	-6.8387e-05	-6.8421e-05	-6.8457e-05	-6.8494e-05	-6.8534e-05	-6.8575e-05
25	-7.0162e-05	-7.0163e-05	-7.0165e-05	-7.0169e-05	-7.0175e-05	-7.0183e-05	-7.0193e-05	-7.0204e-05	-7.0217e-05	-7.0231e-05	-7.0247e-05	-7.0265e-05	-7.0285e-05	-7.0307e-05	-7.0330e-05	-7.0355e-05	-7.0381e-05	-7.0409e-05	-7.0439e-05	-7.0471e-05	-7.0505e-05	-7.0540e-05	-7.0577e-05	-7.0615e-05
26	-6.4757e-05	-6.4757e-05	-6.4759e-05	-6.4763e-05	-6.4768e-05	-6.4774e-05	-6.4782e-05	-6.4792e-05	-6.4802e-05	-6.4815e-05	-6.4828e-05	-6.4843e-05	-6.4860e-05	-6.4878e-05	-6.4897e-05	-6.4918e-05	-6.4940e-05	-6.4964e-05	-6.4989e-05	-6.5015e-05	-6.5043e-05	-6.5073e-05	-6.5104e-05	-6.5136e-05
27	-5.2759e-05	-5.2759e-05	-5.2761e-05	-5.2763e-05	-5.2767e-05	-5.2772e-05	-5.2777e-05	-5.2784e-05	-5.2791e-05	-5.2800e-05	-5.2810e-05	-5.2820e-05	-5.2832e-05	-5.2845e-05	-5.2859e-05	-5.2873e-05	-5.2889e-05	-5.2906e-05	-5.2924e-05	-5.2943e-05	-5.2963e-05	-5.2983e-05	-5.3005e-05	-5.3028e-05
28	-3.5719e-05	-3.5719e-05	-3.5720e-05	-3.5721e-05	-3.5723e-05	-3.5725e-05	-3.5728e-05	-3.5731e-05	-3.5735e-05	-3.5740e-05	-3.5744e-05	-3.5750e-05	-3.5756e-05	-3.5762e-05	-3.5769e-05	-3.5776e-05	-3.5784e-05	-3.5793e-05	-3.5802e-05	-3.5811e-05	-3.5821e-05	-3.5832e-05	-3.5843e-05	-3.5854e-05
29	-1.5661e-05	-1.5661e-05	-1.5661e-05	-1.5661e-05	-1.5661e-05	-1.5661e-05	-1.5661e-05	-1.5661e-05	-1.5661e-05	-1.5660e-05	-1.5660e-05	-1.5660e-05	-1.5660e-05	-1.5659e-05	-1.5659e-05	-1.5659e-05	-1.5658e-05	-1.5658e-05	-1.5657e-05	-1.5657e-05	-1.5656e-05	-1.5656e-05	-1.5655e-05	-1.5655e-05
30	5.1486e-06	5.1489e-06	5.1497e-06	5.1510e-06	5.1529e-06	5.1553e-06	5.1583e-06	5.1618e-06	5.1658e-06	5.1704e-06	5.1755e-06	5.1811e-06	5.1873e-06	5.1940e-06	5.2013e-06	5.2091e-06	5.2174e-06	5.2263e-06	5.2357e-06	5.2457e-06	5.2562e-06	5.2672e-06	5.2788e-06	5.2909e-06
31	2.4456e-05	2.4457e-05	2.4458e-05	2.4461e-05	2.4464e-05	2.4469e-05	2.4474e-05	2.4480e-05	2.4488e-05	2.4496e-05	2.4505e-05	2.4516e-05	2.4527e-05	2.4539e-05	2.4552e-05	2.4567e-05	2.4582e-05	2.4598e-05	2.4615e-05	2.4633e-05	2.4652e-05	2.4672e-05	2.4693e-05	2.4715e-05
32	4.0259e-05	4.0260e-05	4.0262e-05	4.0265e-05	4.0270e-05	4.0276e-05	4.0283e-05	4.0291e-05	4.0301e-05	4.0312e-05	4.0325e-05	4.0339e-05	4.0354e-05	4.0370e-05	4.0388e-05	4.0407e-05	4.0427e-05	4.0448e-05	4.0471e-05	4.0496e-05	4.0521e-05	4.0548e-05	4.0576e-05	4.0606e-05
33	5.1014e-05	5.1015e-05	5.1017e-05	5.1020e-05	5.1026e-05	5.1032e-05	5.1041e-05	5.1050e-05	5.1062e-05	5.1074e-05	5.1089e-05	5.1104e-05	5.1121e-05	5.1140e-05	5.1160e-05	5.1182e-05	5.1205e-05	5.1230e-05	5.1256e-05	5.1284e-05	5.1313e-05	5.1344e-05	5.1376e-05	5.1410e-05
34	5.5787e-05	5.5788e-05	5.5790e-05	5.5794e-05	5.5800e-05	5.5806e-05	5.5815e-05	5.5825e-05	5.5836e-05	5.5849e-05	5.5863e-05	5.5879e-05	5.5897e-05	5.5916e-05	5.5936e-05	5.5958e-05	5.5982e-05	5.6007e-05	5.6033e-05	5.6061e-05	5.6091e-05	5.6122e-05	5.6155e-05	5.6189e-05
35	5.4342e-05	5.4343e-05	5.4345e-05	5.4348e-05	5.4353e-05	5.4359e-05	5.4367e-05	5.4375e-05	5.4386e-05	5.4397e-05	5.4410e-05	5.4424e-05	5.4440e-05	5.4457e-05	5.4475e-05	5.4495e-05	5.4516e-05	5.4539e-05	5.4562e-05	5.4588e-05	5.4614e-05	5.4642e-05	5.4671e-05	5.4702e-05
36	4.7138e-05	4.7138e-05	4.7140e-05	4.7142e-05	4.7146e-05	4.7151e-05	4.7157e-05	4.7163e-05	4.7171e-05	4.7180e-05	4.7190e-05	4.7201e-05	4.7213e-05	4.7226e-05	4.7240e-05	4.7255e-05	4.7271e-05	4.7289e-05	4.7307e-05	4.7326e-05	4.7346e-05	4.7368e-05	4.7390e-05	4.7414e-05
37	3.5259e-05	3.5259e-05	3.5260e-05	3.5261e-05	3.5264e-05	3.5266e-05	3.5270e-05	3.5274e-05	3.5278e-05	3.5284e-05	3.5289e-05	3.5296e-05	3.5303e-05	3.5311e-05	3.5319e-05	3.5328e-05	3.5337e-05	3.5347e-05	3.5358e-05	3.5369e-05	3.5381e-05	3.5394e-05	3.5407e-05	3.5421e-05

