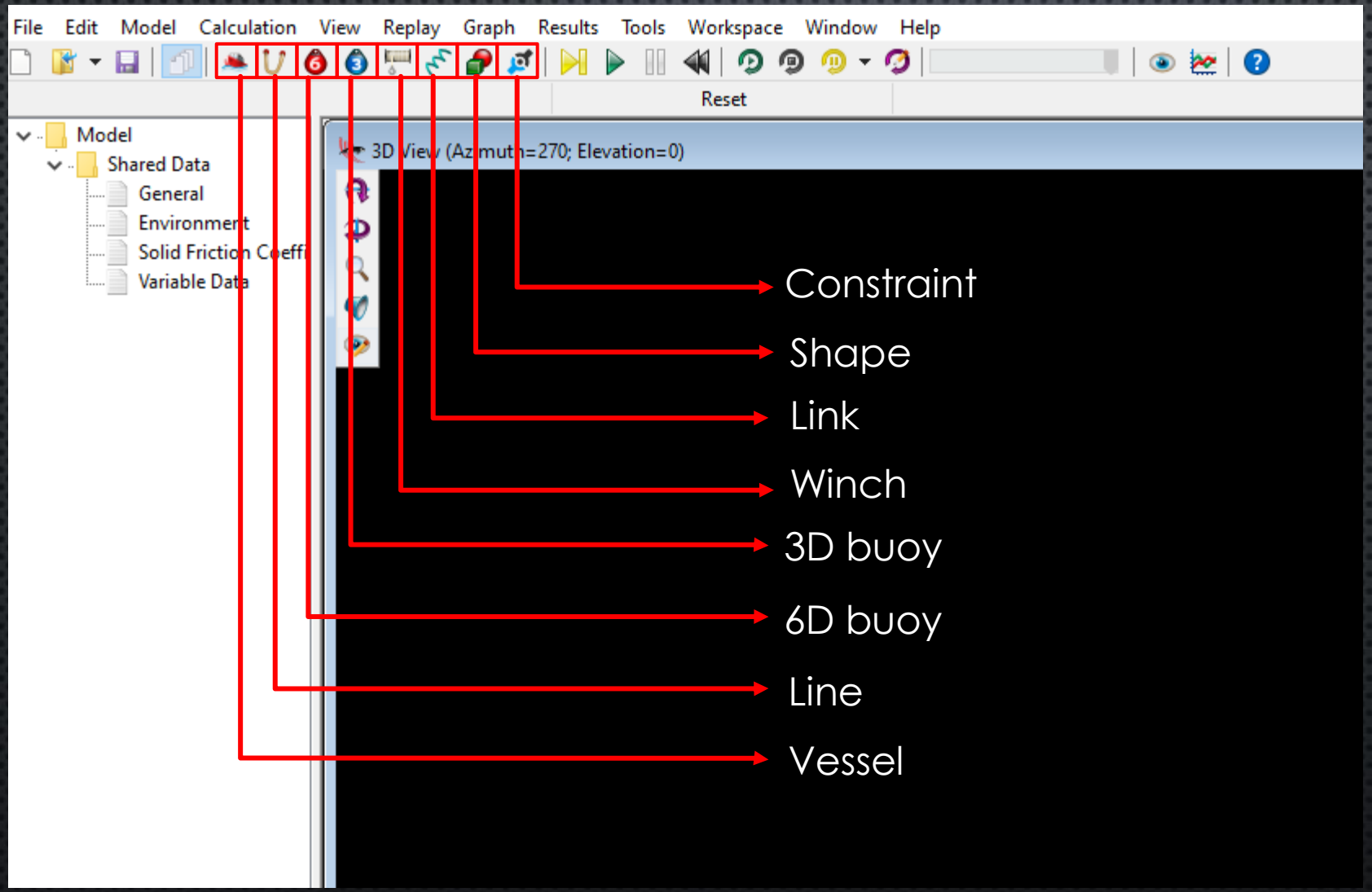
MOORING ANALYSIS USING **ORCAFLEX**

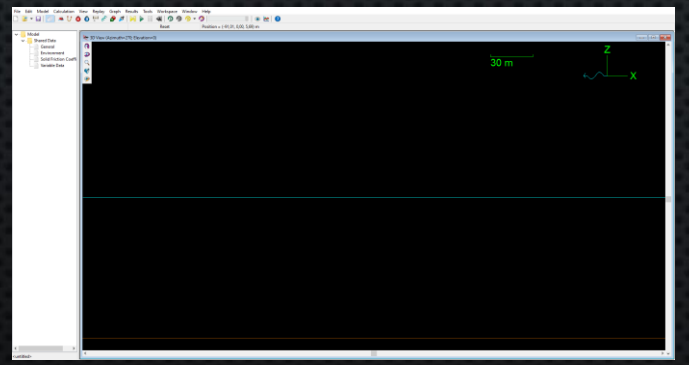
BY: NUGIE RAMADHAN

Jetty Mooring System

BAB 1
INTRODUCTION

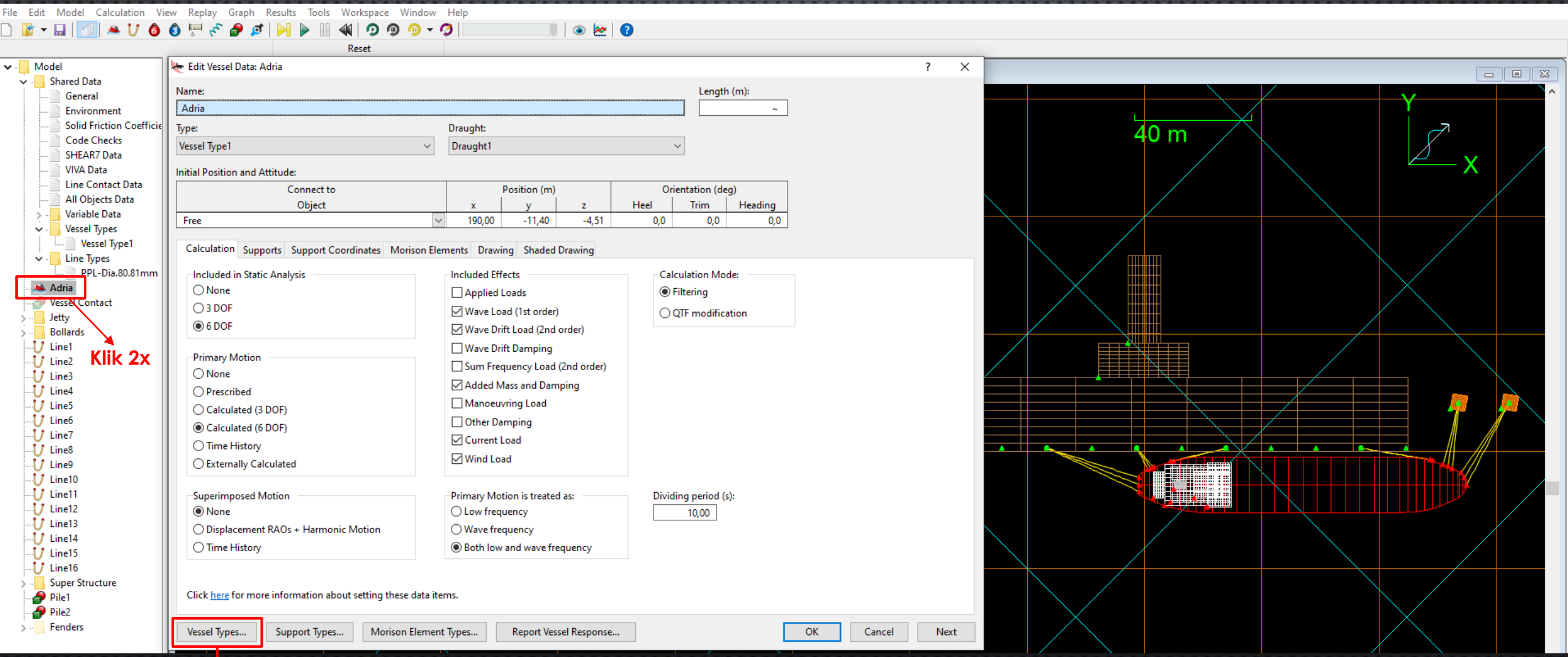
Orcaflex Operation System



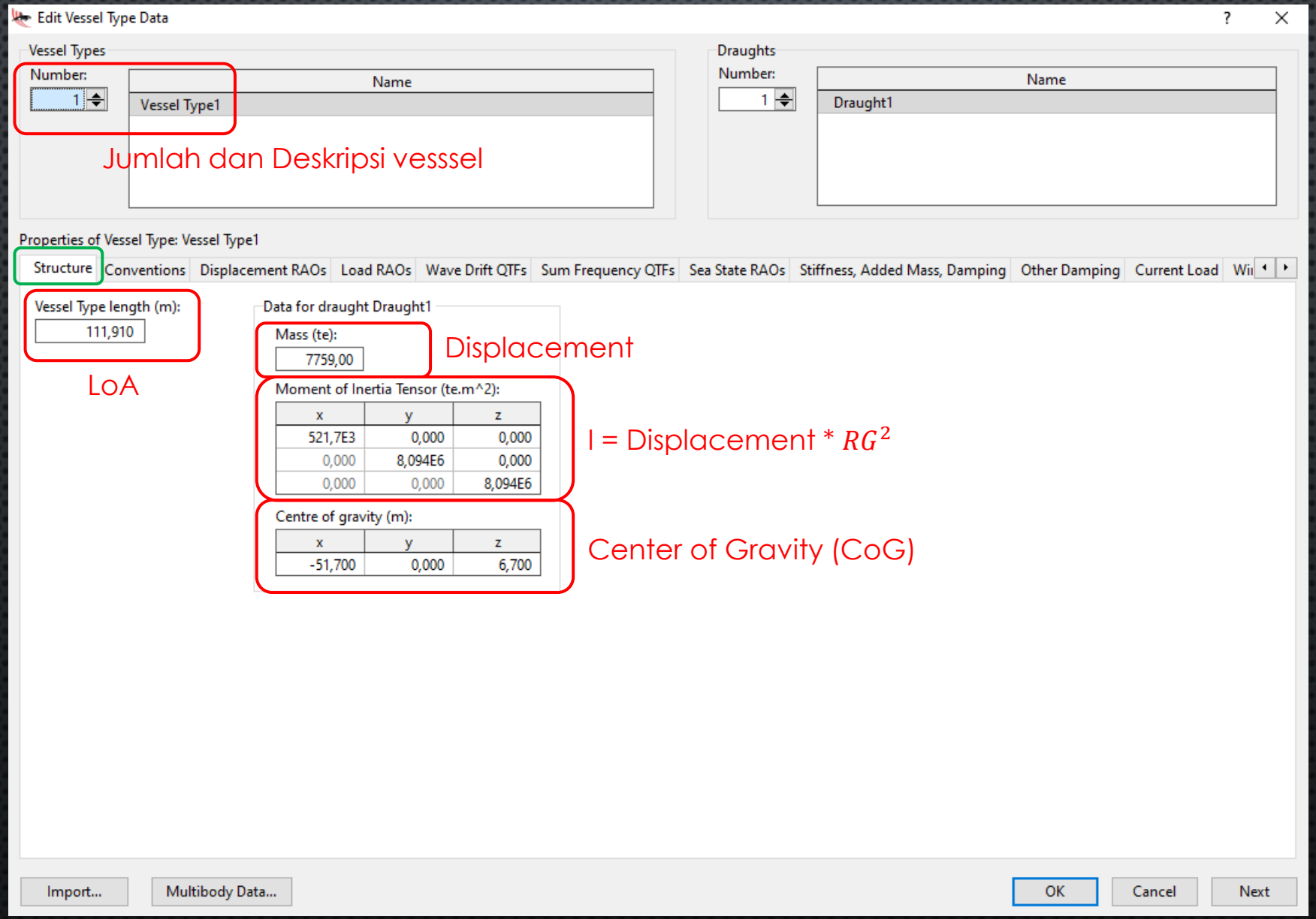


BAB 2
VESSEL

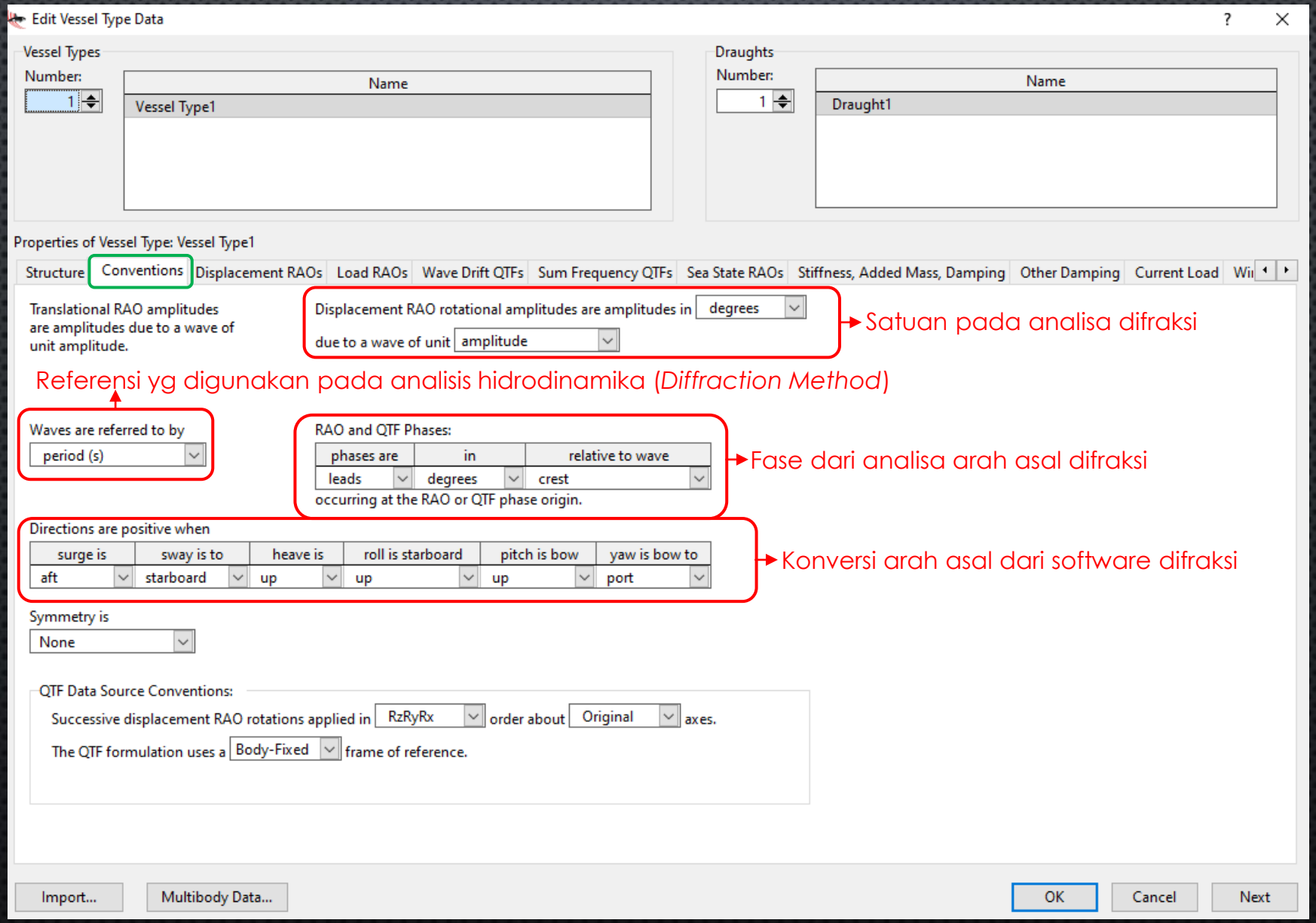
Vessel Data


File Edit Model Calculation View Replay Graph Results Tools Workspace Window Help
Reset
Model
Shared Data
General
Environment
Solid Friction Coefficie
Code Checks
SHEAR7 Data
VIVA Data
Line Contact Data
All Objects Data
Variable Data
Vessel Types
Vessel Type1
Line Types
PPL-Dia.80.81mm
Adria
Vessel Contact
Jetty
Bollards
Line1
Line2
Line3
Line4
Line5
Line6
Line7
Line8
Line9
Line10
Line11
Line12
Line13
Line14
Line15
Line16
Super Structure
Pile1
Pile2
Fenders
Klik 2x
Edit Vessel Data: Adria
Name:
Adria
Length (m):
Type:
Vessel Type1
Draught:
Draught1
Initial Position and Attitude:
Connect to Object
Position (m)
x
y
z
Orientation (deg)
Heel
Trim
Heading
Free
190,00
-11,40
-4,51
0,0
0,0
0,0
Calculation
Supports
Support Coordinates
Morison Elements
Drawing
Shaded Drawing
Included in Static Analysis
None
3 DOF
6 DOF
Primary Motion
None
Prescribed
Calculated (3 DOF)
Calculated (6 DOF)
Time History
Externally Calculated
Superimposed Motion
None
Displacement RAOs + Harmonic Motion
Time History
Included Effects
Applied Loads
Wave Load (1st order)
Wave Drift Load (2nd order)
Wave Drift Damping
Sum Frequency Load (2nd order)
Added Mass and Damping
Manoeuvring Load
Other Damping
Current Load
Wind Load
Primary Motion is treated as:
Low frequency
Wave frequency
Both low and wave frequency
Calculation Mode:
Filtering
QTF modification
Dividing period (s):
10,00
Click here for more information about setting these data items.
Vessel Types...
Support Types...
Morison Element Types...
Report Vessel Response...
OK
Cancel
Next
40 m
Y
X
Klik Vessel Types