Table 3.7: Velocity data for the 180m water depth

Z

8193x1024 double

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
1	-1.8000	-1.7982	-1.7965	-1.7947	-1.7930	-1.7912	-1.7894	-1.7877	-1.7859	-1.7841	-1.7824	-1.7806	-1.7789	-1.7771	-1.7753	-1.7736	-1.7718	-1.7700	-1.7683	-1.7665	-1.7648	-1.7630	-1.7612	-1.7595
2	-1.8000	-1.7982	-1.7965	-1.7947	-1.7930	-1.7912	-1.7894	-1.7877	-1.7859	-1.7841	-1.7824	-1.7806	-1.7789	-1.7771	-1.7753	-1.7736	-1.7718	-1.7700	-1.7683	-1.7665	-1.7648	-1.7630	-1.7612	-1.7595
3	-1.8000	-1.7982	-1.7965	-1.7947	-1.7930	-1.7912	-1.7894	-1.7877	-1.7859	-1.7842	-1.7824	-1.7806	-1.7789	-1.7771	-1.7753	-1.7736	-1.7718	-1.7701	-1.7683	-1.7665	-1.7648	-1.7630	-1.7613	-1.7595
4	-1.8000	-1.7982	-1.7965	-1.7947	-1.7930	-1.7912	-1.7895	-1.7877	-1.7859	-1.7842	-1.7824	-1.7807	-1.7789	-1.7771	-1.7754	-1.7736	-1.7719	-1.7701	-1.7684	-1.7666	-1.7648	-1.7631	-1.7613	-1.7596
5	-1.8000	-1.7982	-1.7965	-1.7947	-1.7930	-1.7912	-1.7895	-1.7877	-1.7860	-1.7842	-1.7825	-1.7807	-1.7790	-1.7772	-1.7754	-1.7737	-1.7719	-1.7702	-1.7684	-1.7667	-1.7649	-1.7632	-1.7614	-1.7597
6	-1.8000	-1.7983	-1.7965	-1.7948	-1.7930	-1.7913	-1.7895	-1.7878	-1.7860	-1.7843	-1.7825	-1.7808	-1.7790	-1.7773	-1.7755	-1.7738	-1.7720	-1.7703	-1.7685	-1.7668	-1.7650	-1.7633	-1.7615	-1.7598
7	-1.8000	-1.7983	-1.7965	-1.7948	-1.7930	-1.7913	-1.7895	-1.7878	-1.7860	-1.7843	-1.7825	-1.7808	-1.7790	-1.7773	-1.7755	-1.7738	-1.7720	-1.7703	-1.7685	-1.7668	-1.7650	-1.7633	-1.7615	-1.7598
8	-1.8000	-1.7982	-1.7965	-1.7947	-1.7930	-1.7912	-1.7895	-1.7877	-1.7860	-1.7842	-1.7825	-1.7807	-1.7790	-1.7772	-1.7754	-1.7737	-1.7719	-1.7702	-1.7684	-1.7667	-1.7649	-1.7632	-1.7614	-1.7597
9	-1.8000	-1.7982	-1.7965	-1.7947	-1.7930	-1.7912	-1.7895	-1.7877	-1.7859	-1.7842	-1.7824	-1.7807	-1.7789	-1.7771	-1.7754	-1.7736	-1.7719	-1.7701	-1.7684	-1.7666	-1.7648	-1.7631	-1.7613	-1.7596
10	-1.8000	-1.7982	-1.7965	-1.7947	-1.7930	-1.7912	-1.7894	-1.7877	-1.7859	-1.7842	-1.7824	-1.7806	-1.7789	-1.7771	-1.7753	-1.7736	-1.7718	-1.7701	-1.7683	-1.7665	-1.7648	-1.7630	-1.7613	-1.7595
11	-1.8000	-1.7982	-1.7965	-1.7947	-1.7929	-1.7912	-1.7894	-1.7877	-1.7859	-1.7841	-1.7824	-1.7806	-1.7788	-1.7771	-1.7753	-1.7735	-1.7718	-1.7700	-1.7683	-1.7665	-1.7647	-1.7630	-1.7612	-1.7594
12	-1.8000	-1.7982	-1.7965	-1.7947	-1.7929	-1.7912	-1.7894	-1.7876	-1.7859	-1.7841	-1.7823	-1.7806	-1.7788	-1.7770	-1.7753	-1.7735	-1.7717	-1.7699	-1.7682	-1.7664	-1.7646	-1.7629	-1.7611	-1.7593
13	-1.8000	-1.7982	-1.7965	-1.7947	-1.7929	-1.7911	-1.7894	-1.7876	-1.7858	-1.7841	-1.7823	-1.7805	-1.7787	-1.7770	-1.7752	-1.7734	-1.7717	-1.7699	-1.7681	-1.7663	-1.7646	-1.7628	-1.7610	-1.7593
14	-1.8000	-1.7982	-1.7965	-1.7947	-1.7929	-1.7911	-1.7894	-1.7876	-1.7858	-1.7841	-1.7823	-1.7805	-1.7788	-1.7770	-1.7752	-1.7734	-1.7717	-1.7699	-1.7681	-1.7664	-1.7646	-1.7628	-1.7610	-1.7593
15	-1.8000	-1.7982	-1.7965	-1.7947	-1.7929	-1.7912	-1.7894	-1.7876	-1.7859	-1.7841	-1.7823	-1.7806	-1.7788	-1.7770	-1.7753	-1.7735	-1.7717	-1.7700	-1.7682	-1.7664	-1.7647	-1.7629	-1.7611	-1.7594
16	-1.8000	-1.7982	-1.7965	-1.7947	-1.7930	-1.7912	-1.7894	-1.7877	-1.7859	-1.7842	-1.7824	-1.7806	-1.7789	-1.7771	-1.7754	-1.7736	-1.7718	-1.7701	-1.7683	-1.7666	-1.7648	-1.7630	-1.7613	-1.7595
17	-1.8000	-1.7982	-1.7965	-1.7947	-1.7930	-1.7912	-1.7895	-1.7877	-1.7860	-1.7842	-1.7825	-1.7807	-1.7790	-1.7772	-1.7755	-1.7737	-1.7719	-1.7702	-1.7684	-1.7667	-1.7649	-1.7632	-1.7614	-1.7597
18	-1.8000	-1.7983	-1.7965	-1.7948	-1.7930	-1.7913	-1.7895	-1.7878	-1.7860	-1.7843	-1.7825	-1.7808	-1.7790	-1.7773	-1.7755	-1.7738	-1.7720	-1.7703	-1.7685	-1.7668	-1.7651	-1.7633	-1.7616	-1.7598
19	-1.8000	-1.7983	-1.7965	-1.7948	-1.7930	-1.7913	-1.7895	-1.7878	-1.7860	-1.7843	-1.7826	-1.7808	-1.7791	-1.7773	-1.7756	-1.7738	-1.7721	-1.7703	-1.7686	-1.7669	-1.7651	-1.7634	-1.7616	-1.7599
20	-1.8000	-1.7983	-1.7965	-1.7948	-1.7930	-1.7913	-1.7895	-1.7878	-1.7860	-1.7843	-1.7825	-1.7808	-1.7790	-1.7773	-1.7755	-1.7738	-1.7720	-1.7703	-1.7685	-1.7668	-1.7650	-1.7633	-1.7615	-1.7598
21	-1.8000	-1.7982	-1.7965	-1.7947	-1.7930	-1.7912	-1.7894	-1.7877	-1.7859	-1.7842	-1.7824	-1.7806	-1.7789	-1.7771	-1.7754	-1.7736	-1.7719	-1.7701	-1.7683	-1.7666	-1.7648	-1.7631	-1.7613	-1.7595
22	-1.8000	-1.7982	-1.7965	-1.7947	-1.7929	-1.7912	-1.7894	-1.7876	-1.7859	-1.7841	-1.7823	-1.7805	-1.7788	-1.7770	-1.7752	-1.7735	-1.7717	-1.7699	-1.7682	-1.7664	-1.7646	-1.7629	-1.7611	-1.7593
23	-1.8000	-1.7982	-1.7965	-1.7947	-1.7929	-1.7911	-1.7894	-1.7876	-1.7858	-1.7841	-1.7823	-1.7805	-1.7787	-1.7770	-1.7752	-1.7734	-1.7717	-1.7699	-1.7681	-1.7664	-1.7646	-1.7628	-1.7610	-1.7593
24	-1.8000	-1.7982	-1.7965	-1.7947	-1.7929	-1.7912	-1.7894	-1.7876	-1.7859	-1.7841	-1.7823	-1.7806	-1.7788	-1.7770	-1.7753	-1.7735	-1.7717	-1.7700	-1.7682	-1.7664	-1.7647	-1.7629	-1.7611	-1.7594
25	-1.8000	-1.7982	-1.7965	-1.7947	-1.7930	-1.7912	-1.7894	-1.7877	-1.7859	-1.7841	-1.7824	-1.7806	-1.7789	-1.7771	-1.7753	-1.7736	-1.7718	-1.7700	-1.7683	-1.7665	-1.7648	-1.7630	-1.7612	-1.7595
26	-1.8000	-1.7982	-1.7965	-1.7947	-1.7930	-1.7912	-1.7894	-1.7877	-1.7859	-1.7841	-1.7824	-1.7806	-1.7789	-1.7771	-1.7753	-1.7736	-1.7718	-1.7701	-1.7683	-1.7665	-1.7648	-1.7630	-1.7613	-1.7595
27	-1.8000	-1.7982	-1.7965	-1.7947	-1.7930	-1.7912	-1.7894	-1.7877	-1.7859	-1.7842	-1.7824	-1.7806	-1.7789	-1.7771	-1.7754	-1.7736	-1.7718	-1.7701	-1.7683	-1.7665	-1.7648	-1.7630	-1.7613	-1.7595
28	-1.8000	-1.7982	-1.7965	-1.7947	-1.7930	-1.7912	-1.7895	-1.7877	-1.7859	-1.7842	-1.7824	-1.7807	-1.7789	-1.7771	-1.7754	-1.7736	-1.7719	-1.7701	-1.7684	-1.7666	-1.7648	-1.7631	-1.7613	-1.7596
29	-1.8000	-1.7982	-1.7965	-1.7947	-1.7930	-1.7912	-1.7895	-1.7877	-1.7860	-1.7842	-1.7825	-1.7807	-1.7790	-1.7772	-1.7755	-1.7737	-1.7719	-1.7702	-1.7684	-1.7667	-1.7649	-1.7632	-1.7614	-1.7597
30	-1.8000	-1.7982	-1.7965	-1.7947	-1.7930	-1.7912	-1.7895	-1.7877	-1.7860	-1.7842	-1.7825	-1.7807	-1.7790	-1.7772	-1.7755	-1.7737	-1.7720	-1.7702	-1.7685	-1.7667	-1.7650	-1.7632	-1.7615	-1.7597
31	-1.8000	-1.7982	-1.7965	-1.7947	-1.7930	-1.7912	-1.7895	-1.7877	-1.7860	-1.7842	-1.7825	-1.7807	-1.7790	-1.7772	-1.7755	-1.7737	-1.7720	-1.7702	-1.7685	-1.7667	-1.7650	-1.7632	-1.7615	-1.7597
32	-1.8000	-1.7982	-1.7965	-1.7947	-1.7930	-1.7912	-1.7895	-1.7877	-1.7860	-1.7842	-1.7825	-1.7807	-1.7789	-1.7772	-1.7754	-1.7737	-1.7719	-1.7702	-1.7684	-1.7667	-1.7649	-1.7631	-1.7614	-1.7596
33	-1.8000	-1.7982	-1.7965	-1.7947	-1.7930	-1.7912	-1.7894	-1.7877	-1.7859	-1.7841	-1.7824	-1.7806	-1.7789	-1.7771	-1.7753	-1.7736	-1.7718	-1.7701	-1.7683	-1.7665	-1.7648	-1.7630	-1.7612	-1.7595
34	-1.8000	-1.7982	-1.7965	-1.7947	-1.7929	-1.7912	-1.7894	-1.7876	-1.7859	-1.7841	-1.7823	-1.7805	-1.7788	-1.7770	-1.7752	-1.7735	-1.7717	-1.7699	-1.7682	-1.7664	-1.7646	-1.7629	-1.7611	-1.7593
35	-1.8000	-1.7982	-1.7965	-1.7947	-1.7929	-1.7911	-1.7894	-1.7876	-1.7858	-1.7841	-1.7823	-1.7805	-1.7787	-1.7770	-1.7752	-1.7734	-1.7717	-1.7699	-1.7681	-1.7664	-1.7646	-1.7628	-1.7610	-1.7593
36	-1.8000	-1.7982	-1.7965	-1.7947	-1.7929	-1.7912	-1.7894	-1.7876	-1.7859	-1.7841	-1.7823	-1.7806	-1.7788	-1.7770	-1.7753	-1.7735	-1.7717	-1.7700	-1.7682	-1.7664	-1.7647	-1.7629	-1.7611	-1.7594
37	-1.8000	-1.7982	-1.7965	-1.7947	-1.7930	-1.7912	-1.7894	-1.7877	-1.7859	-1.7842	-1.7824	-1.7806	-1.7789	-1.7771	-1.7754	-1.7736	-1.7718	-1.7701	-1.7683	-1.7666	-1.7648	-1.7630	-1.7613	-1.7595

Table 3.8: Elevation data for the 180m water depth

The table above the acceleration, velocity and elevation for each time period in 180m water depth. The column represent the acceleration , velocity and elevation while for the row represent the wave period. The difference between row is 1/66 seconds.

Based on the data from Universiti Teknologi Petronas , the value for the acceleration, velocity and elevation are substitute into the Morison equation with constant diameter and density which is 0.5 m and 1000 kg/m^3 to find the Total force. Therefore, the results for the regular wave and irregular waves are compared.

3.3 Project Gantt Chart and Key Milestones

No	Activities/ Week	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1	Project planning and FYP II briefing															
2	Perform simulation and analysis															
3	Preparation of Progress Report															
4	Completion of progress report and submission to SV															
5	Continuation of project work															
6	Preparation of poster for Pre-SEDEX															
7	Pre-SEDEX poster presentation with internal examiner															
8	Completion of simulation and continuation on project documentation															
9	Preparation and submission of Dissertation (soft-bound)															
10	Preparation and submission of Technical Paper															
11	FYP viva oral presentation															
12	Dissertation format checking and final touch-up															
13	Completion of FYP and submission of Project Dissertation (hard-bound)															

Project Timeline Key Milestone

3.4 Key Project Milestones Details

No	Activities/ Week	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1	Project planning and FYP II briefing															
1st Key Milestone: Completion of FYP II Progress Report																
2	Collection of data for simulation															
3	Preparation of data for simulation															
4	Analysing the data for simulation															
5	Execution of simulation															
2nd Key Milestone: Pre-SEDEX Presentation																
7	Continuation on simulation and data analysis															
8	Preparation of poster for Pre-SEDEX															
3rd Key Milestone: Completion of FYP II Dissertation (soft-bound)																
9	Results documentation															
10	Preparation of dissertation															
4th Key Milestone: Completion of FYP II Technical Paper																
11	Preparation of technical paper															
12	Format and Turnitin checking															
5th Key Milestone: FYP II Viva Oral Presentation																

13	Preparation of slides and material for presentation															
6th Key Milestone: Completion of FYP II Project Dissertation (hard-bound)																
14	Printing of FYP hard-bound															
15	Completion of FYP and submission of hard-bound															

RESULTS

4.1 Simulation

4.1.1 Simulation of Regular wave

The total length of the vertical cylinder which is as column for the platform is assumed. The numerical case is conducted with following input data which is d=0.5m , Cm = 1.0, Cd = 2.0 , T=10s and p= 1000 kg/m^3. Figure below shows the time series of wave profile based on the input data and the numerical results with the analytical solutions

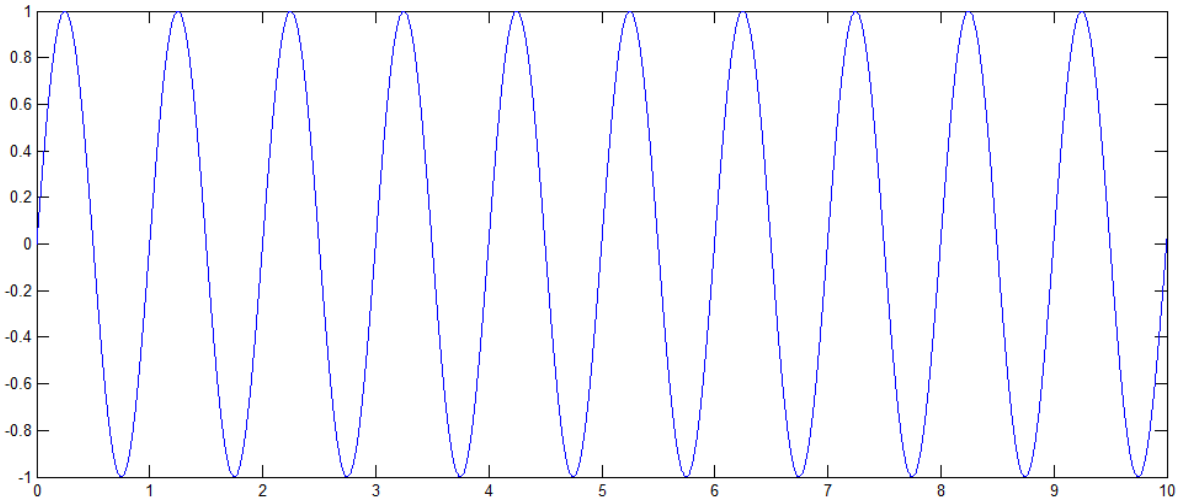

Figure 4.1 : Time series of regular wave on vertical cylinder

4.1.2 Simulation of Irregular wave

The irregular waves are simulated for the repetition period without the vertical cylinder which is assumed as column of the platform. The time series for the irregular waves are shown in figure below.. For the different water depth which is d=80m and d= 180m, the wave spectrum is shown in figure below.

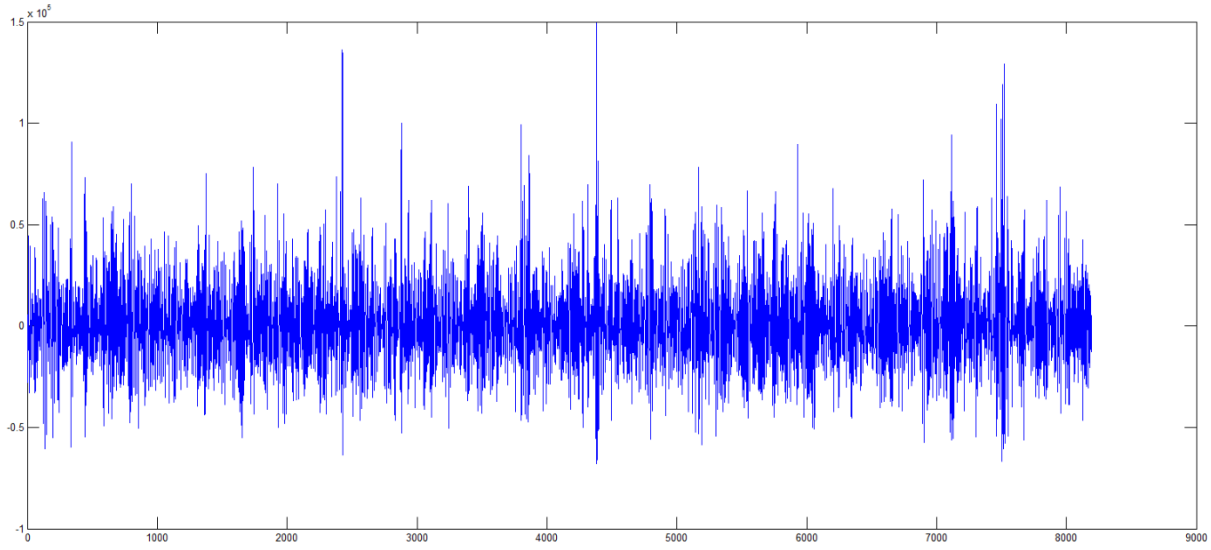

Figure 4.2 : Time series of irregular wave on vertical cylinder with 80m depth

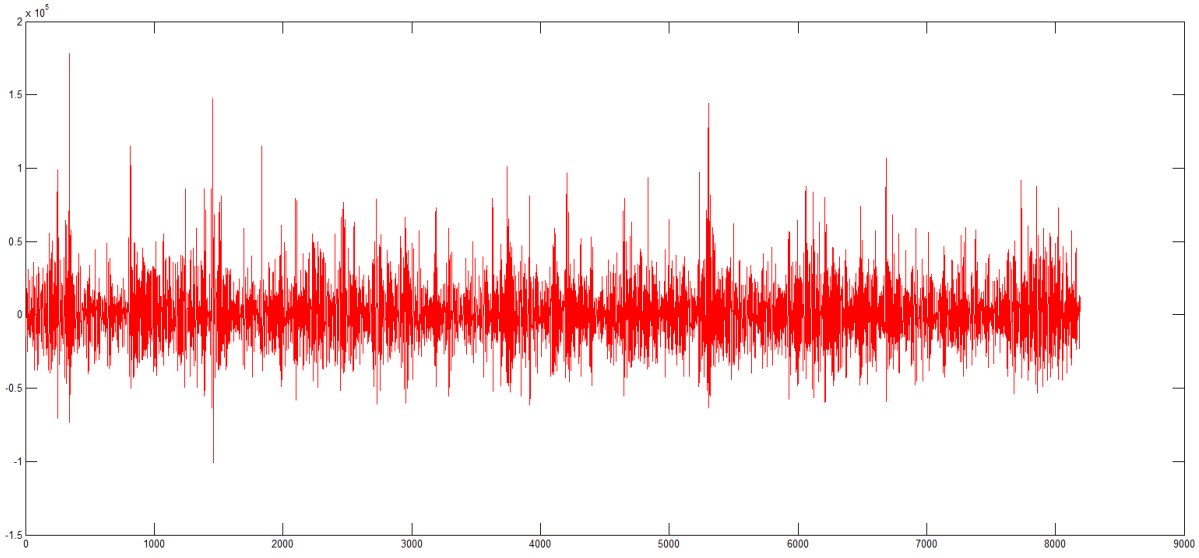

Figure 4.3: Time series of irregular wave on vertical cylinder with 180m depth

4.2 Impact of water depth on the drag and inertia coefficient

After the time series of simulation is done, the different water depths is investigated for the drag coefficient and inertia coefficient acting on vertical cylinder which is the column for the fixed jacket platform. The water depth for the regular wave is substitute the value 80m and 180 into the drag coefficient and inertia coefficient. The table below shows that input data for different water depth in irregular wave . The water depth value scale is 80m to 180m which is indicated to the finite water depth. The wave height which is H wave period ,T is considered constant in regular wave