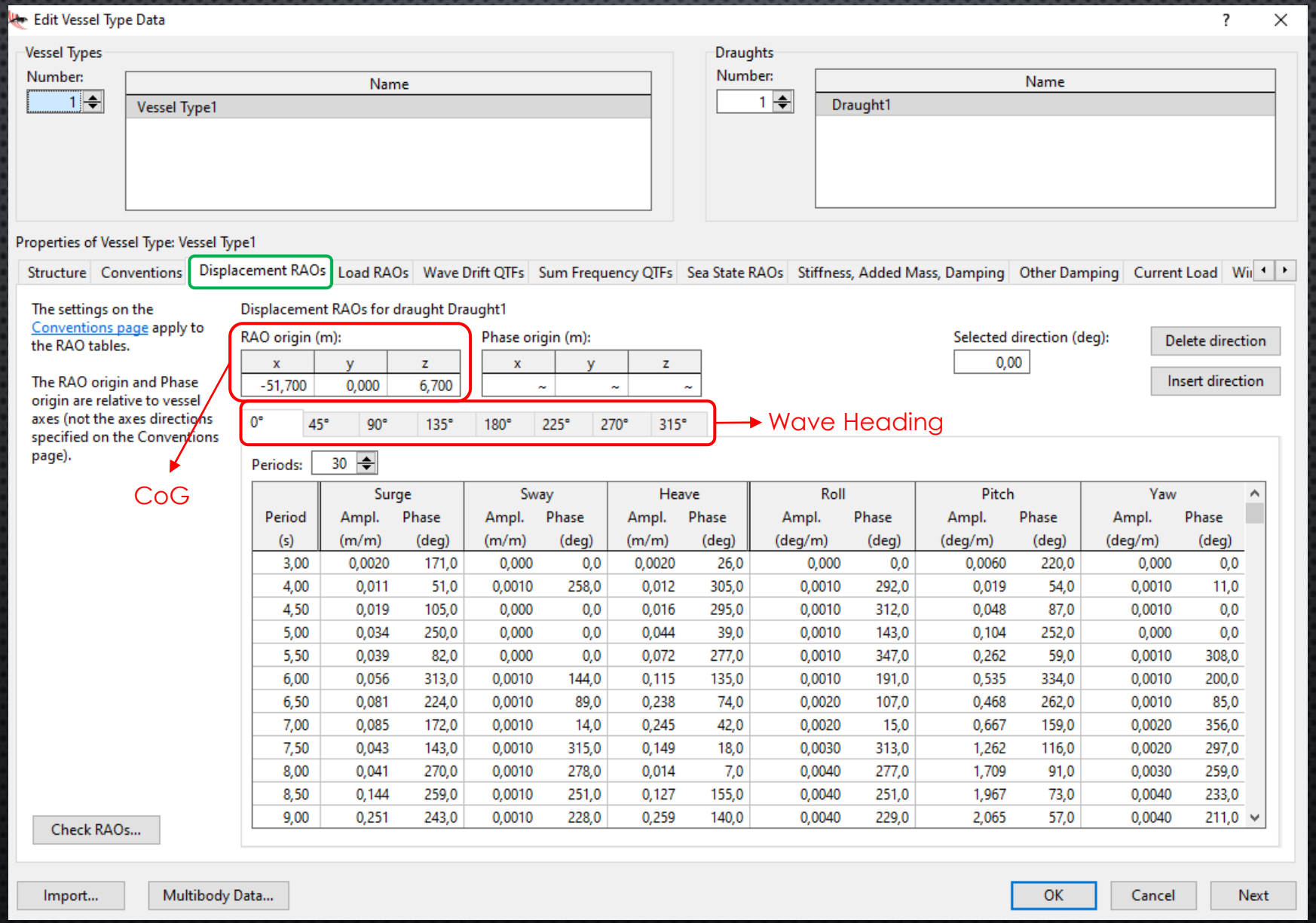
Vessel Types : *STRUCTURE*

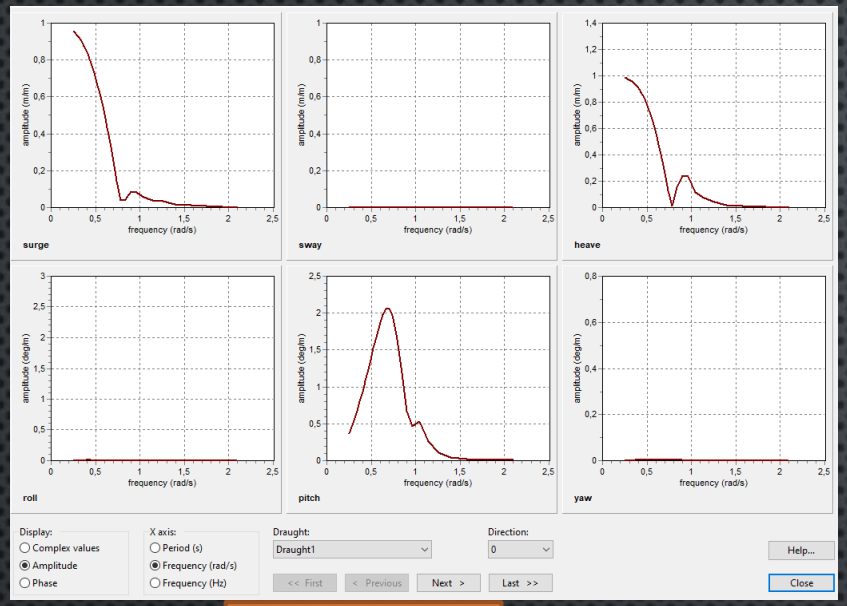


Vessel Types : CONVENTIONS

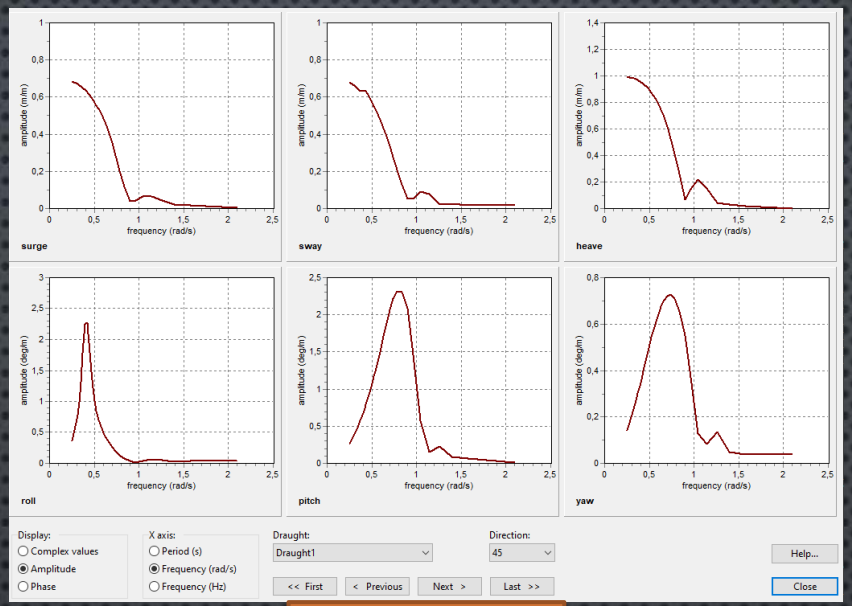


Vessel Types : *Displacement RAO/Motion RAO*

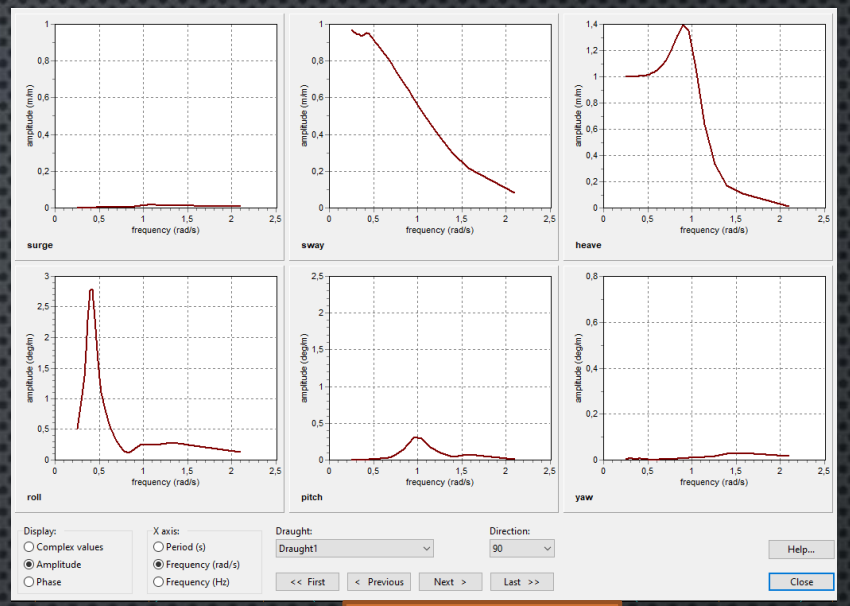




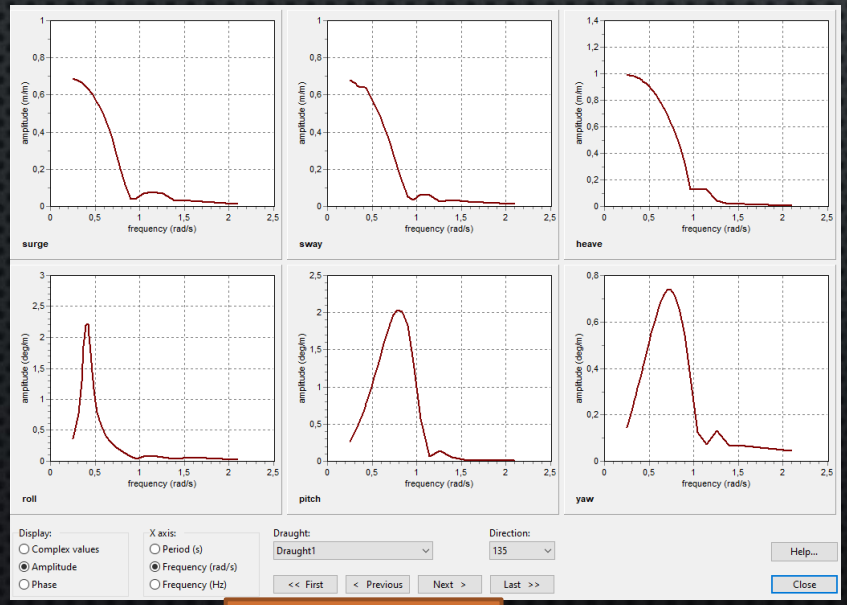
0 deg



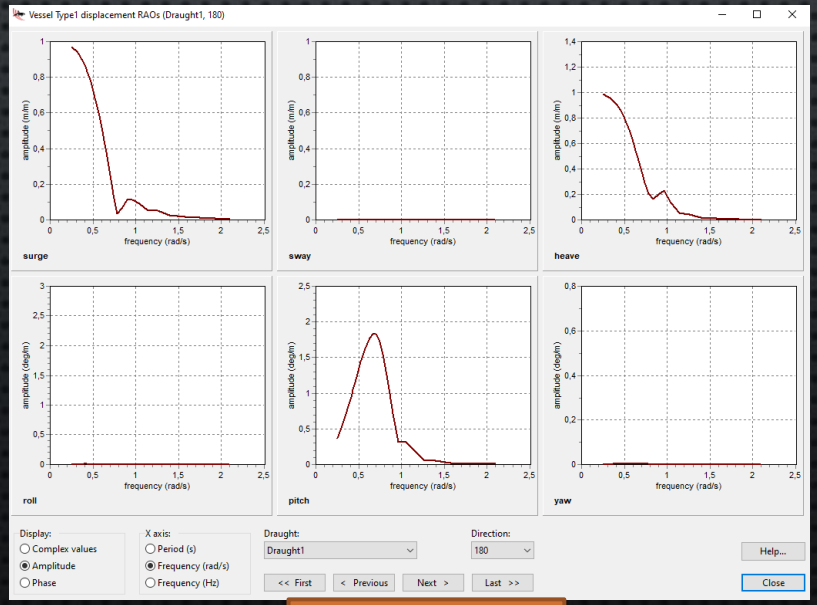
45 deg



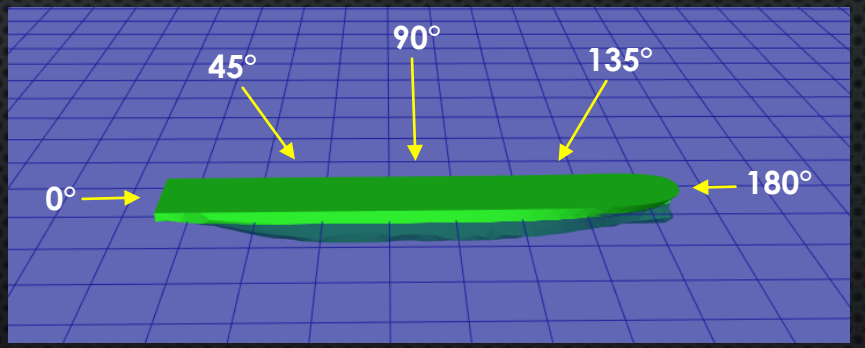
90 deg



135 deg



180 deg



Vessel Types : *Load RAO*

Edit Vessel Type Data

Vessel Types

Number: 1

Name
Vessel Type1

Draughts

Number: 1

Name
Draught1

Properties of Vessel Type: Vessel Type1

Structure | Conventions | Displacement RAOs | Load RAOs | Wave Drift QTFs | Sum Frequency QTFs | Sea State RAOs | Stiffness, Added Mass, Damping | Other Damping | Current Load | Wi

The settings on the Conventions page apply to the RAO tables.

The RAO origin and Phase origin are relative to vessel axes (not the axes directions specified on the Conventions page).