AX

8193x1024 double

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
1	-4.6708e-04	-4.6709e-04	-4.6712e-04	-4.6716e-04	-4.6721e-04	-4.6729e-04	-4.6737e-04	-4.6748e-04	-4.6760e-04	-4.6774e-04	-4.6789e-04	-4.6806e-04	-4.6825e-04	-4.6845e-04	-4.6867e-04	-4.6891e-04	-4.6916e-04	-4.6942e-04	-4.6971e-04	-4.7001e-04	-4.7032e-04	-4.7066e-04	-4.7101e-04	-4.7137e-04
2	-4.7721e-04	-4.7722e-04	-4.7724e-04	-4.7728e-04	-4.7734e-04	-4.7741e-04	-4.7750e-04	-4.7761e-04	-4.7773e-04	-4.7786e-04	-4.7802e-04	-4.7819e-04	-4.7838e-04	-4.7858e-04	-4.7880e-04	-4.7903e-04	-4.7928e-04	-4.7955e-04	-4.7984e-04	-4.8014e-04	-4.8045e-04	-4.8079e-04	-4.8114e-04	-4.8150e-04
3	-4.2846e-04	-4.2847e-04	-4.2849e-04	-4.2852e-04	-4.2857e-04	-4.2863e-04	-4.2871e-04	-4.2880e-04	-4.2891e-04	-4.2903e-04	-4.2916e-04	-4.2931e-04	-4.2947e-04	-4.2965e-04	-4.2984e-04	-4.3004e-04	-4.3026e-04	-4.3049e-04	-4.3074e-04	-4.3100e-04	-4.3128e-04	-4.3157e-04	-4.3187e-04	-4.3219e-04
4	-3.2739e-04	-3.2739e-04	-3.2741e-04	-3.2743e-04	-3.2747e-04	-3.2751e-04	-3.2757e-04	-3.2764e-04	-3.2771e-04	-3.2780e-04	-3.2789e-04	-3.2800e-04	-3.2812e-04	-3.2824e-04	-3.2838e-04	-3.2853e-04	-3.2868e-04	-3.2885e-04	-3.2903e-04	-3.2922e-04	-3.2942e-04	-3.2962e-04	-3.2984e-04	-3.3007e-04
5	-1.8707e-04	-1.8707e-04	-1.8708e-04	-1.8709e-04	-1.8711e-04	-1.8713e-04	-1.8716e-04	-1.8719e-04	-1.8723e-04	-1.8727e-04	-1.8732e-04	-1.8737e-04	-1.8743e-04	-1.8749e-04	-1.8756e-04	-1.8763e-04	-1.8771e-04	-1.8779e-04	-1.8788e-04	-1.8797e-04	-1.8807e-04	-1.8817e-04	-1.8828e-04	-1.8839e-04
6	-2.5303e-05	-2.5303e-05	-2.5302e-05	-2.5301e-05	-2.5298e-05	-2.5296e-05	-2.5292e-05	-2.5288e-05	-2.5283e-05	-2.5278e-05	-2.5272e-05	-2.5265e-05	-2.5258e-05	-2.5250e-05	-2.5242e-05	-2.5233e-05	-2.5223e-05	-2.5213e-05	-2.5202e-05	-2.5190e-05	-2.5178e-05	-2.5165e-05	-2.5151e-05	-2.5137e-05
7	1.3778e-04	1.3779e-04	1.3780e-04	1.3781e-04	1.3783e-04	1.3786e-04	1.3789e-04	1.3793e-04	1.3797e-04	1.3802e-04	1.3808e-04	1.3814e-04	1.3821e-04	1.3829e-04	1.3837e-04	1.3845e-04	1.3855e-04	1.3864e-04	1.3875e-04	1.3886e-04	1.3898e-04	1.3910e-04	1.3923e-04	1.3936e-04
8	2.8234e-04	2.8234e-04	2.8236e-04	2.8238e-04	2.8242e-04	2.8247e-04	2.8252e-04	2.8259e-04	2.8267e-04	2.8276e-04	2.8285e-04	2.8296e-04	2.8308e-04	2.8321e-04	2.8335e-04	2.8350e-04	2.8366e-04	2.8384e-04	2.8402e-04	2.8421e-04	2.8441e-04	2.8463e-04	2.8485e-04	2.8508e-04
9	3.9128e-04	3.9128e-04	3.9130e-04	3.9134e-04	3.9138e-04	3.9144e-04	3.9152e-04	3.9160e-04	3.9170e-04	3.9182e-04	3.9194e-04	3.9208e-04	3.9224e-04	3.9240e-04	3.9258e-04	3.9278e-04	3.9298e-04	3.9320e-04	3.9344e-04	3.9368e-04	3.9394e-04	3.9422e-04	3.9451e-04	3.9481e-04
10	4.5235e-04	4.5236e-04	4.5238e-04	4.5242e-04	4.5247e-04	4.5253e-04	4.5261e-04	4.5271e-04	4.5282e-04	4.5294e-04	4.5308e-04	4.5323e-04	4.5340e-04	4.5358e-04	4.5377e-04	4.5398e-04	4.5421e-04	4.5445e-04	4.5470e-04	4.5497e-04	4.5525e-04	4.5555e-04	4.5586e-04	4.5619e-04
11	4.5951e-04	4.5951e-04	4.5953e-04	4.5957e-04	4.5962e-04	4.5968e-04	4.5975e-04	4.5984e-04	4.5995e-04	4.6006e-04	4.6019e-04	4.6034e-04	4.6050e-04	4.6067e-04	4.6085e-04	4.6105e-04	4.6127e-04	4.6149e-04	4.6173e-04	4.6199e-04	4.6226e-04	4.6254e-04	4.6284e-04	4.6315e-04
12	4.1337e-04	4.1338e-04	4.1340e-04	4.1342e-04	4.1346e-04	4.1352e-04	4.1358e-04	4.1365e-04	4.1374e-04	4.1383e-04	4.1394e-04	4.1406e-04	4.1419e-04	4.1433e-04	4.1449e-04	4.1465e-04	4.1483e-04	4.1501e-04	4.1521e-04	4.1542e-04	4.1564e-04	4.1588e-04	4.1612e-04	4.1638e-04
13	3.2095e-04	3.2095e-04	3.2096e-04	3.2098e-04	3.2101e-04	3.2104e-04	3.2108e-04	3.2113e-04	3.2119e-04	3.2125e-04	3.2133e-04	3.2141e-04	3.2150e-04	3.2159e-04	3.2169e-04	3.2180e-04	3.2192e-04	3.2205e-04	3.2218e-04	3.2232e-04	3.2247e-04	3.2263e-04	3.2279e-04	3.2297e-04
14	1.9444e-04	1.9444e-04	1.9445e-04	1.9445e-04	1.9446e-04	1.9448e-04	1.9450e-04	1.9452e-04	1.9454e-04	1.9457e-04	1.9460e-04	1.9463e-04	1.9467e-04	1.9471e-04	1.9475e-04	1.9480e-04	1.9484e-04	1.9490e-04	1.9495e-04	1.9501e-04	1.9507e-04	1.9514e-04	1.9521e-04	1.9528e-04
15	4.9591e-05	4.9590e-05	4.9588e-05	4.9584e-05	4.9579e-05	4.9573e-05	4.9565e-05	4.9556e-05	4.9546e-05	4.9534e-05	4.9521e-05	4.9506e-05	4.9490e-05	4.9472e-05	4.9453e-05	4.9433e-05	4.9411e-05	4.9388e-05	4.9363e-05	4.9337e-05	4.9309e-05	4.9280e-05	4.9250e-05	4.9218e-05
16	-9.6390e-05	-9.6393e-05	-9.6401e-05	-9.6415e-05	-9.6434e-05	-9.6458e-05	-9.6488e-05	-9.6524e-05	-9.6565e-05	-9.6611e-05	-9.6663e-05	-9.6721e-05	-9.6784e-05	-9.6852e-05	-9.6926e-05	-9.7005e-05	-9.7090e-05	-9.7180e-05	-9.7276e-05	-9.7378e-05	-9.7485e-05	-9.7597e-05	-9.7715e-05	-9.7839e-05
17	-2.2692e-04	-2.2692e-04	-2.2693e-04	-2.2695e-04	-2.2698e-04	-2.2702e-04	-2.2707e-04	-2.2713e-04	-2.2719e-04	-2.2726e-04	-2.2734e-04	-2.2743e-04	-2.2753e-04	-2.2764e-04	-2.2776e-04	-2.2788e-04	-2.2801e-04	-2.2815e-04	-2.2830e-04	-2.2846e-04	-2.2863e-04	-2.2881e-04	-2.2899e-04	-2.2919e-04
18	-3.2792e-04	-3.2792e-04	-3.2794e-04	-3.2796e-04	-3.2800e-04	-3.2805e-04	-3.2810e-04	-3.2817e-04	-3.2825e-04	-3.2834e-04	-3.2844e-04	-3.2855e-04	-3.2867e-04	-3.2880e-04	-3.2894e-04	-3.2909e-04	-3.2925e-04	-3.2943e-04	-3.2961e-04	-3.2980e-04	-3.3001e-04	-3.3022e-04	-3.3045e-04	-3.3068e-04
19	-3.8932e-04	-3.8933e-04	-3.8934e-04	-3.8937e-04	-3.8941e-04	-3.8946e-04	-3.8952e-04	-3.8959e-04	-3.8968e-04	-3.8977e-04	-3.8987e-04	-3.8999e-04	-3.9012e-04	-3.9025e-04	-3.9040e-04	-3.9056e-04	-3.9073e-04	-3.9092e-04	-3.9111e-04	-3.9131e-04	-3.9153e-04	-3.9175e-04	-3.9199e-04	-3.9224e-04
20	-4.0598e-04	-4.0598e-04	-4.0600e-04	-4.0602e-04	-4.0606e-04	-4.0611e-04	-4.0616e-04	-4.0623e-04	-4.0631e-04	-4.0640e-04	-4.0650e-04	-4.0660e-04	-4.0672e-04	-4.0685e-04	-4.0700e-04	-4.0715e-04	-4.0731e-04	-4.0748e-04	-4.0766e-04	-4.0786e-04	-4.0806e-04	-4.0827e-04	-4.0850e-04	-4.0873e-04
21	-3.7793e-04	-3.7793e-04	-3.7795e-04	-3.7797e-04	-3.7800e-04	-3.7804e-04	-3.7809e-04	-3.7814e-04	-3.7821e-04	-3.7828e-04	-3.7837e-04	-3.7846e-04	-3.7856e-04	-3.7867e-04	-3.7879e-04	-3.7892e-04	-3.7905e-04	-3.7920e-04	-3.7935e-04	-3.7951e-04	-3.7968e-04	-3.7986e-04	-3.8005e-04	-3.8025e-04
22	-3.1015e-04	-3.1016e-04	-3.1017e-04	-3.1018e-04	-3.1020e-04	-3.1023e-04	-3.1027e-04	-3.1031e-04	-3.1035e-04	-3.1041e-04	-3.1047e-04	-3.1053e-04	-3.1060e-04	-3.1068e-04	-3.1076e-04	-3.1085e-04	-3.1095e-04	-3.1105e-04	-3.1116e-04	-3.1128e-04	-3.1140e-04	-3.1153e-04	-3.1166e-04	-3.1180e-04
23	-2.1170e-04	-2.1170e-04	-2.1171e-04	-2.1172e-04	-2.1173e-04	-2.1174e-04	-2.1176e-04	-2.1178e-04	-2.1180e-04	-2.1183e-04	-2.1186e-04	-2.1189e-04	-2.1193e-04	-2.1197e-04	-2.1201e-04	-2.1205e-04	-2.1210e-04	-2.1215e-04	-2.1221e-04	-2.1227e-04	-2.1233e-04	-2.1239e-04	-2.1246e-04	-2.1253e-04
24	-9.4514e-05	-9.4514e-05	-9.4514e-05	-9.4513e-05	-9.4513e-05	-9.4512e-05	-9.4512e-05	-9.4511e-05	-9.4510e-05	-9.4509e-05	-9.4508e-05	-9.4506e-05	-9.4505e-05	-9.4503e-05	-9.4502e-05	-9.4500e-05	-9.4498e-05	-9.4496e-05	-9.4493e-05	-9.4491e-05	-9.4489e-05	-9.4486e-05	-9.4483e-05	-9.4480e-05
25	2.8021e-05	2.8022e-05	2.8027e-05	2.8035e-05	2.8046e-05	2.8060e-05	2.8077e-05	2.8098e-05	2.8121e-05	2.8148e-05	2.8178e-05	2.8211e-05	2.8247e-05	2.8286e-05	2.8328e-05	2.8374e-05	2.8422e-05	2.8474e-05	2.8529e-05	2.8587e-05	2.8649e-05	2.8713e-05	2.8781e-05	2.8852e-05
26	1.4255e-04	1.4256e-04	1.4257e-04	1.4258e-04	1.4260e-04	1.4263e-04	1.4266e-04	1.4269e-04	1.4274e-04	1.4278e-04	1.4284e-04	1.4290e-04	1.4296e-04	1.4303e-04	1.4311e-04	1.4319e-04	1.4328e-04	1.4337e-04	1.4347e-04	1.4358e-04	1.4369e-04	1.4380e-04	1.4393e-04	1.4405e-04
27	2.3718e-04	2.3719e-04	2.3720e-04	2.3722e-04	2.3724e-04	2.3728e-04	2.3732e-04	2.3737e-04	2.3742e-04	2.3749e-04	2.3756e-04	2.3764e-04	2.3772e-04	2.3782e-04	2.3792e-04	2.3803e-04	2.3814e-04	2.3827e-04	2.3840e-04	2.3854e-04	2.3868e-04	2.3884e-04	2.3900e-04	2.3917e-04
28	3.0263e-04	3.0264e-04	3.0265e-04	3.0267e-04	3.0270e-04	3.0274e-04	3.0278e-04	3.0284e-04	3.0290e-04	3.0298e-04	3.0306e-04	3.0314e-04	3.0324e-04	3.0335e-04	3.0346e-04	3.0358e-04	3.0372e-04	3.0386e-04	3.0400e-04	3.0416e-04	3.0433e-04	3.0450e-04	3.0468e-04	3.0487e-04
29	3.3310e-04	3.3310e-04	3.3312e-04	3.3314e-04	3.3317e-04	3.3321e-04	3.3325e-04	3.3331e-04	3.3337e-04	3.3345e-04	3.3353e-04	3.3362e-04	3.3371e-04	3.3382e-04	3.3394e-04	3.3406e-04	3.3419e-04	3.3433e-04	3.3448e-04	3.3464e-04	3.3481e-04	3.3498e-04	3.3517e-04	3.3536e-04
30	3.2674e-04	3.2674e-04	3.2676e-04	3.2678e-04	3.2680e-04	3.2684e-04	3.2688e-04	3.2693e-04	3.2699e-04	3.2706e-04	3.2713e-04	3.2721e-04	3.2730e-04	3.2740e-04	3.2750e-04	3.2761e-04	3.2773e-04	3.2786e-04	3.2800e-04	3.2814e-04	3.2829e-04	3.2845e-04	3.2862e-04	3.2879e-04
31	2.8571e-04	2.8572e-04	2.8573e-04	2.8574e-04	2.8576e-04	2.8579e-04	2.8582e-04	2.8587e-04	2.8591e-04	2.8596e-04	2.8602e-04	2.8609e-04	2.8616e-04	2.8624e-04	2.8632e-04	2.8641e-04	2.8651e-04	2.8661e-04	2.8672e-04	2.8684e-04	2.8696e-04	2.8709e-04	2.8722e-04	2.8736e-04
32	2.1582e-04	2.1583e-04	2.1583e-04	2.1584e-04	2.1586e-04	2.1587e-04	2.1590e-04	2.1592e-04	2.1595e-04	2.1599e-04	2.1603e-04	2.1607e-04	2.1612e-04	2.1617e-04	2.1622e-04	2.1628e-04	2.1635e-04	2.1641e-04	2.1648e-04	2.1656e-04	2.1664e-04	2.1672e-04	2.1681e-04	2.1690e-04
33	1.2581e-04	1.2581e-04	1.2581e-04	1.2581e-04	1.2582e-04	1.2583e-04	1.2584e-04	1.2585e-04	1.2586e-04	1.2587e-04	1.2588e-04	1.2590e-04	1.2592e-04	1.2594e-04	1.2596e-04	1.2598e-04	1.2600e-04	1.2603e-04	1.2605e-04	1.2608e-04	1.2611e-04	1.2614e-04	1.2618e-04	1.2621e-04
34	2.6312e-05	2.6311e-05	2.6309e-05	2.6306e-05	2.6302e-05	2.6296e-05	2.6290e-05	2.6282e-05	2.6272e-05	2.6262e-05	2.6250e-05	2.6237e-05	2.6223e-05	2.6208e-05	2.6191e-05	2.6173e-05	2.6154e-05	2.6134e-05	2.6112e-05	2.6089e-05	2.6065e-05	2.6040e-05	2.6013e-05	2.5986e-05
35	-7.1315e-05	-7.1317e-05	-7.1323e-05	-7.1333e-05	-7.1346e-05	-7.1363e-05	-7.1385e-05	-7.1410e-05	-7.1439e-05	-7.1471e-05	-7.1508e-05	-7.1549e-05	-7.1593e-05	-7.1641e-05	-7.1693e-05	-7.1749e-05	-7.1809e-05	-7.1873e-05	-7.1940e-05	-7.2012e-05	-7.2087e-05	-7.2166e-05	-7.2249e-05	-7.2336e-05
36	-1.5629e-04	-1.5630e-04	-1.5630e-04	-1.5632e-04	-1.5634e-04	-1.5637e-04	-1.5640e-04	-1.5644e-04	-1.5648e-04	-1.5654e-04	-1.5659e-04	-1.5666e-04	-1.5672e-04	-1.5680e-04	-1.5688e-04	-1.5697e-04	-1.5706e-04	-1.5716e-04	-1.5727e-04	-1.5738e-04	-1.5749e-04	-1.5762e-04	-1.5775e-04	-1.5788e-04
37	-2.1961e-04	-2.1961e-04	-2.1963e-04	-2.1964e-04	-2.1967e-04	-2.1970e-04	-2.1974e-04	-2.1979e-04	-2.1985e-04	-2.1991e-04	-2.1998e-04	-2.2006e-04	-2.2014e-04	-2.2024e-04	-2.2034e-04	-2.2044e-04	-2.2056e-04	-2.2068e-04	-2.2081e-04	-2.2095e-04	-2.2109e-04	-2.2124e-04	-2.2140e-04	-2.2157e-04

Table 4.1: Data for 80m water depth

AX

8193x1024 double

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
1	-4.6708e-04	-4.6709e-04	-4.6712e-04	-4.6716e-04	-4.6721e-04	-4.6729e-04	-4.6737e-04	-4.6748e-04	-4.6760e-04	-4.6774e-04	-4.6789e-04	-4.6806e-04	-4.6825e-04	-4.6845e-04	-4.6867e-04	-4.6891e-04	-4.6916e-04	-4.6942e-04	-4.6971e-04	-4.7001e-04	-4.7032e-04	-4.7066e-04	-4.7101e-04	-4.7137e-04
2	-4.7721e-04	-4.7722e-04	-4.7724e-04	-4.7728e-04	-4.7734e-04	-4.7741e-04	-4.7750e-04	-4.7761e-04	-4.7773e-04	-4.7786e-04	-4.7802e-04	-4.7819e-04	-4.7838e-04	-4.7858e-04	-4.7880e-04	-4.7903e-04	-4.7928e-04	-4.7955e-04	-4.7984e-04	-4.8014e-04	-4.8045e-04	-4.8079e-04	-4.8114e-04	-4.8150e-04
3	-4.2846e-04	-4.2847e-04	-4.2849e-04	-4.2852e-04	-4.2857e-04	-4.2863e-04	-4.2871e-04	-4.2880e-04	-4.2891e-04	-4.2903e-04	-4.2916e-04	-4.2931e-04	-4.2947e-04	-4.2965e-04	-4.2984e-04	-4.3004e-04	-4.3026e-04	-4.3049e-04	-4.3074e-04	-4.3100e-04	-4.3128e-04	-4.3157e-04	-4.3187e-04	-4.3219e-04
4	-3.2739e-04	-3.2739e-04	-3.2741e-04	-3.2743e-04	-3.2747e-04	-3.2751e-04	-3.2757e-04	-3.2764e-04	-3.2771e-04	-3.2780e-04	-3.2789e-04	-3.2800e-04	-3.2812e-04	-3.2824e-04	-3.2838e-04	-3.2853e-04	-3.2868e-04	-3.2885e-04	-3.2903e-04	-3.2922e-04	-3.2942e-04	-3.2962e-04	-3.2984e-04	-3.3007e-04
5	-1.8707e-04	-1.8707e-04	-1.8708e-04	-1.8709e-04	-1.8711e-04	-1.8713e-04	-1.8716e-04	-1.8719e-04	-1.8723e-04	-1.8727e-04	-1.8732e-04	-1.8737e-04	-1.8743e-04	-1.8749e-04	-1.8756e-04	-1.8763e-04	-1.8771e-04	-1.8779e-04	-1.8788e-04	-1.8797e-04	-1.8807e-04	-1.8817e-04	-1.8828e-04	-1.8839e-04
6	-2.5303e-05	-2.5303e-05	-2.5302e-05	-2.5301e-05	-2.5298e-05	-2.5296e-05	-2.5292e-05	-2.5288e-05	-2.5283e-05	-2.5278e-05	-2.5272e-05	-2.5265e-05	-2.5258e-05	-2.5250e-05	-2.5242e-05	-2.5233e-05	-2.5223e-05	-2.5213e-05	-2.5202e-05	-2.5190e-05	-2.5178e-05	-2.5165e-05	-2.5151e-05	-2.5137e-05
7	1.3778e-04	1.3779e-04	1.3780e-04	1.3781e-04	1.3783e-04	1.3786e-04	1.3789e-04	1.3793e-04	1.3797e-04	1.3802e-04	1.3808e-04	1.3814e-04	1.3821e-04	1.3829e-04	1.3837e-04	1.3845e-04	1.3855e-04	1.3864e-04	1.3875e-04	1.3886e-04	1.3898e-04	1.3910e-04	1.3923e-04	1.3936e-04
8	2.8234e-04	2.8234e-04	2.8236e-04	2.8238e-04	2.8242e-04	2.8247e-04	2.8252e-04	2.8259e-04	2.8267e-04	2.8276e-04	2.8285e-04	2.8296e-04	2.8308e-04	2.8321e-04	2.8335e-04	2.8350e-04	2.8366e-04	2.8384e-04	2.8402e-04	2.8421e-04	2.8441e-04	2.8463e-04	2.8485e-04	2.8508e-04
9	3.9128e-04	3.9128e-04	3.9130e-04	3.9134e-04	3.9138e-04	3.9144e-04	3.9152e-04	3.9160e-04	3.9170e-04	3.9182e-04	3.9194e-04	3.9208e-04	3.9224e-04	3.9240e-04	3.9258e-04	3.9278e-04	3.9298e-04	3.9320e-04	3.9344e-04	3.9368e-04	3.9394e-04	3.9422e-04	3.9451e-04	3.9481e-04
10	4.5235e-04	4.5236e-04	4.5238e-04	4.5242e-04	4.5247e-04	4.5253e-04	4.5261e-04	4.5271e-04	4.5282e-04	4.5294e-04	4.5308e-04	4.5323e-04	4.5340e-04	4.5358e-04	4.5377e-04	4.5398e-04	4.5421e-04	4.5445e-04	4.5470e-04	4.5497e-04	4.5525e-04	4.5555e-04	4.5586e-04	4.5619e-04
11	4.5951e-04	4.5951e-04	4.5953e-04	4.5957e-04	4.5962e-04	4.5968e-04	4.5975e-04	4.5984e-04	4.5995e-04	4.6006e-04	4.6019e-04	4.6034e-04	4.6050e-04	4.6067e-04	4.6085e-04	4.6105e-04	4.6127e-04	4.6149e-04	4.6173e-04	4.6199e-04	4.6226e-04	4.6254e-04	4.6284e-04	4.6315e-04
12	4.1337e-04	4.1338e-04	4.1340e-04	4.1342e-04	4.1346e-04	4.1352e-04	4.1358e-04	4.1365e-04	4.1374e-04	4.1383e-04	4.1394e-04	4.1406e-04	4.1419e-04	4.1433e-04	4.1449e-04	4.1465e-04	4.1483e-04	4.1501e-04	4.1521e-04	4.1542e-04	4.1564e-04	4.1588e-04	4.1612e-04	4.1638e-04
13	3.2095e-04	3.2095e-04	3.2096e-04	3.2098e-04	3.2101e-04	3.2104e-04	3.2108e-04	3.2113e-04	3.2119e-04	3.2125e-04	3.2133e-04	3.2141e-04	3.2150e-04	3.2159e-04	3.2169e-04	3.2180e-04	3.2192e-04	3.2205e-04	3.2218e-04	3.2232e-04	3.2247e-04	3.2263e-04	3.2279e-04	3.2297e-04
14	1.9444e-04	1.9444e-04	1.9445e-04	1.9445e-04	1.9446e-04	1.9448e-04	1.9450e-04	1.9452e-04	1.9454e-04	1.9457e-04	1.9460e-04	1.9463e-04	1.9467e-04	1.9471e-04	1.9475e-04	1.9480e-04	1.9484e-04	1.9490e-04	1.9495e-04	1.9501e-04	1.9507e-04	1.9514e-04	1.9521e-04	1.9528e-04
15	4.9591e-05	4.9590e-05	4.9588e-05	4.9584e-05	4.9579e-05	4.9573e-05	4.9565e-05	4.9556e-05	4.9546e-05	4.9534e-05	4.9521e-05	4.9506e-05	4.9490e-05	4.9472e-05	4.9453e-05	4.9433e-05	4.9411e-05	4.9388e-05	4.9363e-05	4.9337e-05	4.9309e-05	4.9280e-05	4.9250e-05	4.9218e-05
16	-9.6390e-05	-9.6393e-05	-9.6401e-05	-9.6415e-05	-9.6434e-05	-9.6458e-05	-9.6488e-05	-9.6524e-05	-9.6565e-05	-9.6611e-05	-9.6663e-05	-9.6721e-05	-9.6784e-05	-9.6852e-05	-9.6926e-05	-9.7005e-05	-9.7090e-05	-9.7180e-05	-9.7276e-05	-9.7378e-05	-9.7485e-05	-9.7597e-05	-9.7715e-05	-9.7839e-05
17	-2.2692e-04	-2.2692e-04	-2.2693e-04	-2.2695e-04	-2.2698e-04	-2.2702e-04	-2.2707e-04	-2.2713e-04	-2.2719e-04	-2.2726e-04	-2.2734e-04	-2.2743e-04	-2.2753e-04	-2.2764e-04	-2.2776e-04	-2.2788e-04	-2.2801e-04	-2.2815e-04	-2.2830e-04	-2.2846e-04	-2.2863e-04	-2.2881e-04	-2.2899e-04	-2.2919e-04
18	-3.2792e-04	-3.2792e-04	-3.2794e-04	-3.2796e-04	-3.2800e-04	-3.2805e-04	-3.2810e-04	-3.2817e-04	-3.2825e-04	-3.2834e-04	-3.2844e-04	-3.2855e-04	-3.2867e-04	-3.2880e-04	-3.2894e-04	-3.2909e-04	-3.2925e-04	-3.2943e-04	-3.2961e-04	-3.2980e-04	-3.3001e-04	-3.3022e-04	-3.3045e-04	-3.3068e-04
19	-3.8932e-04	-3.8933e-04	-3.8934e-04	-3.8937e-04	-3.8941e-04	-3.8946e-04	-3.8952e-04	-3.8959e-04	-3.8968e-04	-3.8977e-04	-3.8987e-04	-3.8999e-04	-3.9012e-04	-3.9025e-04	-3.9040e-04	-3.9056e-04	-3.9073e-04	-3.9092e-04	-3.9111e-04	-3.9131e-04	-3.9153e-04	-3.9175e-04	-3.9199e-04	-3.9224e-04
20	-4.0598e-04	-4.0598e-04	-4.0600e-04	-4.0602e-04	-4.0606e-04	-4.0611e-04	-4.0616e-04	-4.0623e-04	-4.0631e-04	-4.0640e-04	-4.0650e-04	-4.0660e-04	-4.0672e-04	-4.0685e-04	-4.0700e-04	-4.0715e-04	-4.0731e-04	-4.0748e-04	-4.0766e-04	-4.0786e-04	-4.0806e-04	-4.0827e-04	-4.0850e-04	-4.0873e-04
21	-3.7793e-04	-3.7793e-04	-3.7795e-04	-3.7797e-04	-3.7800e-04	-3.7804e-04	-3.7809e-04	-3.7814e-04	-3.7821e-04	-3.7828e-04	-3.7837e-04	-3.7846e-04	-3.7856e-04	-3.7867e-04	-3.7879e-04	-3.7892e-04	-3.7905e-04	-3.7920e-04	-3.7935e-04	-3.7951e-04	-3.7968e-04	-3.7986e-04	-3.8005e-04	-3.8025e-04
22	-3.1015e-04	-3.1016e-04	-3.1017e-04	-3.1018e-04	-3.1020e-04	-3.1023e-04	-3.1027e-04	-3.1031e-04	-3.1035e-04	-3.1041e-04	-3.1047e-04	-3.1053e-04	-3.1060e-04	-3.1068e-04	-3.1076e-04	-3.1085e-04	-3.1095e-04	-3.1105e-04	-3.1116e-04	-3.1128e-04	-3.1140e-04	-3.1153e-04	-3.1166e-04	-3.1180e-04
23	-2.1170e-04	-2.1170e-04	-2.1171e-04	-2.1172e-04	-2.1173e-04	-2.1174e-04	-2.1176e-04	-2.1178e-04	-2.1180e-04	-2.1183e-04	-2.1186e-04	-2.1189e-04	-2.1193e-04	-2.1197e-04	-2.1201e-04	-2.1205e-04	-2.1210e-04	-2.1215e-04	-2.1221e-04	-2.1227e-04	-2.1233e-04	-2.1239e-04	-2.1246e-04	-2.1253e-04
24	-9.4514e-05	-9.4514e-05	-9.4514e-05	-9.4513e-05	-9.4513e-05	-9.4512e-05	-9.4512e-05	-9.4511e-05	-9.4510e-05	-9.4509e-05	-9.4508e-05	-9.4506e-05	-9.4505e-05	-9.4503e-05	-9.4502e-05	-9.4500e-05	-9.4498e-05	-9.4496e-05	-9.4493e-05	-9.4491e-05	-9.4489e-05	-9.4486e-05	-9.4483e-05	-9.4480e-05
25	2.8021e-05	2.8022e-05	2.8027e-05	2.8035e-05	2.8046e-05	2.8060e-05	2.8077e-05	2.8098e-05	2.8121e-05	2.8148e-05	2.8178e-05	2.8211e-05	2.8247e-05	2.8286e-05	2.8328e-05	2.8374e-05	2.8422e-05	2.8474e-05	2.8529e-05	2.8587e-05	2.8649e-05	2.8713e-05	2.8781e-05	2.8852e-05
26	1.4255e-04	1.4256e-04	1.4257e-04	1.4258e-04	1.4260e-04	1.4263e-04	1.4266e-04	1.4269e-04	1.4274e-04	1.4278e-04	1.4284e-04	1.4290e-04	1.4296e-04	1.4303e-04	1.4311e-04	1.4319e-04	1.4328e-04	1.4337e-04	1.4347e-04	1.4358e-04	1.4369e-04	1.4380e-04	1.4393e-04	1.4405e-04
27	2.3718e-04	2.3719e-04	2.3720e-04	2.3722e-04	2.3724e-04	2.3728e-04	2.3732e-04	2.3737e-04	2.3742e-04	2.3749e-04	2.3756e-04	2.3764e-04	2.3772e-04	2.3782e-04	2.3792e-04	2.3803e-04	2.3814e-04	2.3827e-04	2.3840e-04	2.3854e-04	2.3868e-04	2.3884e-04	2.3900e-04	2.3917e-04
28	3.0263e-04	3.0264e-04	3.0265e-04	3.0267e-04	3.0270e-04	3.0274e-04	3.0278e-04	3.0284e-04	3.0290e-04	3.0298e-04	3.0306e-04	3.0314e-04	3.0324e-04	3.0335e-04	3.0346e-04	3.0358e-04	3.0372e-04	3.0386e-04	3.0400e-04	3.0416e-04	3.0433e-04	3.0450e-04	3.0468e-04	3.0487e-04
29	3.3310e-04	3.3310e-04	3.3312e-04	3.3314e-04	3.3317e-04	3.3321e-04	3.3325e-04	3.3331e-04	3.3337e-04	3.3345e-04	3.3353e-04	3.3362e-04	3.3371e-04	3.3382e-04	3.3394e-04	3.3406e-04	3.3419e-04	3.3433e-04	3.3448e-04	3.3464e-04	3.3481e-04	3.3498e-04	3.3517e-04	3.3536e-04
30	3.2674e-04	3.2674e-04	3.2676e-04	3.2678e-04	3.2680e-04	3.2684e-04	3.2688e-04	3.2693e-04	3.2699e-04	3.2706e-04	3.2713e-04	3.2721e-04	3.2730e-04	3.2740e-04	3.2750e-04	3.2761e-04	3.2773e-04	3.2786e-04	3.2800e-04	3.2814e-04	3.2829e-04	3.2845e-04	3.2862e-04	3.2879e-04
31	2.8571e-04	2.8572e-04	2.8573e-04	2.8574e-04	2.8576e-04	2.8579e-04	2.8582e-04	2.8587e-04	2.8591e-04	2.8596e-04	2.8602e-04	2.8609e-04	2.8616e-04	2.8624e-04	2.8632e-04	2.8641e-04	2.8651e-04	2.8661e-04	2.8672e-04	2.8684e-04	2.8696e-04	2.8709e-04	2.8722e-04	2.8736e-04
32	2.1582e-04	2.1583e-04	2.1583e-04	2.1584e-04	2.1586e-04	2.1587e-04	2.1590e-04	2.1592e-04	2.1595e-04	2.1599e-04	2.1603e-04	2.1607e-04	2.1612e-04	2.1617e-04	2.1622e-04	2.1628e-04	2.1635e-04	2.1641e-04	2.1648e-04	2.1656e-04	2.1664e-04	2.1672e-04	2.1681e-04	2.1690e-04
33	1.2581e-04	1.2581e-04	1.2581e-04	1.2581e-04	1.2582e-04	1.2583e-04	1.2584e-04	1.2585e-04	1.2586e-04	1.2587e-04	1.2588e-04	1.2590e-04	1.2592e-04	1.2594e-04	1.2596e-04	1.2598e-04	1.2600e-04	1.2603e-04	1.2605e-04	1.2608e-04	1.2611e-04	1.2614e-04	1.2618e-04	1.2621e-04
34	2.6312e-05	2.6311e-05	2.6309e-05	2.6306e-05	2.6302e-05	2.6296e-05	2.6290e-05	2.6282e-05	2.6272e-05	2.6262e-05	2.6250e-05	2.6237e-05	2.6223e-05	2.6208e-05	2.6191e-05	2.6173e-05	2.6154e-05	2.6134e-05	2.6112e-05	2.6089e-05	2.6065e-05	2.6040e-05	2.6013e-05	2.5986e-05
35	-7.1315e-05	-7.1317e-05	-7.1323e-05	-7.1333e-05	-7.1346e-05	-7.1363e-05	-7.1385e-05	-7.1410e-05	-7.1439e-05	-7.1471e-05	-7.1508e-05	-7.1549e-05	-7.1593e-05	-7.1641e-05	-7.1693e-05	-7.1749e-05	-7.1809e-05	-7.1873e-05	-7.1940e-05	-7.2012e-05	-7.2087e-05	-7.2166e-05	-7.2249e-05	-7.2336e-05
36	-1.5629e-04	-1.5630e-04	-1.5630e-04	-1.5632e-04	-1.5634e-04	-1.5637e-04	-1.5640e-04	-1.5644e-04	-1.5648e-04	-1.5654e-04	-1.5659e-04	-1.5666e-04	-1.5672e-04	-1.5680e-04	-1.5688e-04	-1.5697e-04	-1.5706e-04	-1.5716e-04	-1.5727e-04	-1.5738e-04	-1.5749e-04	-1.5762e-04	-1.5775e-04	-1.5788e-04
37	-2.1961e-04	-2.1961e-04	-2.1963e-04	-2.1964e-04	-2.1967e-04	-2.1970e-04	-2.1974e-04	-2.1979e-04	-2.1985e-04	-2.1991e-04	-2.1998e-04	-2.2006e-04	-2.2014e-04	-2.2024e-04	-2.2034e-04	-2.2044e-04	-2.2056e-04	-2.2068e-04	-2.2081e-04	-2.2095e-04	-2.2109e-04	-2.2124e-04	-2.2140e-04	-2.2157e-04