Wave Load RAOs for draught Draught1

RAO origin (m):

x	y	z
-51,700	0,000	6,700

Phase origin (m):

x	y	z
~	~	~

Selected direction (deg): 0,00

Delete direction

Insert direction

0° | 45° | 90° | 135° | 180° | 225° | 270° | 315° → Wave Heading

CoG

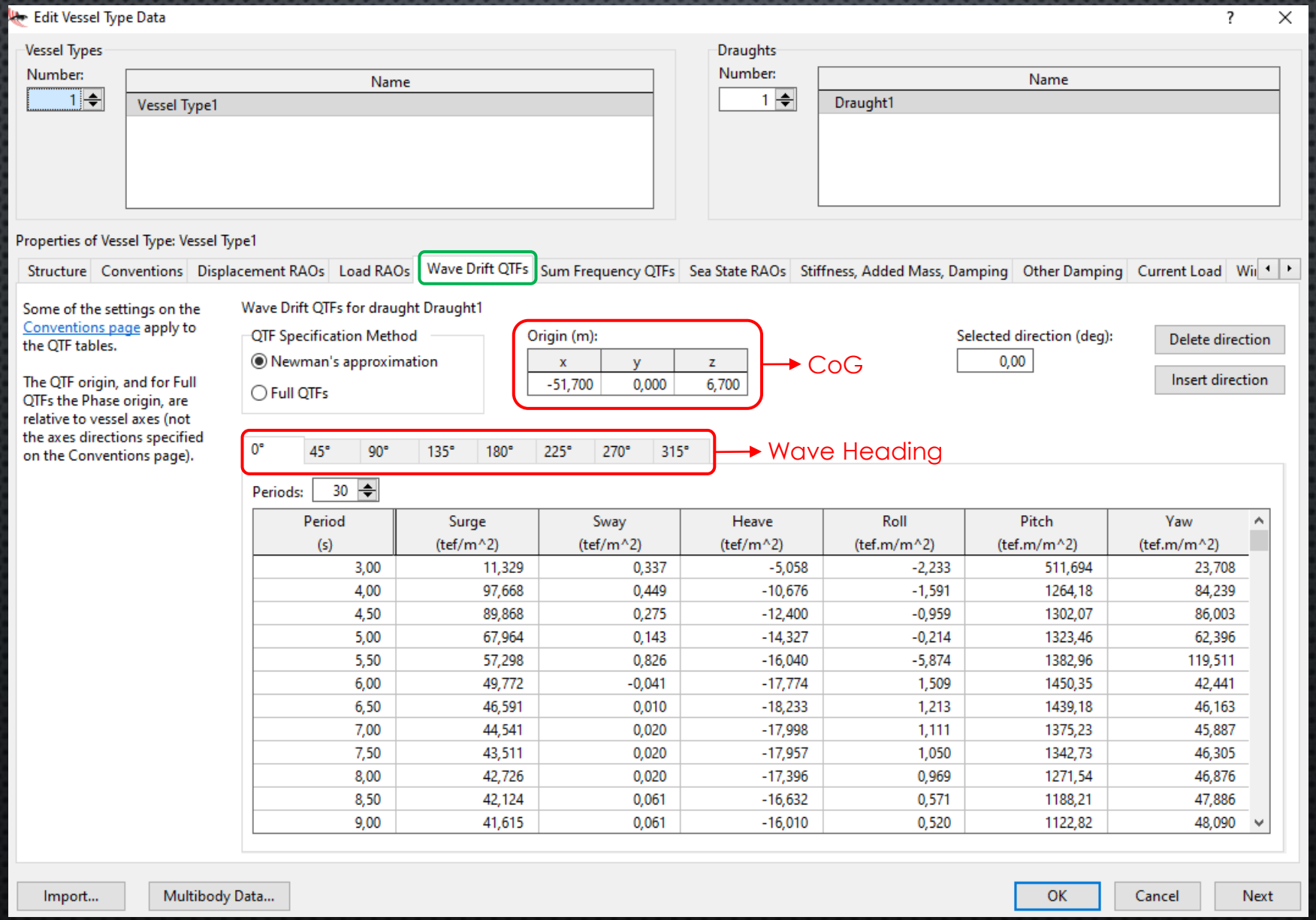
Periods: 30

Period (s)	Surge Ampl. (tef/m)	Surge Phase (deg)	Sway Ampl. (tef/m)	Sway Phase (deg)	Heave Ampl. (tef/m)	Heave Phase (deg)	Roll Ampl. (tef.m/m)	Roll Phase (deg)	Pitch Ampl. (tef.m/m)	Pitch Phase (deg)	Yaw Ampl. (tef.m/m)	Yaw Phase (deg)
3,00	8,566	352,0	0,918	239,0	14,684	205,0	2,243	242,0	700,44	37,0	11,829	257,0
4,00	24,575	246,0	1,020	37,0	27,022	82,0	2,651	71,0	1132,4	232,0	46,907	169,0
4,50	33,957	280,0	0,306	249,0	40,075	109,0	1,122	157,0	1613,2	260,0	46,499	166,0
5,00	52,311	63,0	1,020	301,0	70,462	206,0	3,059	315,0	2257,0	57,0	16,010	327,0
5,50	48,233	247,0	0,510	195,0	65,262	62,0	1,835	185,0	3889,7	215,0	35,690	124,0
6,00	77,091	118,0	0,306	310,0	89,735	253,0	1,020	19,0	5097,8	111,0	28,960	34,0
6,50	89,837	36,0	0,612	251,0	150,00	166,0	1,428	277,0	3701,7	6,0	9,585	292,0
7,00	76,479	329,0	0,510	202,0	154,08	103,0	1,326	209,0	5392,1	252,0	15,194	138,0
7,50	60,775	257,0	0,306	154,0	117,47	41,0	1,020	150,0	9742,4	191,0	25,595	86,0
8,00	66,995	187,0	0,102	65,0	93,406	315,0	0,714	89,0	13,8E3	150,0	28,042	49,0
8,50	85,860	139,0	0,204	318,0	165,70	242,0	0,714	33,0	16,8E3	119,0	26,411	16,0
9,00	104,01	104,0	0,306	285,0	282,36	205,0	0,714	352,0	18,9E3	93,0	23,555	347,0

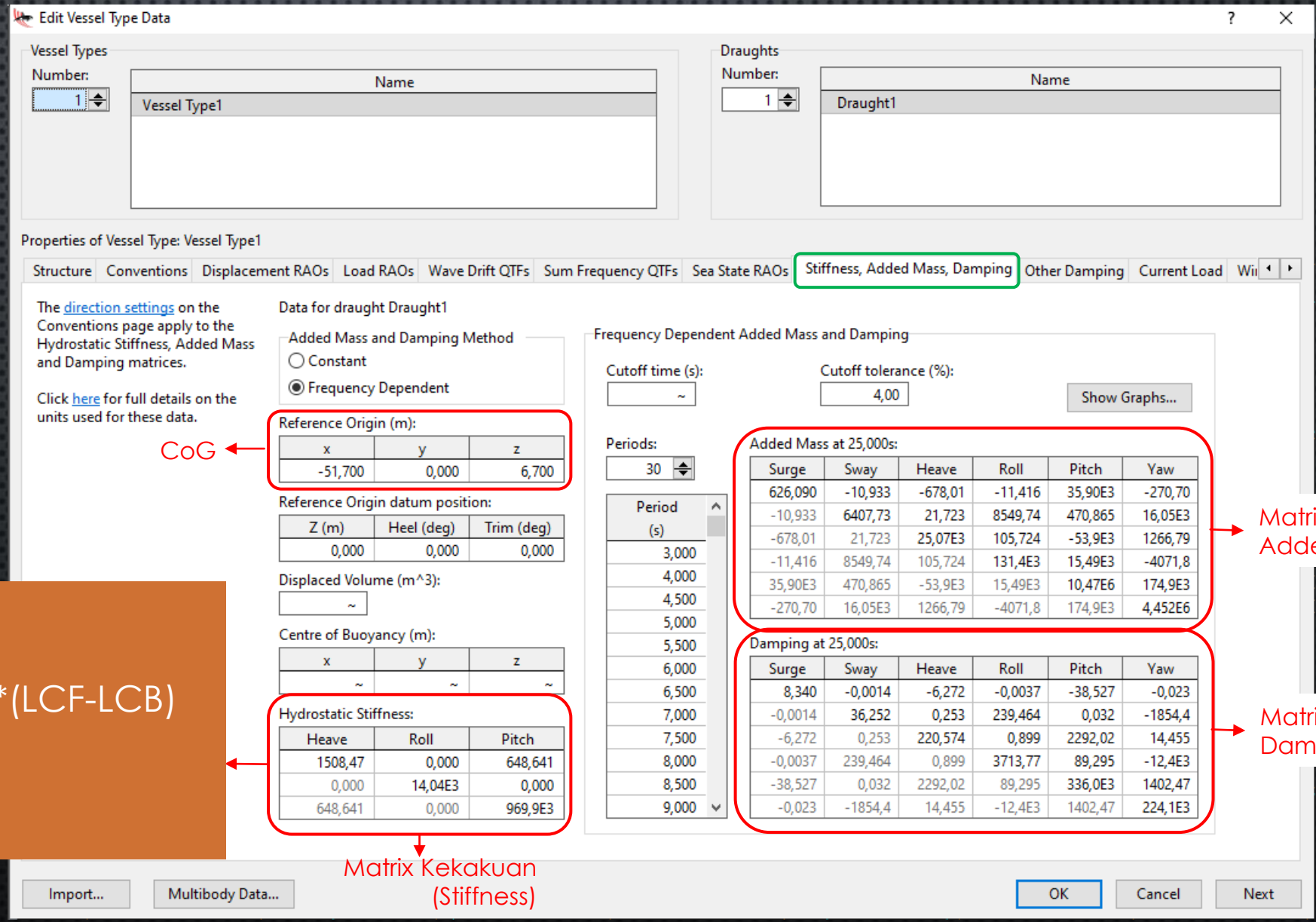
Check RAOs...

Import... | Multibody Data... | OK | Cancel | Next

Vessel Types : *Wave Drift*

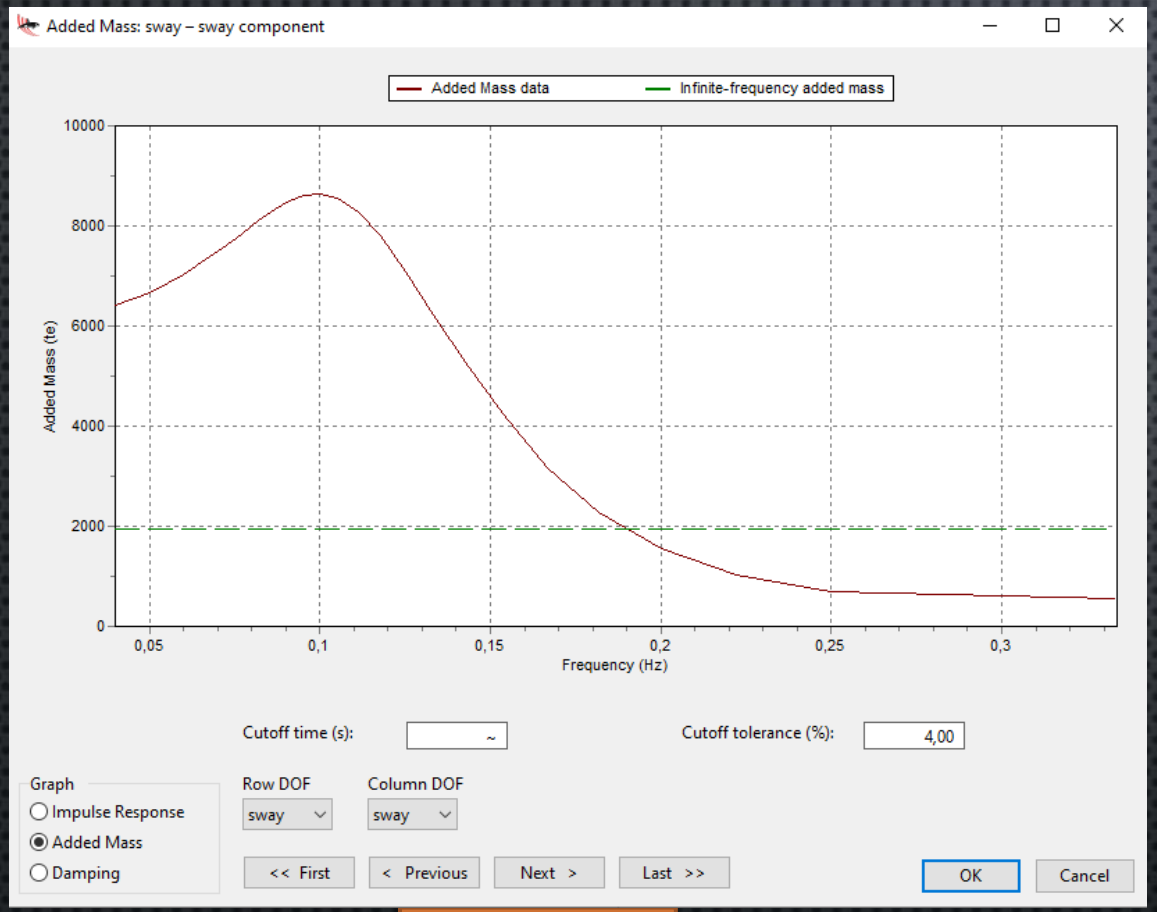


Vessel Types : *Stiffness, Added Mass, & Damping*

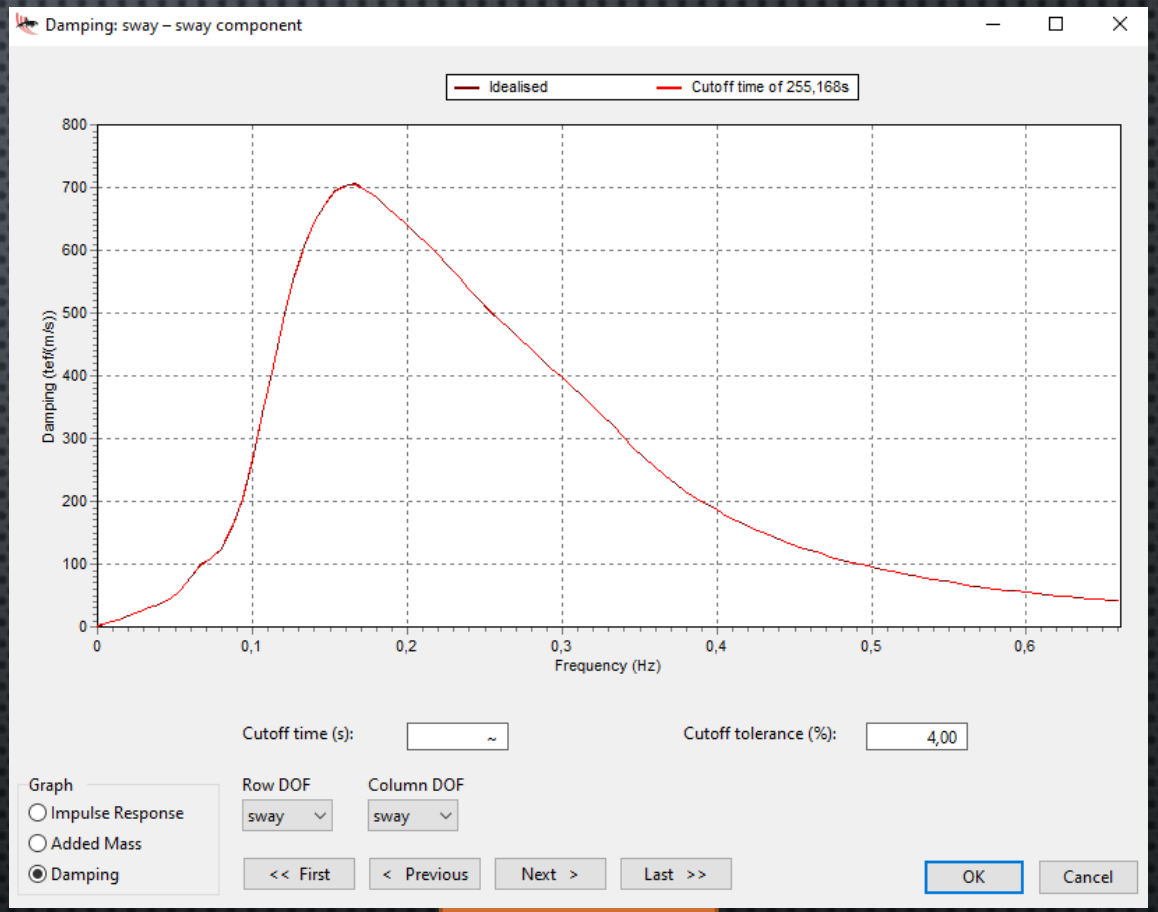


Stiffness Formula:

- Heave = ρ*g*WPA
- Heave-Pitch = ρ*g*WPA*(LCF-LCB)
- Roll = ρ*g*v*GMT
- Pitch = ρ*g*v*GMT