Table 4.2: Data for 180m water depth

The drag coefficient and inertia coefficient for regular wave is obtained by substitute the 80m and 180m water depth into the coefficient with the wave characteristic obtained from Petronas Technical Standard (PTS). The drag coefficient and inertia coefficient to the vertical cylinder which is the column for fixed jacket platform shows at the figures below using the absolute values of the results. The figure below shows that the drag coefficient and inertia coefficient for regular wave and irregular wave with 80m water depth and 180m water depth.

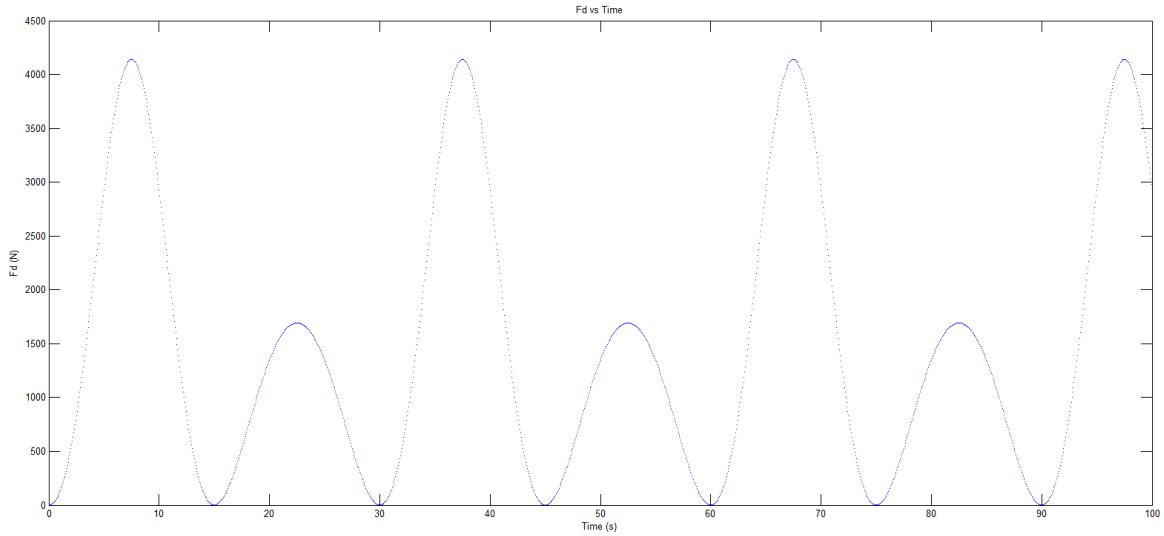

Figure 4.4: Drag coefficient for regular wave with 80m water depth

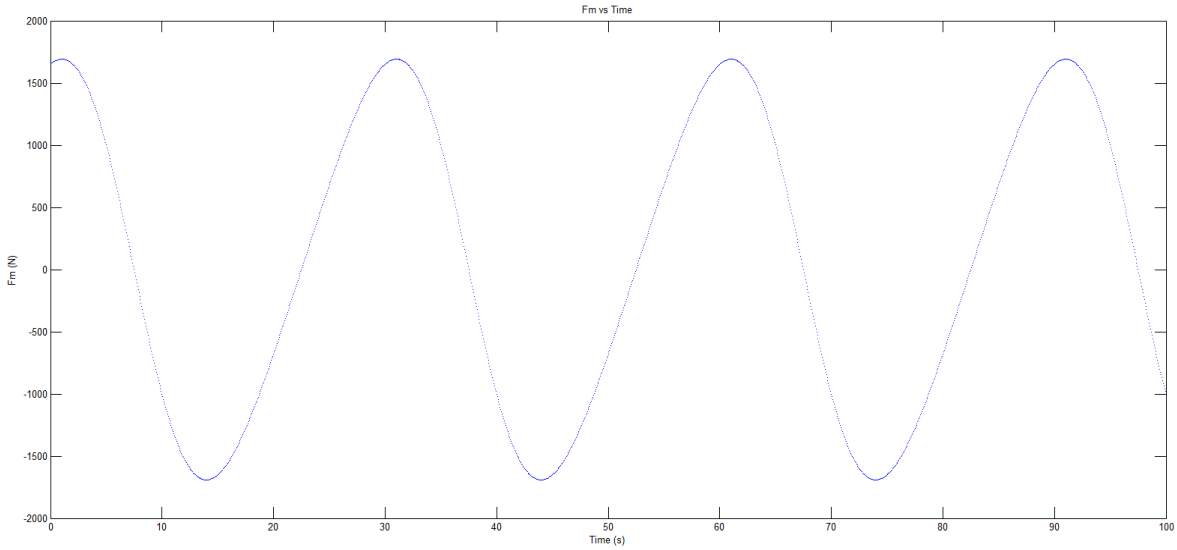

Figure 4.5: Inertia coefficient for regular wave with 80m water depth

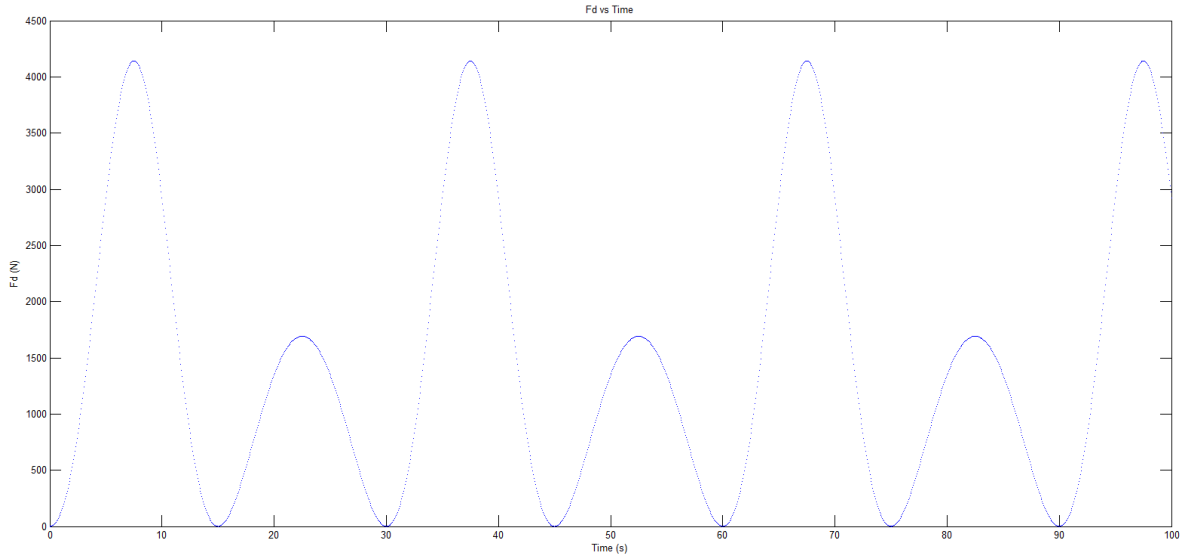

Figure 4.6: Drag coefficient for regular wave with 180m water depth

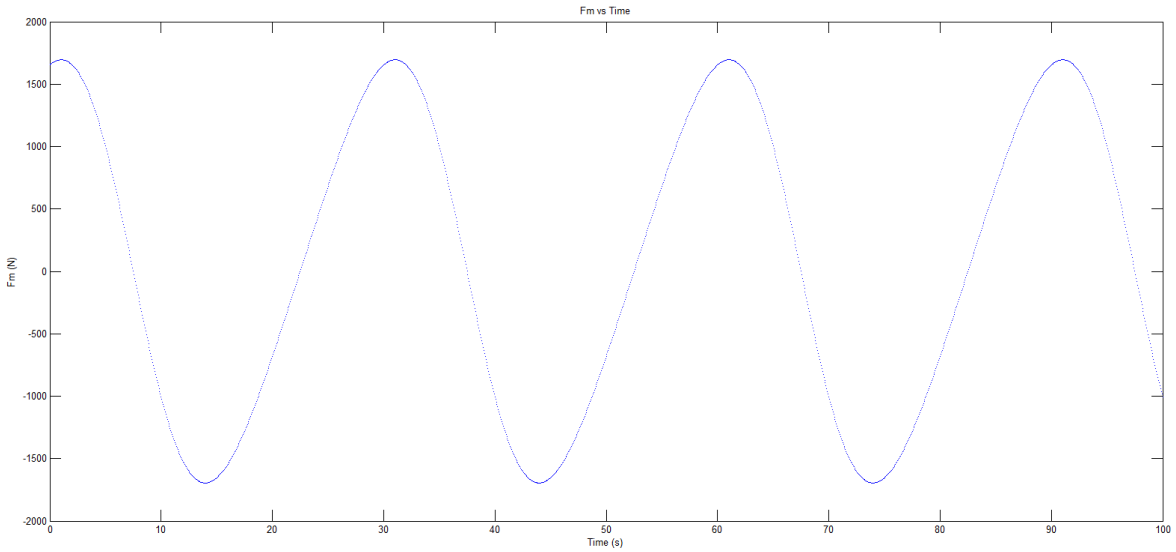

Figure 4.7: Inertia coefficient for regular wave with 180m water depth