Added Mass



Damping

Vessel Types : *Current Load*

Edit Vessel Type Data

Vessel Types

Number: 1

Name
Vessel Type1

Draughts

Number: 1

Name
Draught1

Properties of Vessel Type: Vessel Type1

Structure | Conventions | Displacement RAOs | Load RAOs | Wave Drift QTFs | Sum Frequency QTFs | Sea State RAOs | Stiffness, Added Mass, Damping | Other Damping | **Current Load** | Wi

Current load symmetry: XZ plane

Current load data for draught Draught1

Areas and area moment:

Surge area (m^2)	Sway area (m^2)	Yaw area moment (m^3)
106,075	586,205	61,55E3

Current Area

Current load origin (m):

x	y	z
-48,300	0,000	2,500

Center of Current Attack

Load coefficients:

Directions: 19 View Coefficients

Direction	Surge	Sway	Yaw
0,0	0,092	0,000	0,000
10,0	0,100	0,060	-0,015
20,0	0,115	0,140	-0,029
30,0	0,121	0,225	-0,043
40,0	0,114	0,300	-0,053
50,0	0,096	0,360	-0,059
60,0	0,075	0,420	-0,059
70,0	0,063	0,460	-0,051
80,0	0,055	0,490	-0,040
90,0	0,043	0,500	-0,023
100,0	0,018	0,490	-0,0060
110,0	-0,018	0,470	0,0060
120,0	-0,052	0,420	0,015

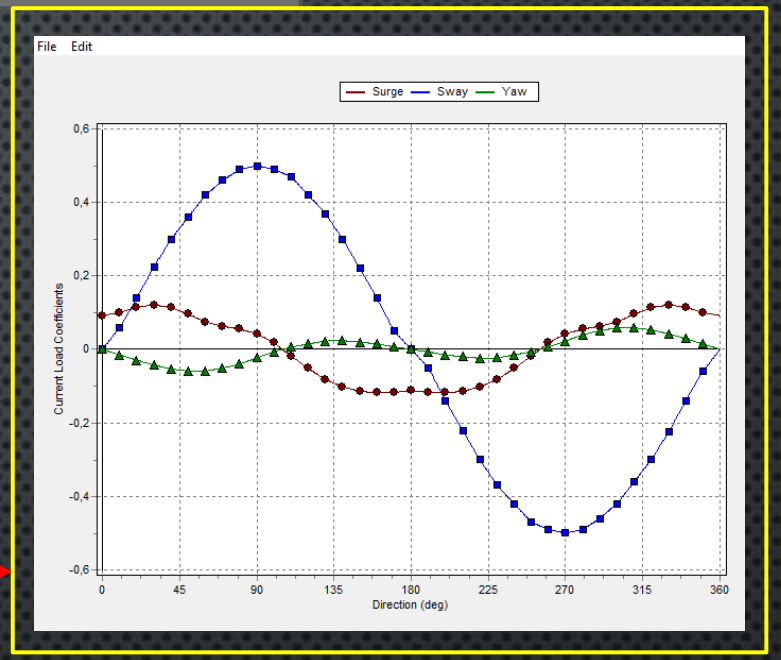
Current Load Coefficient

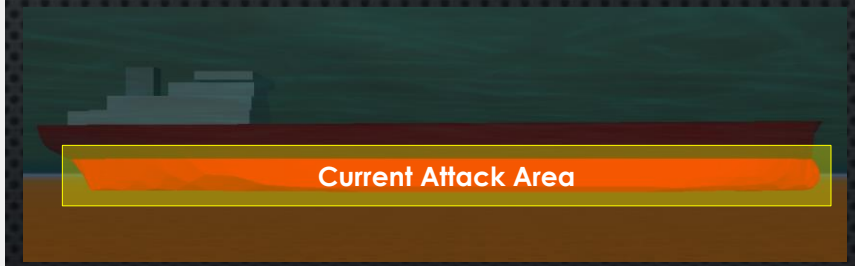
Drag due to Yaw Rate:

Surge Force Factor (m^4)	Sway Force Factor (m^4)	Yaw Moment Factor (m^5)
0,000	0,000	28,54E6

Yaw rate drag Factor

Import... | Multibody Data... | OK | Cancel | Next





Vessel Types : *Wind Load*

Edit Vessel Type Data

Vessel Types

Number: 1

Name
Vessel Type1

Draughts

Number: 1

Name
Draught1

Properties of Vessel Type: Vessel Type1

Load RAOs | Wave Drift QTFs | Sum Frequency QTFs | Sea State RAOs | Stiffness, Added Mass, Damping | Other Damping | Current Load | **Wind Load** | Drawing | Shaded Drawing

Wind load symmetry: XZ plane

Wind load data for draught Draught1

Areas and area moment:

Surge area (m^2)	Sway area (m^2)	Yaw area moment (m^3)
45,334	250,530	4760,07

Current Area

Wind load origin (m):

x	y	z
-20,600	0,000	8,200

Center of Wind Attack

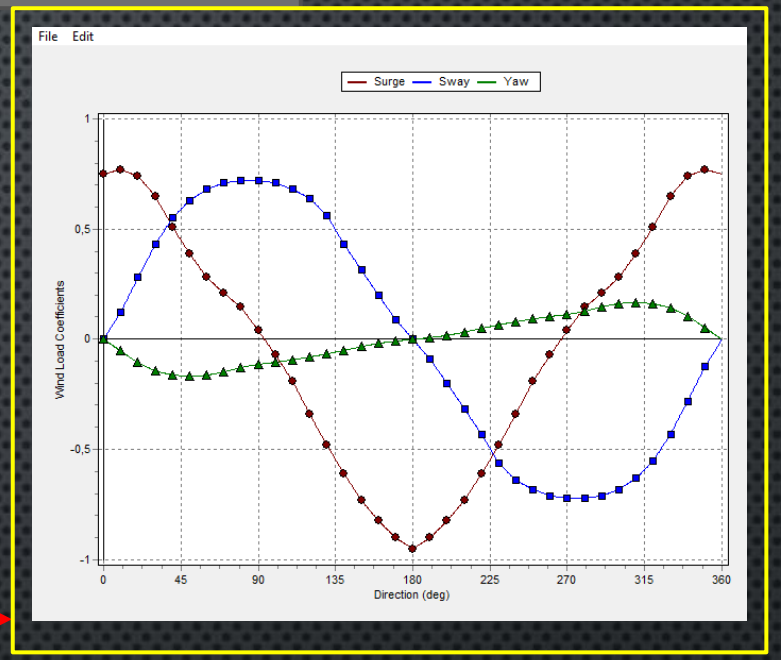
Load coefficients:

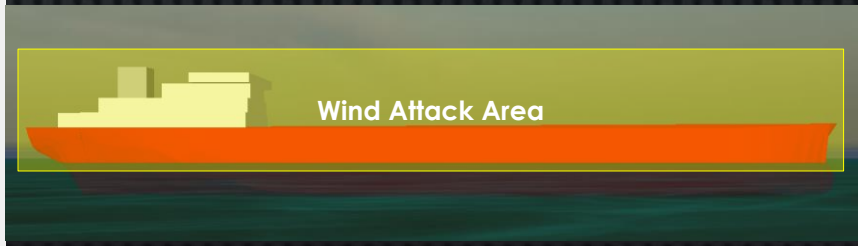
Directions: 19 View Coefficients

Direction	Surge	Sway	Yaw
0,0	0,750	0,000	0,000
10,0	0,770	0,125	-0,053
20,0	0,740	0,280	-0,106
30,0	0,650	0,430	-0,144
40,0	0,510	0,550	-0,162
50,0	0,390	0,630	-0,167
60,0	0,280	0,680	-0,163
70,0	0,210	0,710	-0,148
80,0	0,145	0,720	-0,127
90,0	0,040	0,720	-0,113
100,0	-0,070	0,710	-0,104
110,0	-0,190	0,680	-0,093
120,0	-0,340	0,640	-0,080

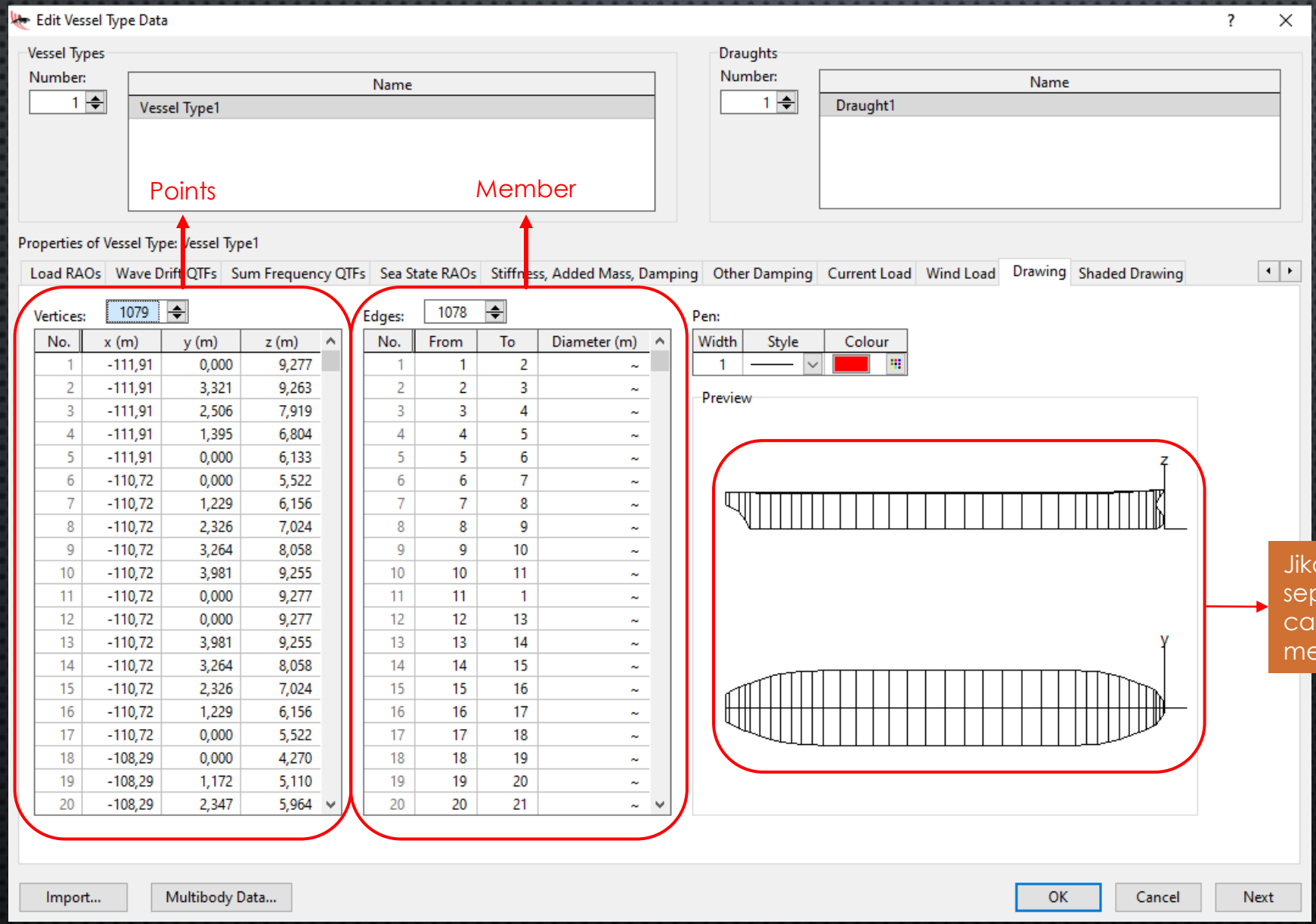
Current Load Coefficient

Import... | Multibody Data... | OK | Cancel | Next





Vessel Types : *Drawing*

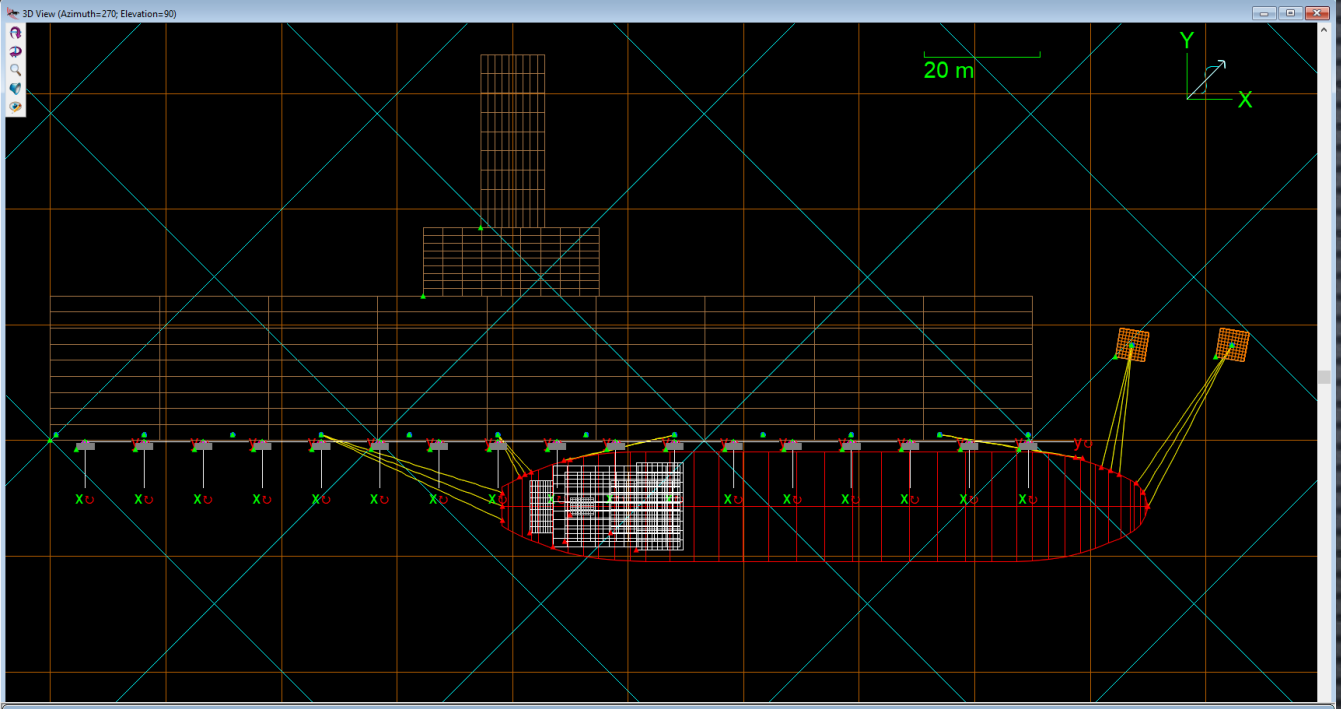


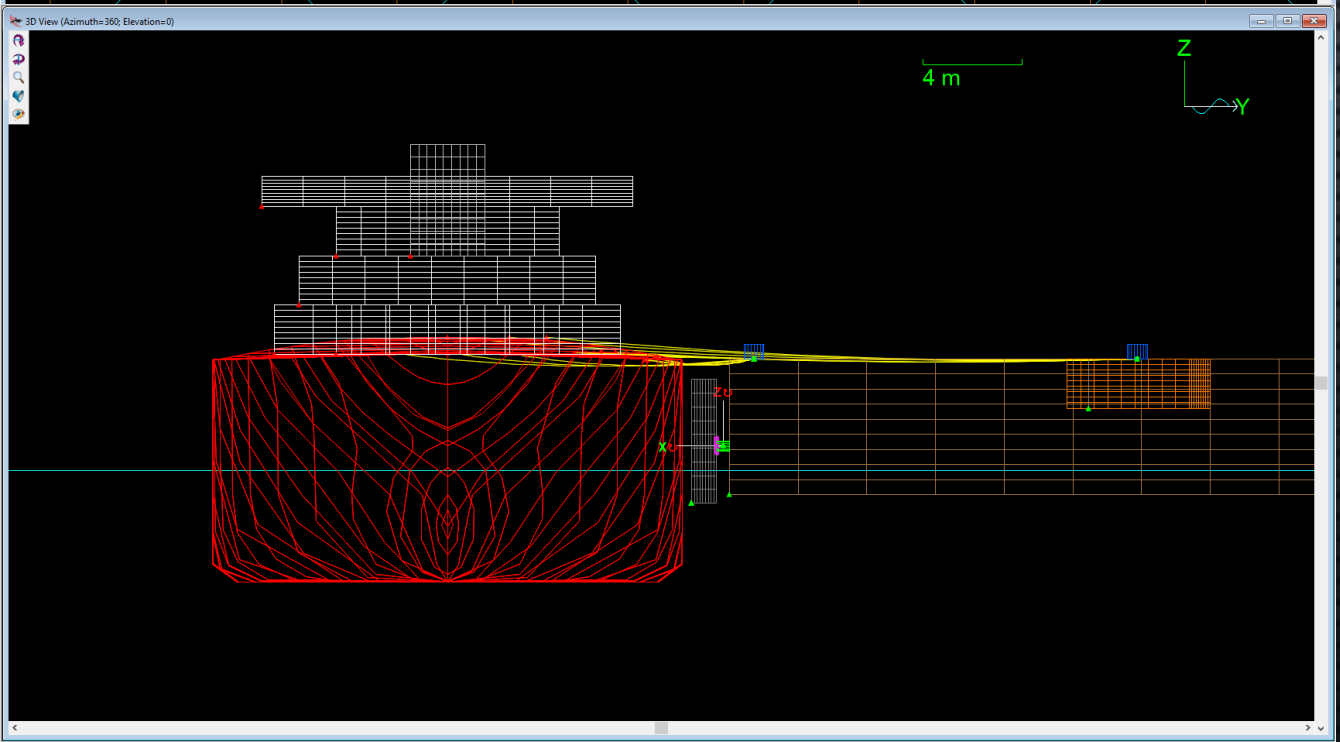
Tips:

Jika ingin memodelkan struktur kapal seperti pada gambar disamping, caranya adalah membuat points dan member dalam bentuk **strip/pias**

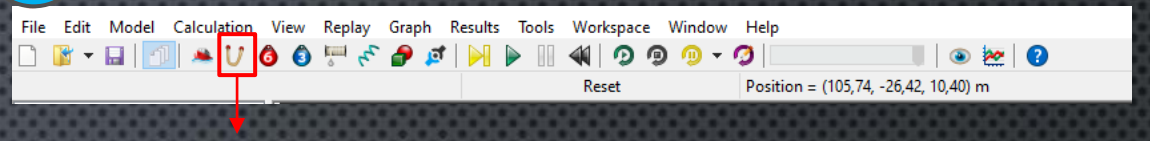
BAB 3
LINE

Mooring Lines



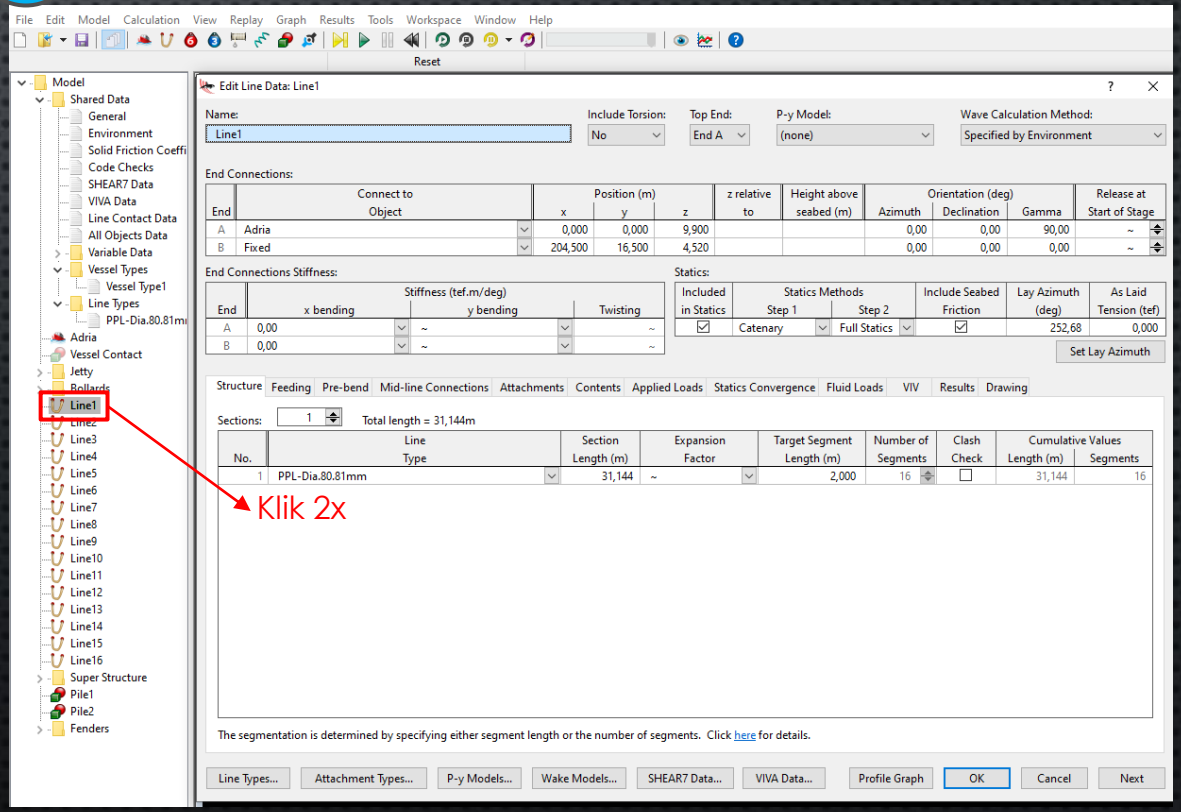


1



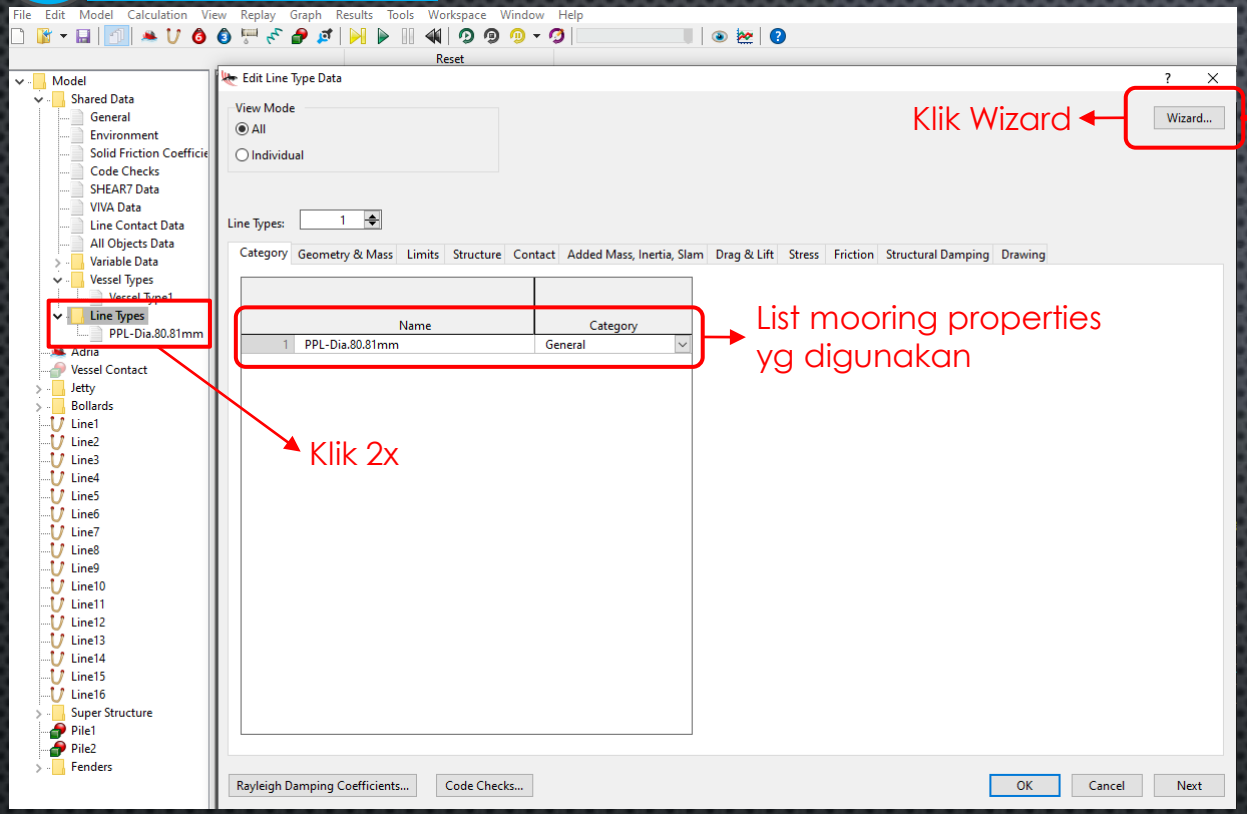
Klik icon "line"

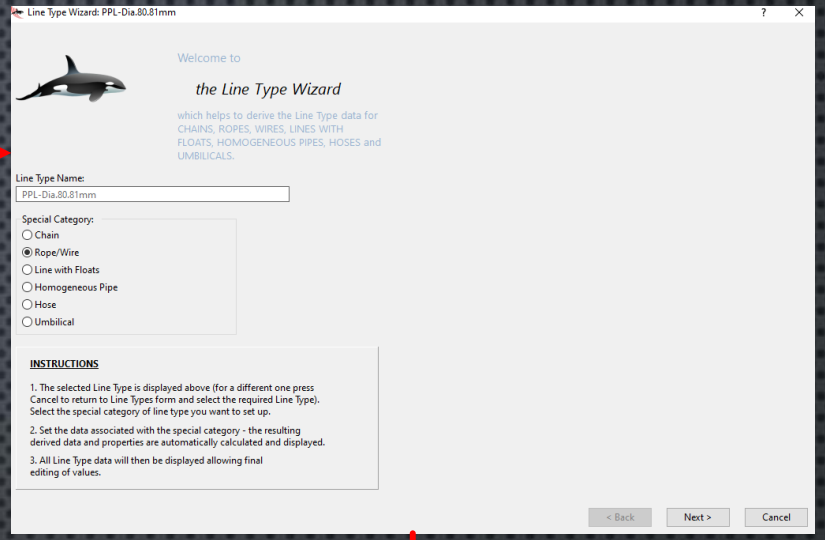
2 Edit line Data

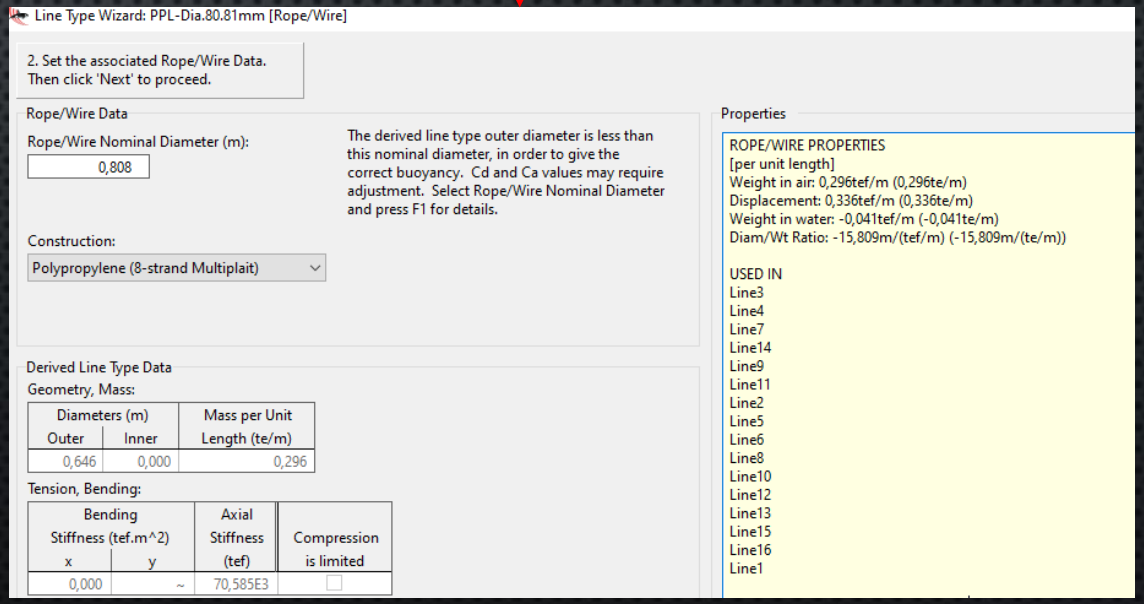


Klik 2x

3 Edit line Data







BAB 4
ENVIRONMENT

ENV : *Seabed*

File Edit Model Calculation View Replay Graph Results Tools Workspace Window Help

Reset

- Model
  - Shared Data
    - General
    - Environment
    - Solid Friction Coefficie
    - Code Checks
    - SHEAR7 Data
    - VIVA Data
    - Line Contact Data
    - All Objects Data
  - Variable Data
  - Vessel Types
    - Vessel Type1
  - Line Types
    - PPL-Dia.80.81mm
  - Adria

Edit Environment Data

Sea | Sea Density | Seabed | Waves | Wave Calculation | Waves Preview | Current | Wind | Drawing

Shape:

Type	Seabed Origin (m) X	Y	Z	Depth	Direction (deg)	Slope (deg)
Flat	0,00	0,00	-17,00	17,00	0,00	0,000

Seabed Model

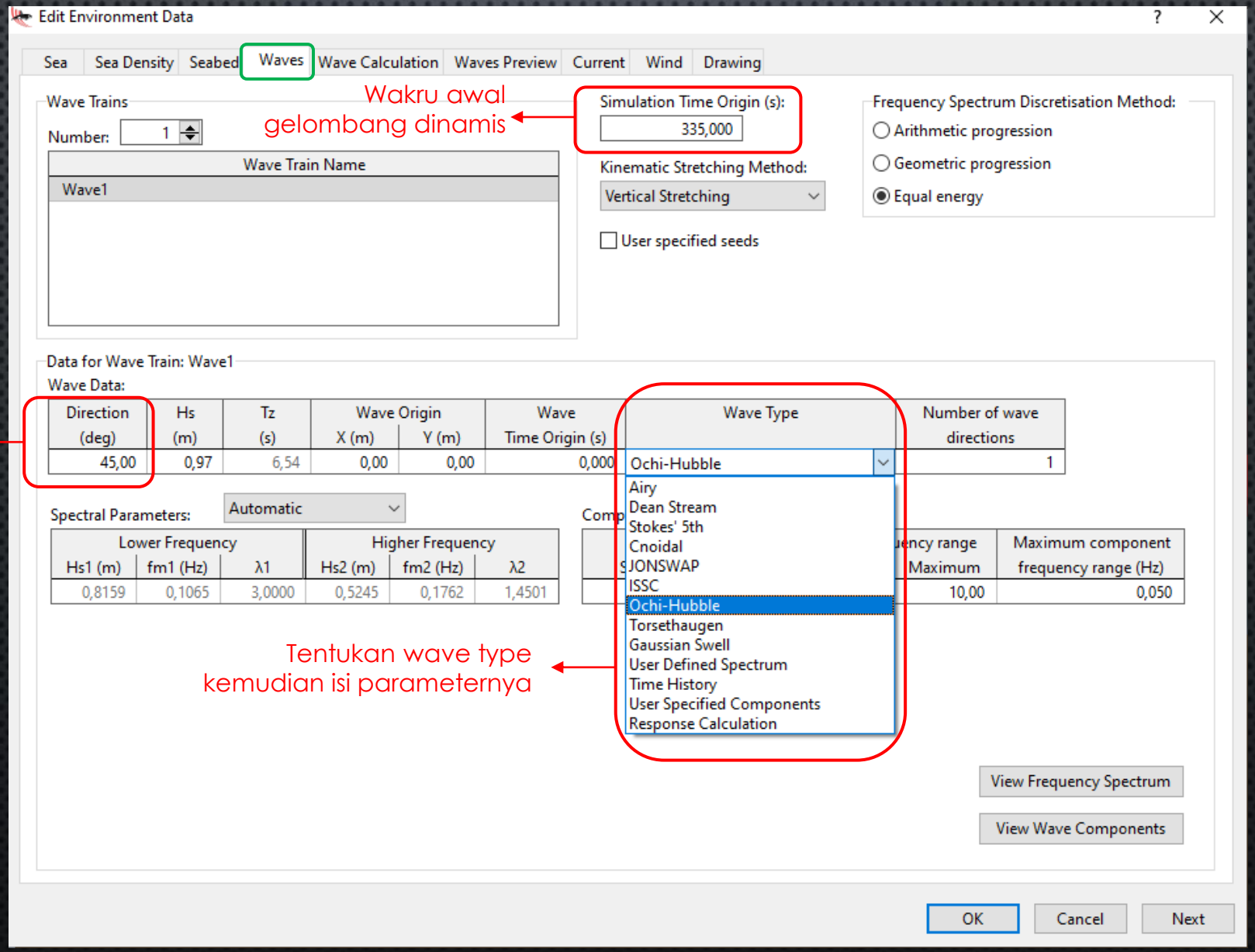
(●) Elastic

( ) Nonlinear soil model

Stiffness & Damping:

Stiffness (tef/m/m^2) Normal	Shear	Damping (% Critical)
10,197	10,197	100,000

ENV : Wave


Edit Environment Data
Sea
Sea Density
Seabed
Waves
Wave Calculation
Waves Preview
Current
Wind
Drawing
Wave Trains
Number: 1
Wave Train Name
Wave1
Wakru awal gelombang dinamis
Simulation Time Origin (s):
335,000
Kinematic Stretching Method:
Vertical Stretching
User specified seeds
Frequency Spectrum Discretisation Method:
Arithmetic progression
Geometric progression
Equal energy
Data for Wave Train: Wave1
Wave Data:
Direction (deg)
Hs (m)
Tz (s)
Wave Origin X (m)
Wave Origin Y (m)
Wave Time Origin (s)
Wave Type
Number of wave directions
45,00
0,97
6,54
0,00
0,00
0,000
Ochi-Hubble
1
Tentukan arah datang gelombang
Spectral Parameters:
Automatic
Lower Frequency
Hs1 (m)
fm1 (Hz)
λ1
Higher Frequency
Hs2 (m)
fm2 (Hz)
λ2
0,8159
0,1065
3,0000
0,5245
0,1762
1,4501
Maximum
10,00
Maximum component frequency range (Hz)
0,050
Airy
Dean Stream
Stokes' 5th
Cnoidal
JONSWAP
ISSC
Ochi-Hubble
Torsethaugen
Gaussian Swell
User Defined Spectrum
Time History
User Specified Components
Response Calculation
Tentukan wave type kemudian isi parameternya
View Frequency Spectrum
View Wave Components
OK
Cancel
Next

ENV : *Wave Preview*

Edit Environment Data

Sea | Sea Density | Seabed | Waves | Wave Calculation | Waves Preview | Current | Wind | Drawing

Position:

X (m)	Y (m)
0,000	0,000

Profile, Autocorrelation:

Period	
Start (s)	Duration (s)
335,000	500,000

View Profile | View Autocorrelation

Horizontal Velocity:

Time (s)
0,000

View Horizontal Velocity

Wave Search Method:

- (•) Height or Steepness
- ( ) Height and Period

Wave search parameters:

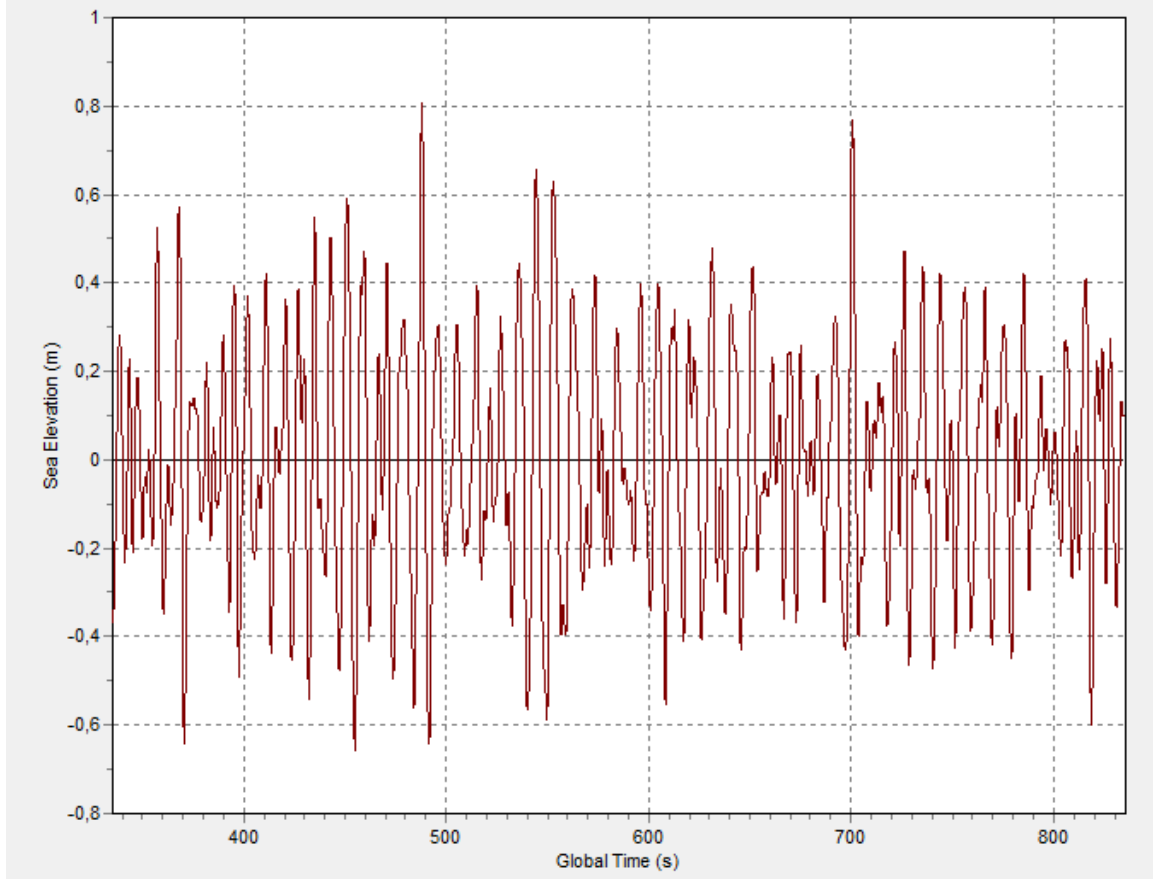
Period		Height OR Steepness	
Start (s)	Duration (s)	> H (m)	> S
0,000	10,000E3	7,000	0,125

List Events

OK | Cancel | Next

Overall Sea Profile at (X=0,00m, Y=0,00m)

File Edit



ENV : *Current*

Edit Environment Data

Sea | Sea Density | Seabed | Waves | Wave Calculation | Waves Preview | **Current** | Wind | Drawing

☐ Multiple sets of current data can be defined

☐ Ramp during build-up

Horizontal Current Variation

Horizontal Variation Factor: ~

Vertical Current Variation

☐ Apply Vertical Stretching

Current Method

◉ Interpolated

○ Power Law

Current Data:

Speed (m/s)	Direction (deg)
1,029	45,000

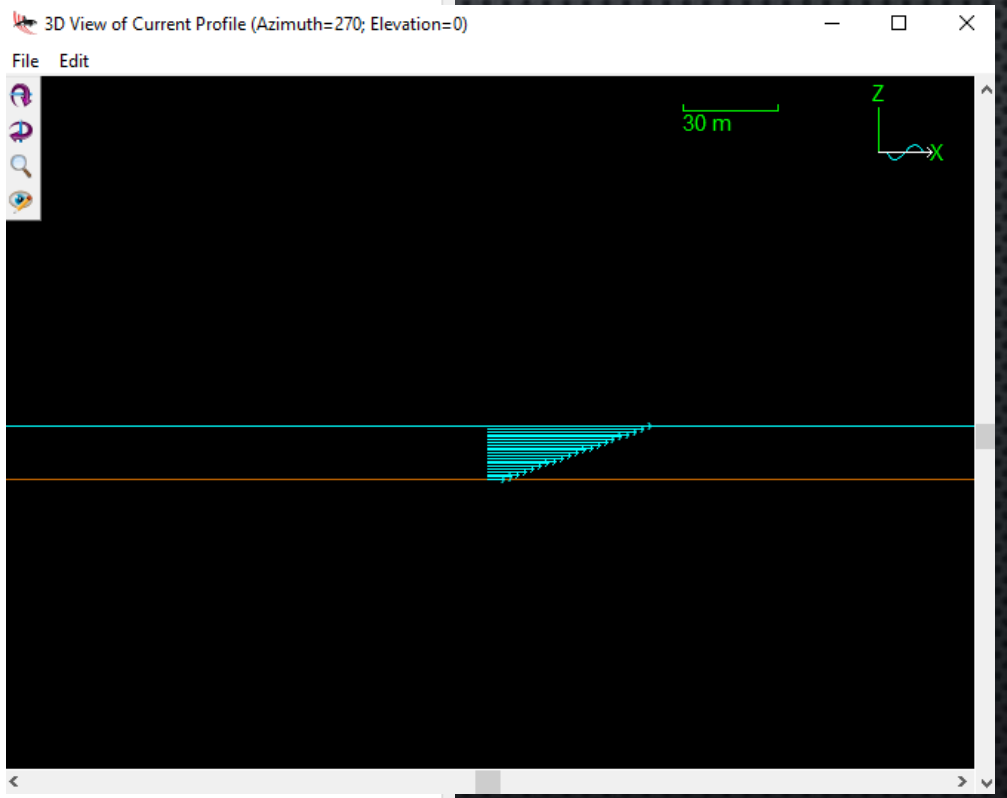
View Vertical Profile Graph

View Vertical Profile 3D View

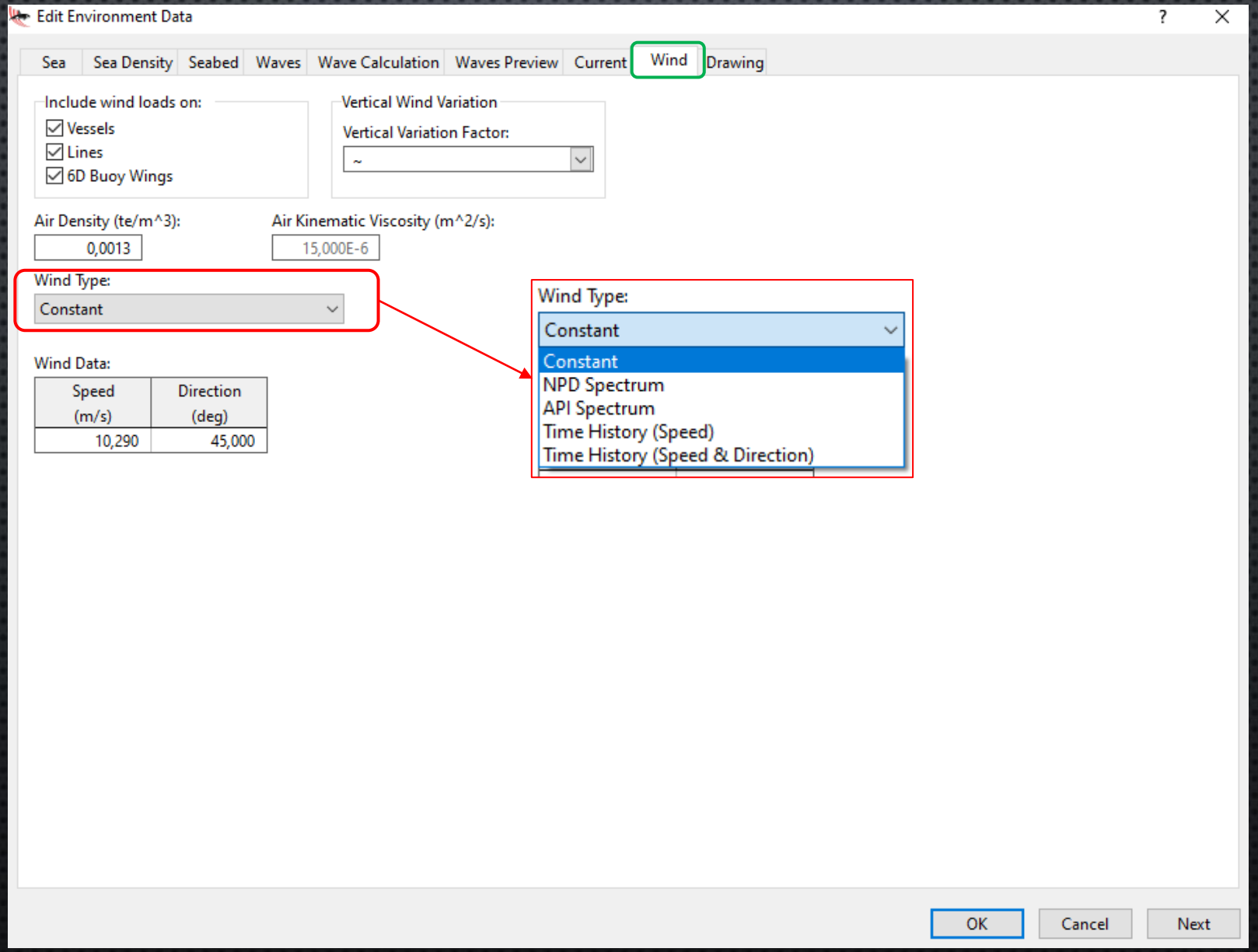
Profile: 2

Number	Depth (m)	Factor	Rotation (deg)
1	0,000	1,000	0,000
2	17,000	0,100	0,000

OK | Cancel | Next

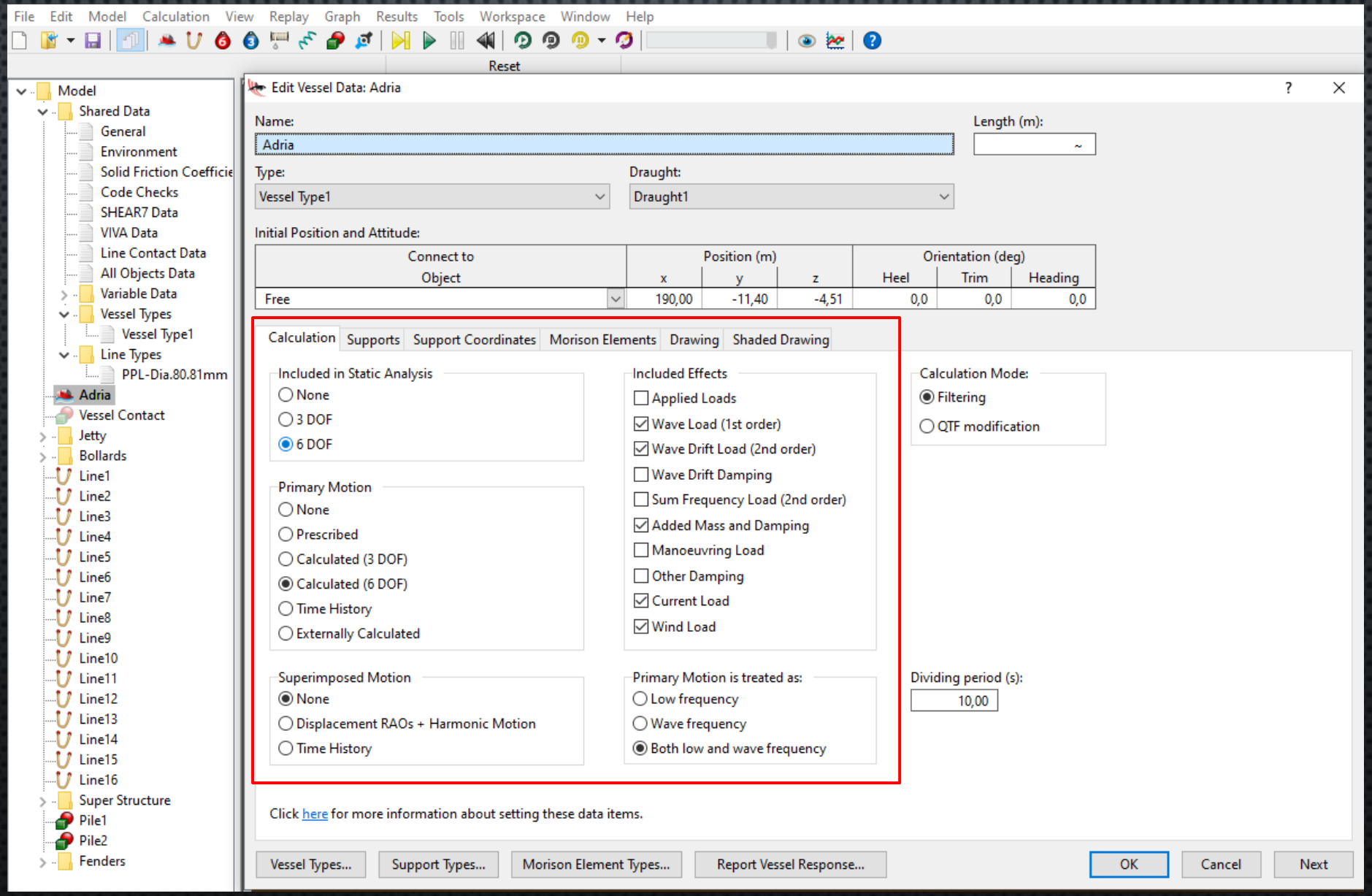


ENV : *Wind*


Edit Environment Data
Sea
Sea Density
Seabed
Waves
Wave Calculation
Waves Preview
Current
Wind
Drawing
Include wind loads on:
Vessels
Lines
6D Buoy Wings
Vertical Wind Variation
Vertical Variation Factor:
~
Air Density (te/m^3):
0,0013
Air Kinematic Viscosity (m^2/s):
15,000E-6
Wind Type:
Constant
Wind Data:
Speed (m/s)
Direction (deg)
10,290
45,000
Wind Type:
Constant
Constant
NPD Spectrum
API Spectrum
Time History (Speed)
Time History (Speed & Direction)
OK
Cancel
Next