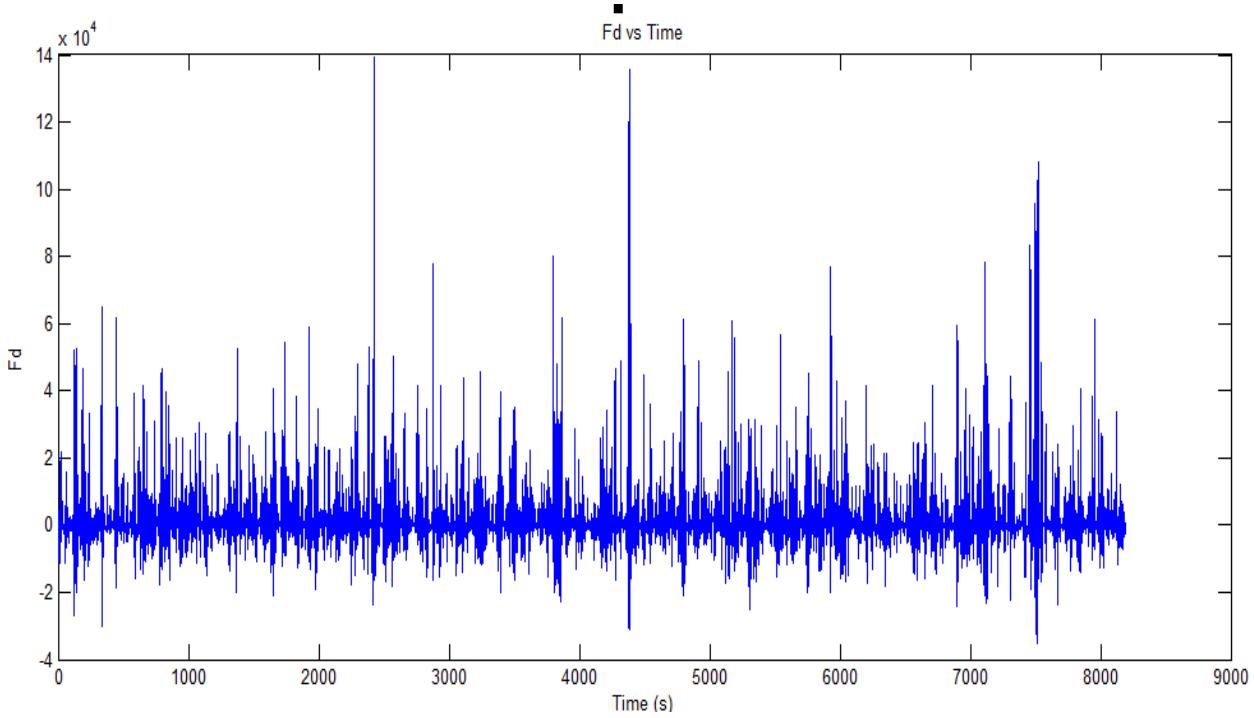

Figure 4.8 : Drag coefficient for irregular wave with 80m water depth

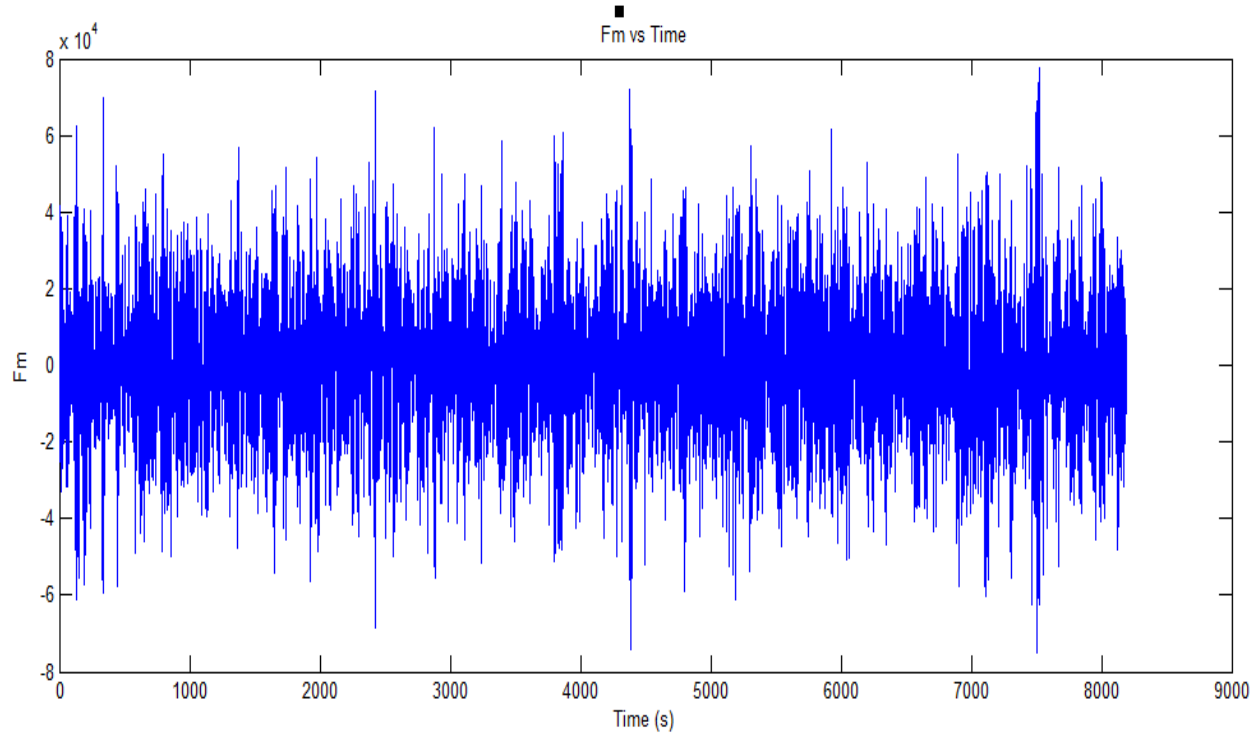

Figure 4.9 : Inertia coefficient for irregular wave with 80m water depth

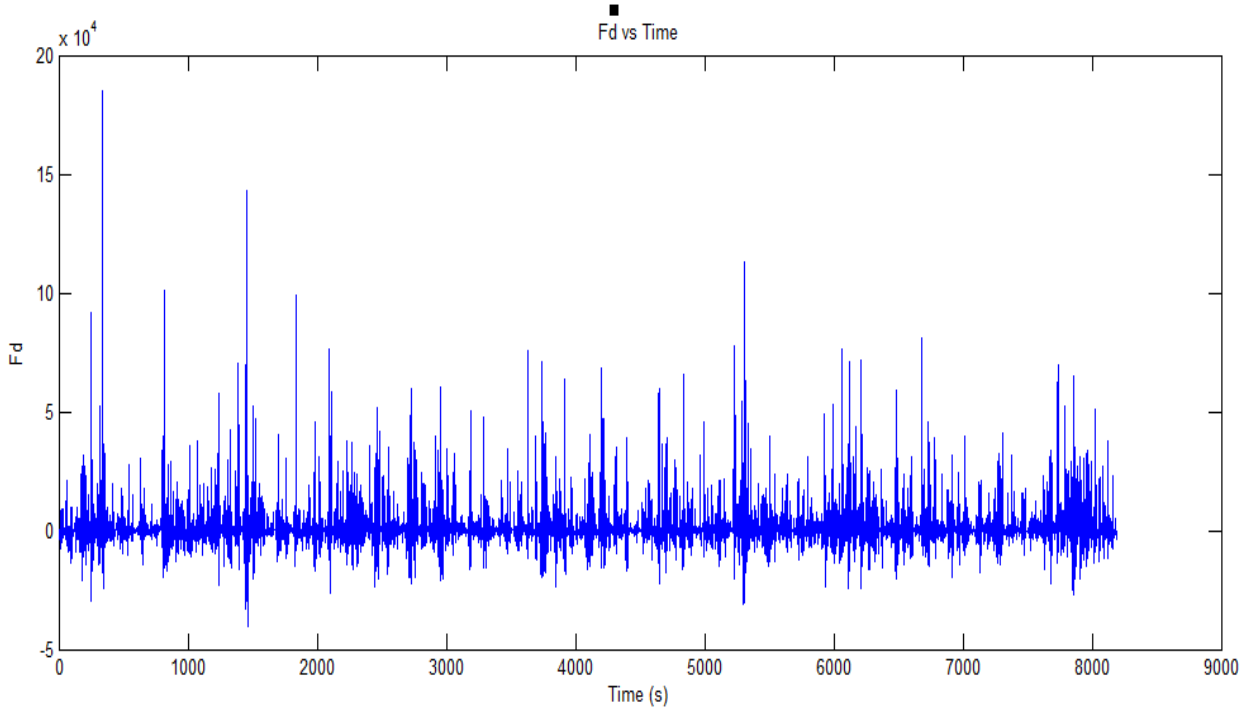

Figure 4.10: Drag coefficient for irregular wave with 180m water depth

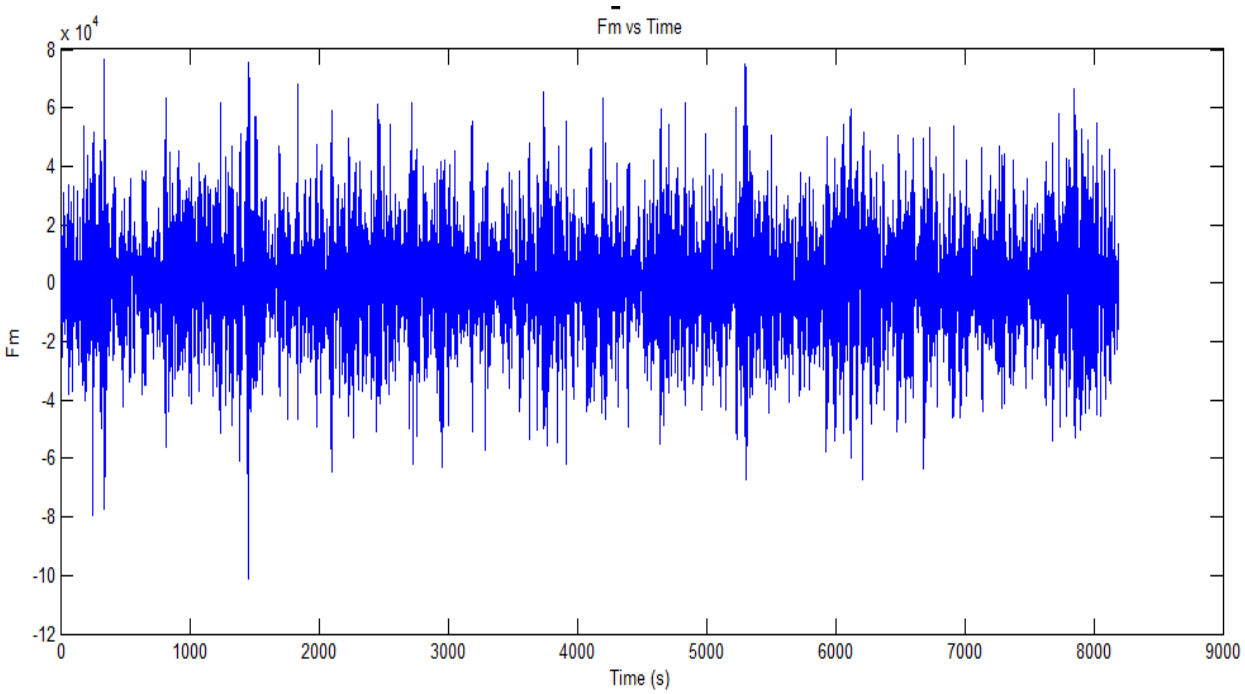

Figure 4.11: Inertia coefficient for irregular wave with 180m water depth

Based on figure above shows that the drag coefficient and inertia coefficient for regular wave decrease when the water depth increase. The drag coefficient and inertia coefficient for irregular wave reach the highest peak which is at water depth 180m and the average values change a little bit. The average values for the regular waves are 26% higher than the irregular wave , while the maximum drag coefficient and inertia coefficient are induced by the irregular waves is 75% higher than the regular waves.