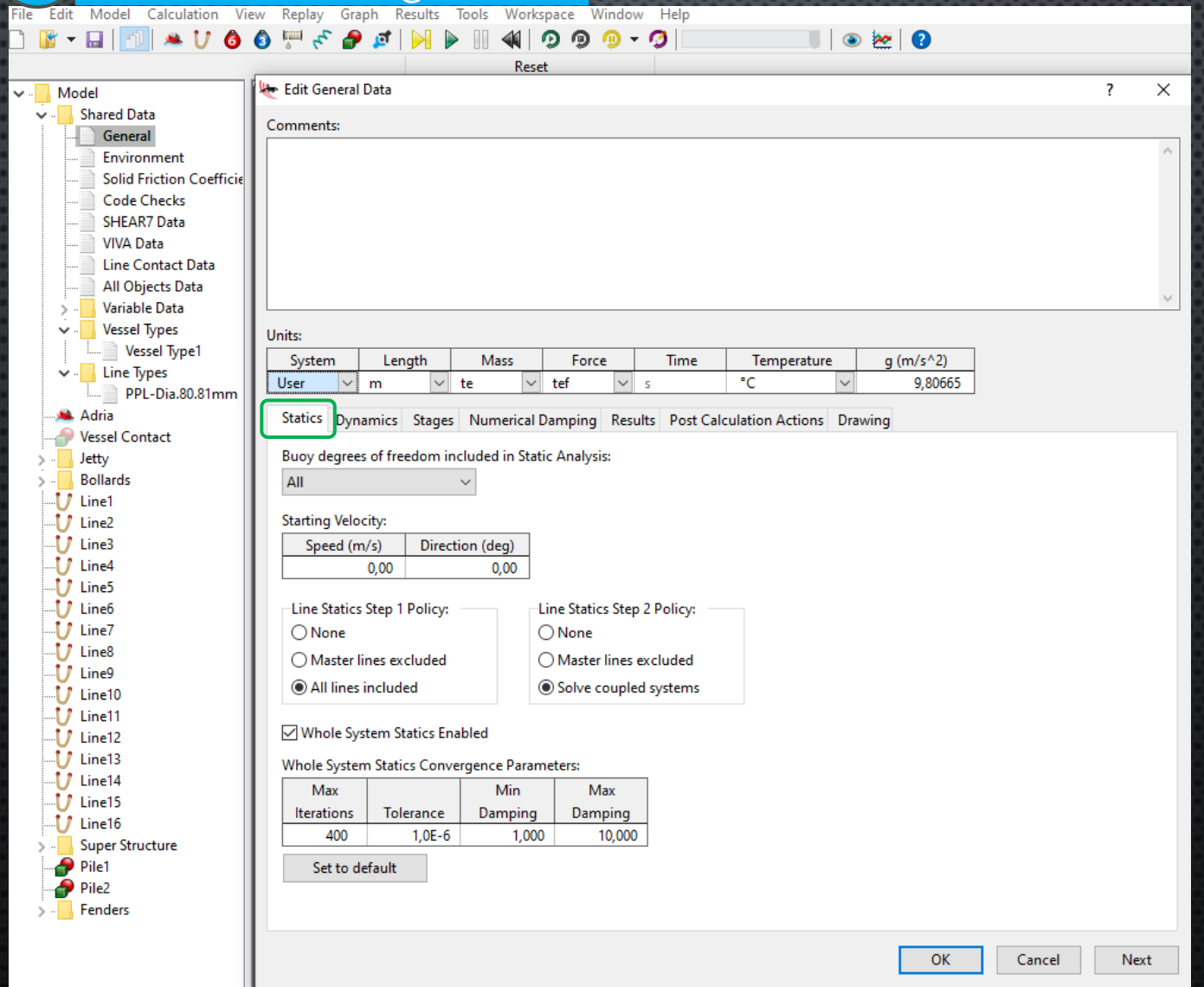
BAB 5
RUN SIMULATION

RUN : *SETUP VESSEL CALCULATION*



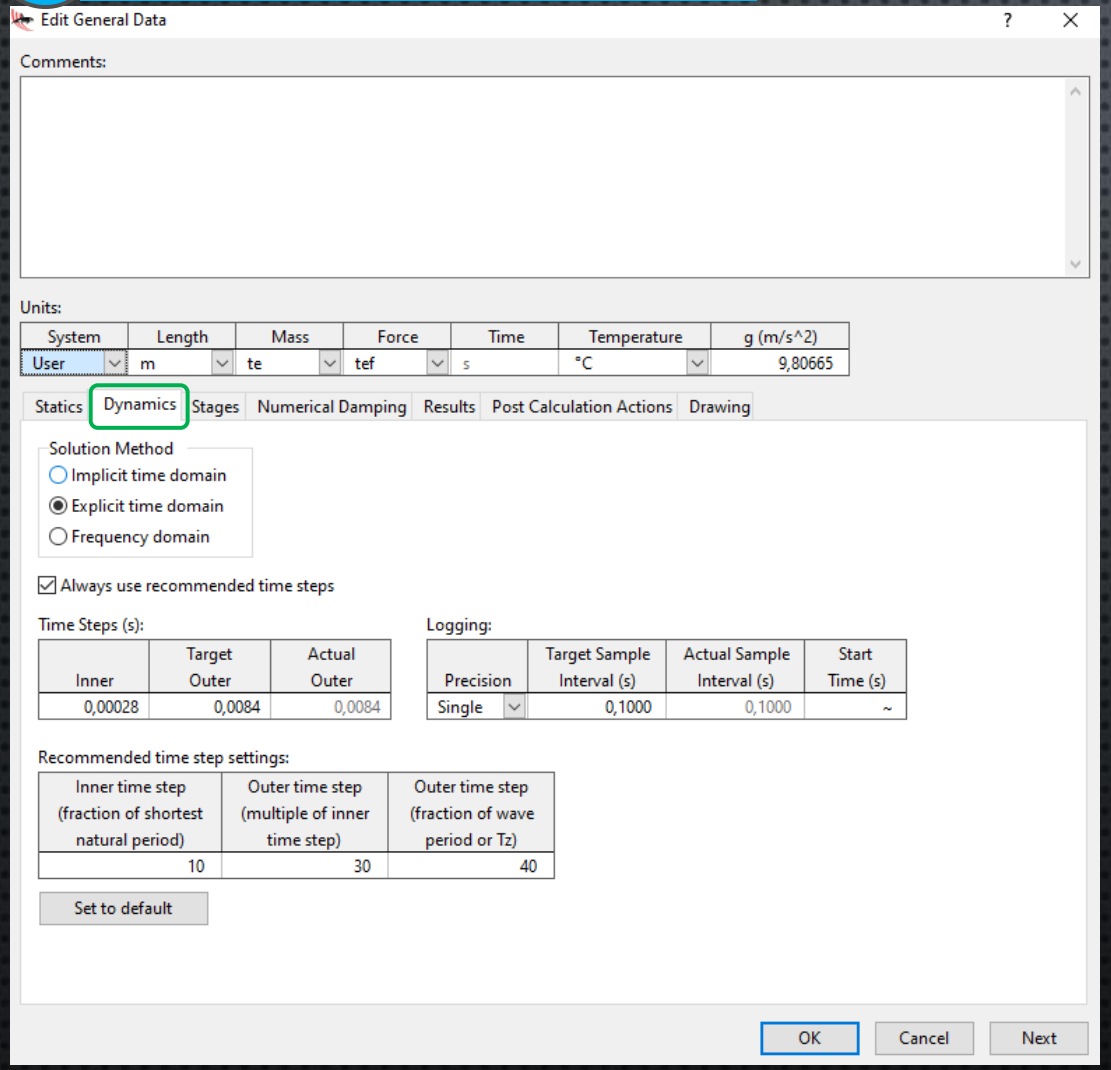
RUN : *GENERAL SETTING*

1 General Setting Static

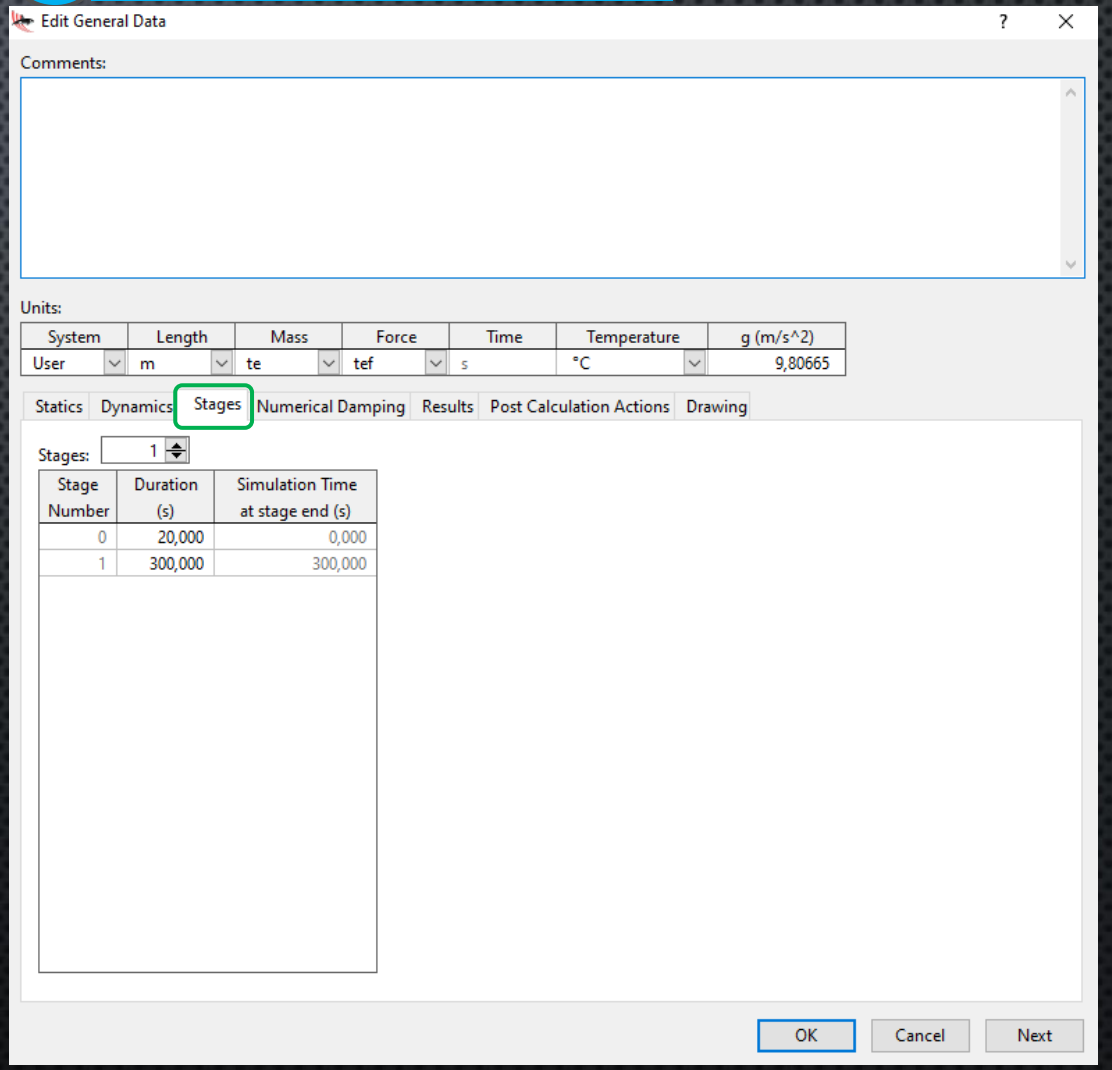


RUN : *GENERAL SETTING*

2 General Setting Dynamics

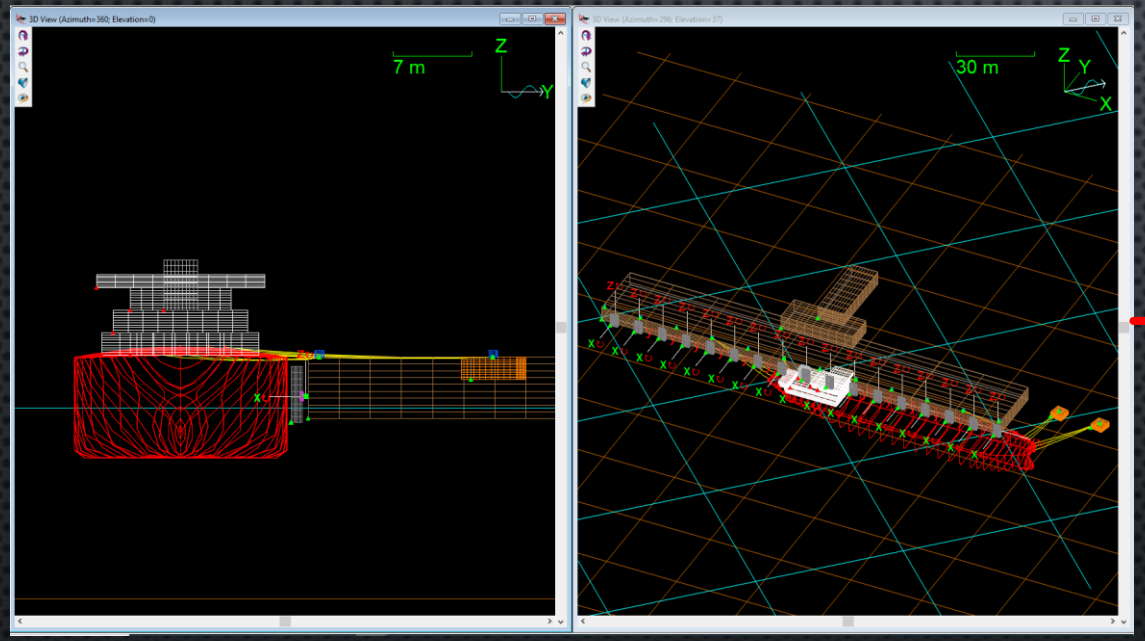


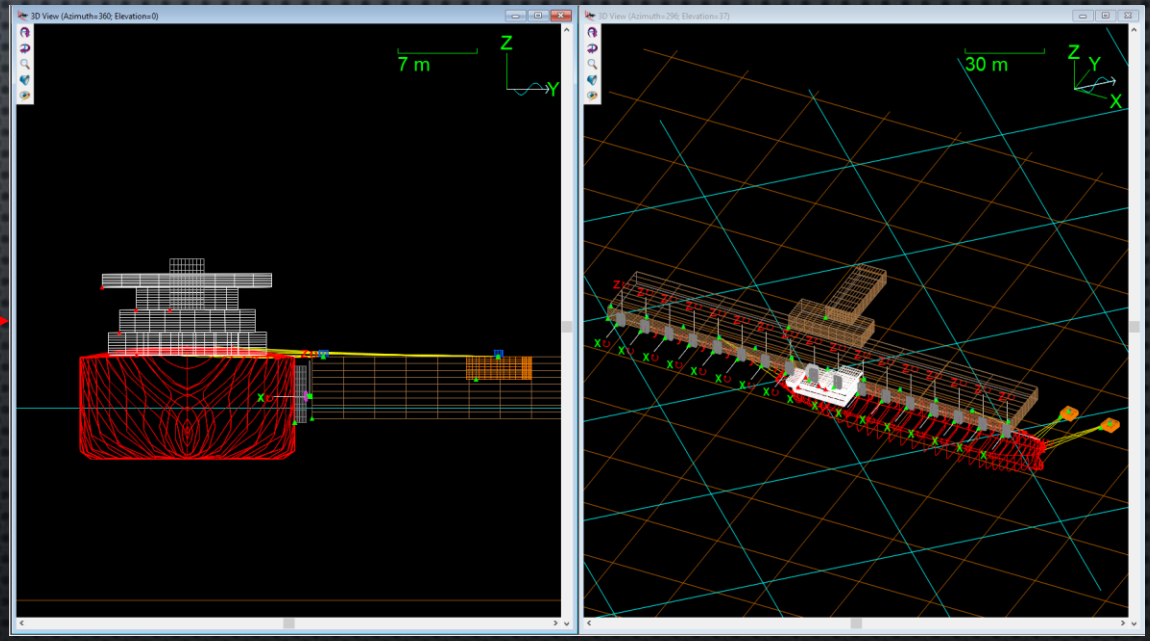
3 General Setting Stages



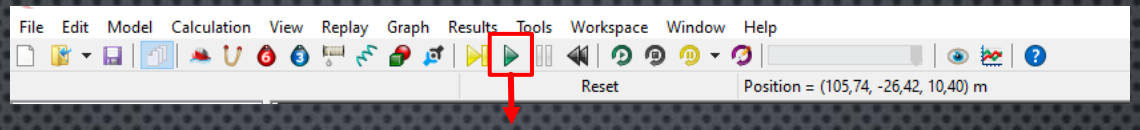
RUN : *STATIC*

Running Static

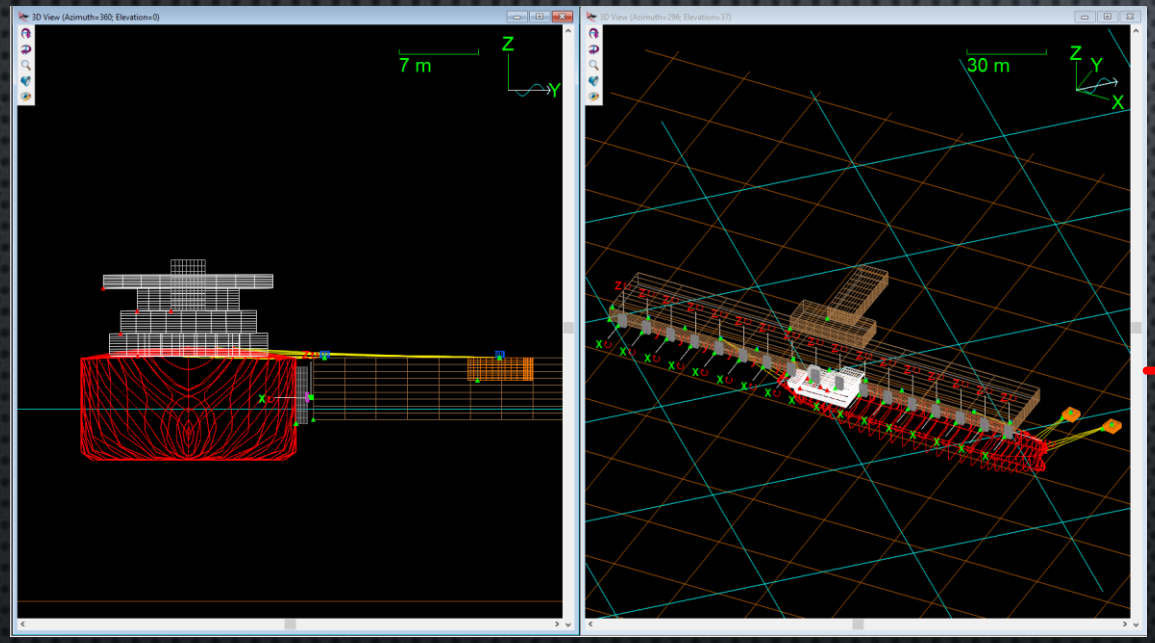


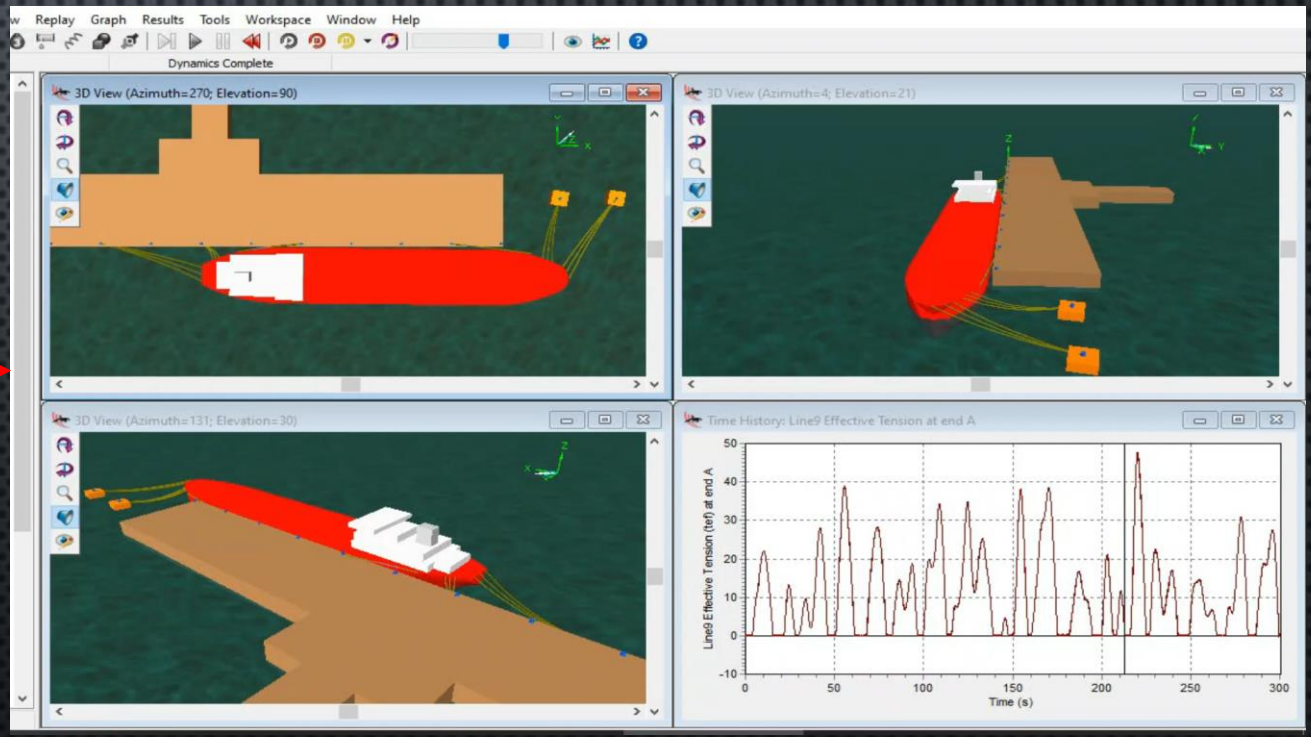


RUN : *DYNAMIC*



Running Dynamic

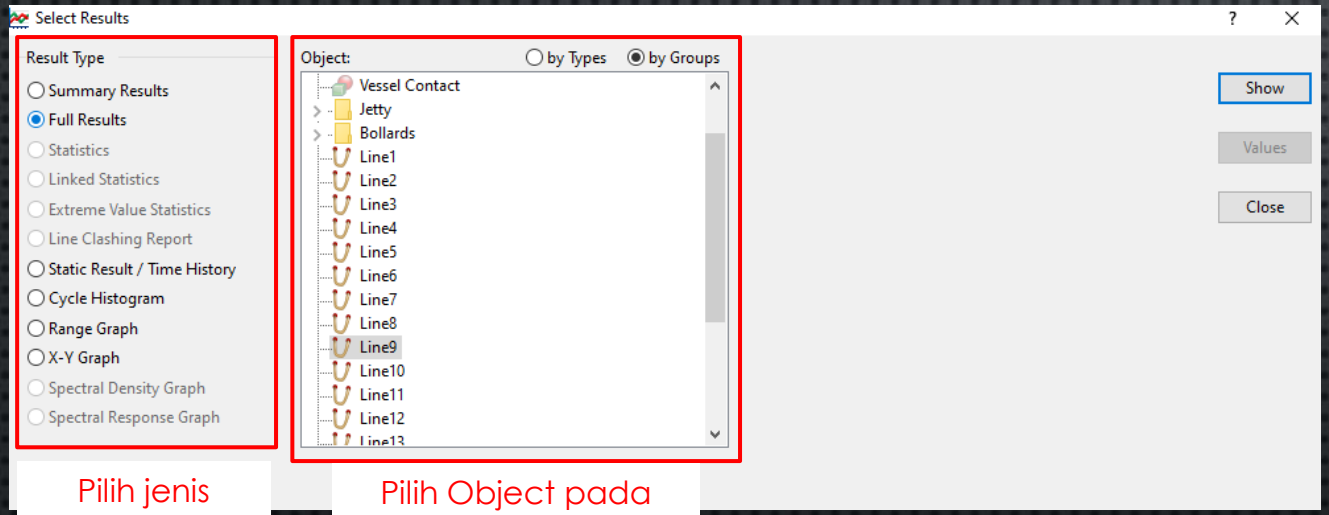




BAB 6
RESULTS

RESULTS STATIC

Klik icon atau tekan F5



Pilih jenis Output

Pilih Object pada **Static Analysis**

Full Results for Line9 in static state

OrcaFlex 10.2d: S2-N2 - M01 -D1.dat (modified 20:20 on 18/06/2021 by OrcaFlex 10.2d)

Shortest nodal natural period = 0,002960s.

Axial damping factors range from 0,000 to 0,000 % of critical damping.