4.3 Impact of water depth on Total Force

For this part, the total force investigated for a vertical cylinder with different water depth . The water depth data shows at Table 4.1 and Table 4.2 for 80m and 180m water depth. The table is for irregular wave water depth and for the regular wave, the 80m and 180m is substitute into the Morison Equation to obtain the total force. The total force acting to the vertical cylinder which is the column for fixed jacket platform shows at the figures below using the absolute values of the results. The figure below shows that the total force for regular wave and irregular wave with 80m water depth and 180m water depth.

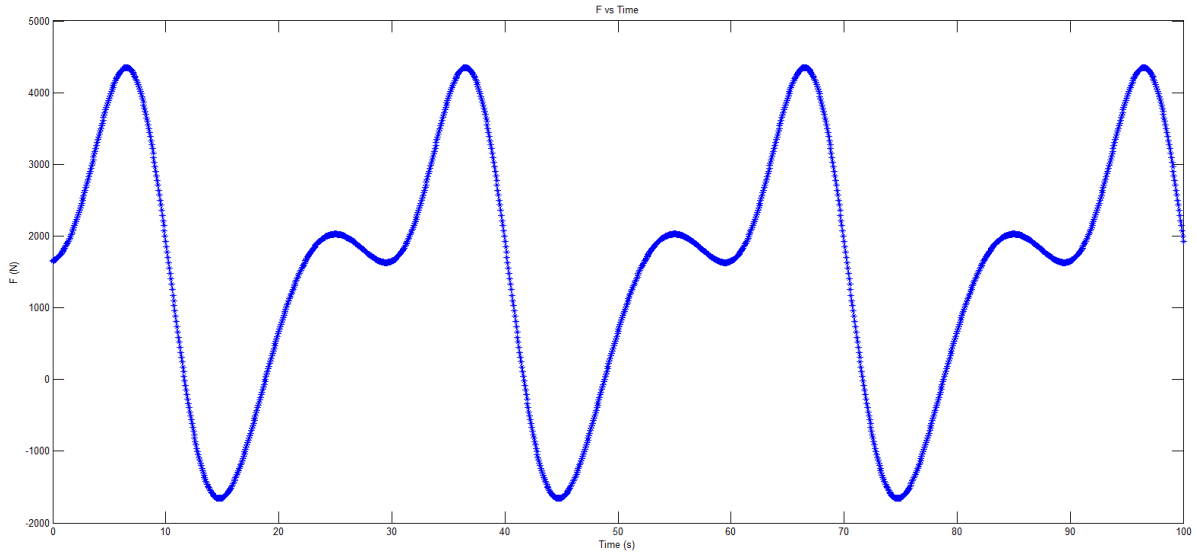

Figure 4.12: Total force for regular wave with 80m water depth

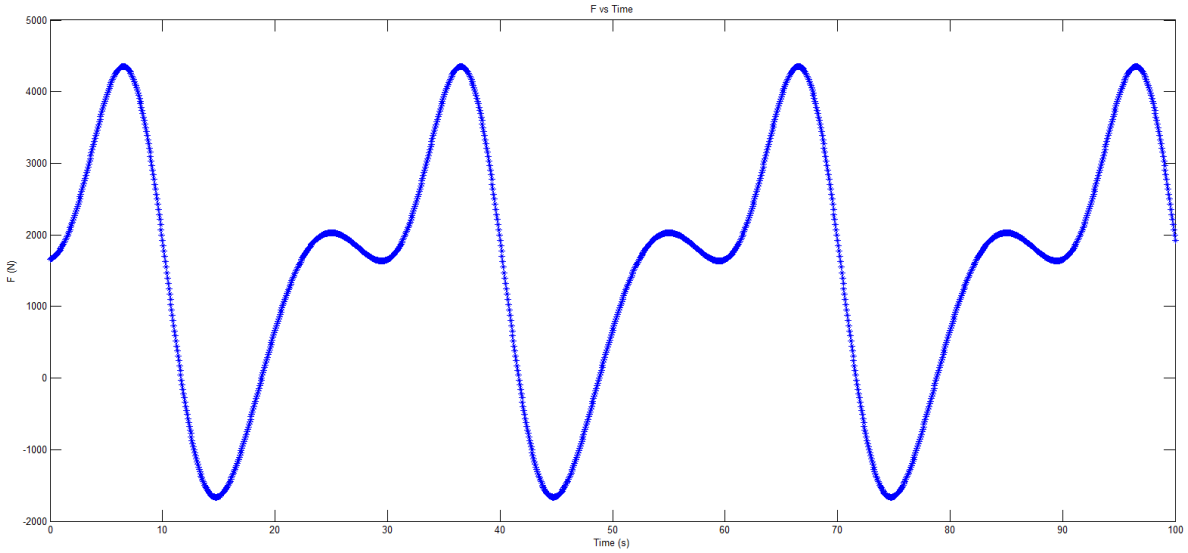

Figure 4.13: Total Force for regular wave with 180m water depth

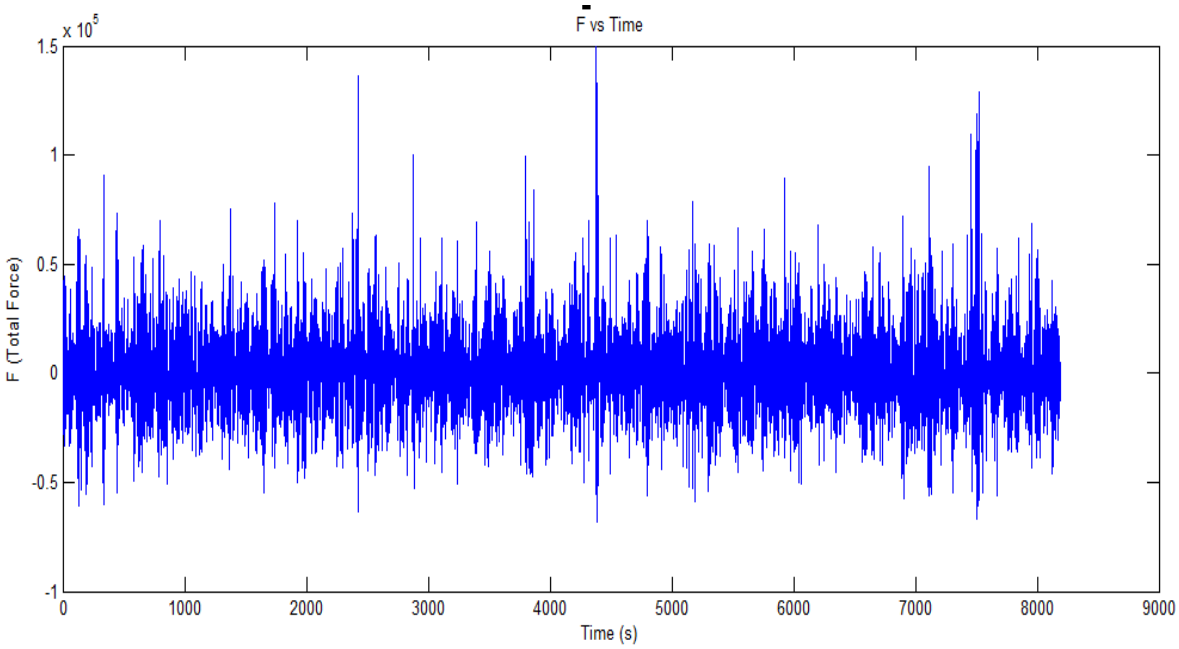

Figure 4.14: Total Force for irregular wave with 80m water depth

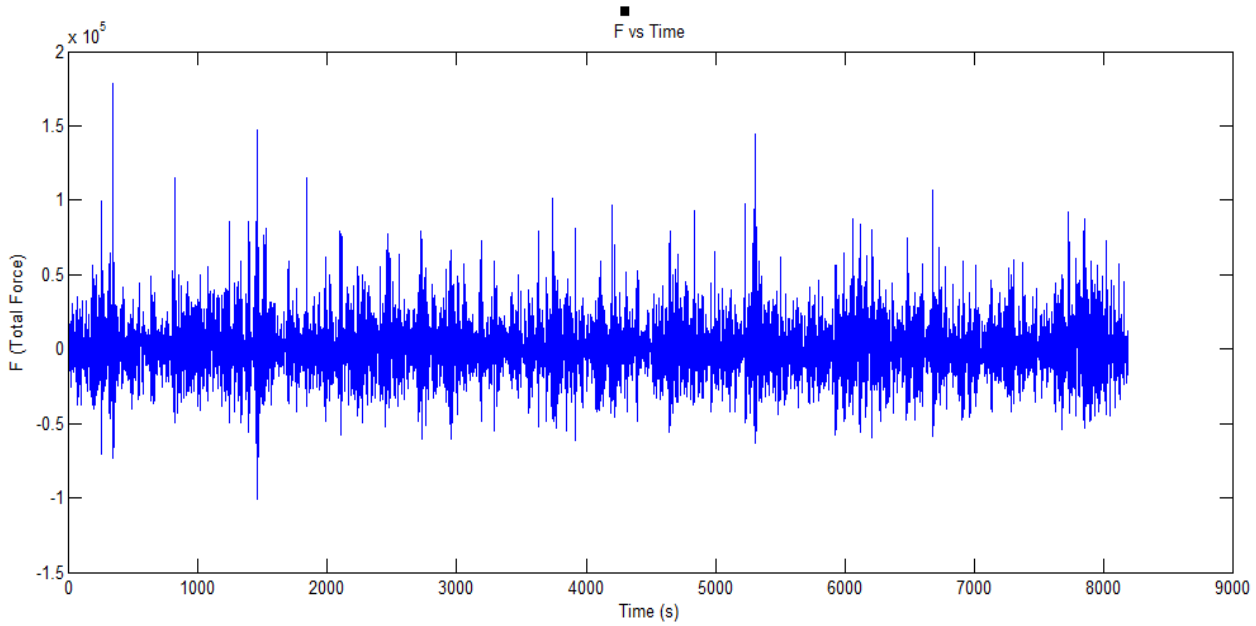

Figure 4.15: Total Force for irregular wave with 180m water depth

Based on figure above shows that the total force for regular wave decrease when the water depth increase. The total force for irregular wave reach the highest peak which is at water depth 180m at time from 1 to 1000s and the average values change a little bit. The average values for the regular waves are 30% higher than the irregular wave , while the Total Force are induced by the irregular waves is 70% higher than the regular waves. Therefore, this shows that irregular waves have larger total force than the regular waves

CONCLUSION & RECOMMENDATION

5.1 Conclusion

In conclusion, this project will focus on the effects of non-irregular wave kinematics to the offshore structure . Furthermore, the kinematics irregular wave will be tested for different wave water depth to obtain the drag coefficient, inertia coefficient and total force. Proper method and procedures will be identified to carry out the simulation process. Data analysis will be comparing the regular wave results with the irregular waves result.

For the results, the drag coefficient and inertia coefficient for the regular wave decrease when the water depth increase . For the irregular waves, the drag coefficient and inertia coefficient give much greater values then the regular waves, while the averages values are lower than the regular waves. For the respect to the different wave depth, the total force for regular waves decrease when the water depth increase. The total force for irregular waves reach the highest peak and the averages values change a little bit. This shows that total force for irregular waves have high value than total force in regular wave . From the discussion , it shown that the irregular waves give more significant results than regular waves.

Lastly, through this project , the author hope that author achieve the objective which is to compare the difference between regular wave and irregular waves , determine the difference due to various method in calculating kinematics by using Morison Equation and to determine the effects of water depth to the wave force.

5.1 Recommendation

For recommendations, more factors can be study in order to gain more understanding on non-irregular waves effects to the offshore structure . Moreover, more method can be study such as experimental and laboratory. Other wave theories and wave spectra such as Fast Fourier Transform, First order theory, Second order theory and other can be study to gain more knowledge about the irregular wave theory. It is important to have essential information on all the factors in order to design offshore structure. Hopefully, this project will add more understanding on non-irregular wave kinematic to the offshore structure for future development.

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