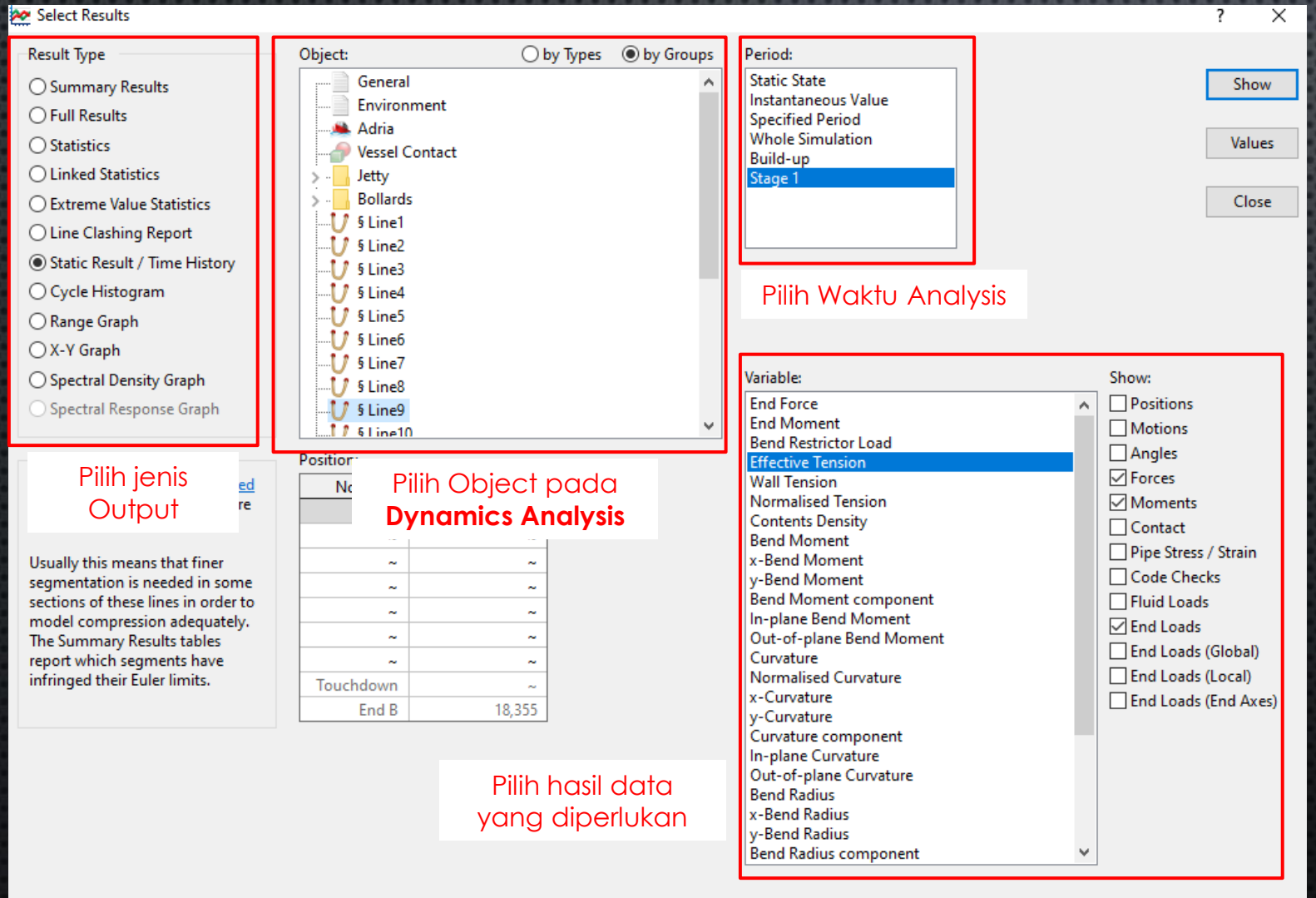
End A	
Total Force (tef)	9,9367
End Tension (tef)	9,9367
End Shear Force (tef)	0,0021
Total Moment (tef.m)	0,0
End Bend Moment (tef.m)	0,0
End Torque (tef.m)	0,0
End Curvature (rad/m)	0,0
End Ez-angle (deg)	89,3523
End Force Azimuth (deg)	12,3035
End Force Declination (deg)	89,3216
End Force Ez-angle (deg)	89,3641
End Force Exy-angle (deg)	12,3222

End A components							
		End Axes			Global Axes		
Load	Magnitude	Ex	Ey	Ez	GX	GY	GZ
Force (tef)	9,9367	9,7072	2,1204	0,1103	9,7078	2,1173	0,1177
Moment (tef.m)	0,0	0,0	0,0	0,0	0,0	0,0	0,0

End B	
Total Force (tef)	9,936
End Tension (tef)	9,936
End Shear Force (tef)	0,0021
Total Moment (tef.m)	0,0
End Bend Moment (tef.m)	0,0
End Torque (tef.m)	0,0
End Curvature (rad/m)	0,0
End Ez-angle (deg)	89,821
End Force Azimuth (deg)	12,2861
End Force Declination (deg)	89,8092
End Force Ez-angle (deg)	89,8092
End Force Exy-angle (deg)	12,2861

RESULTS DYNAMICS

Klik icon atau tekan F5

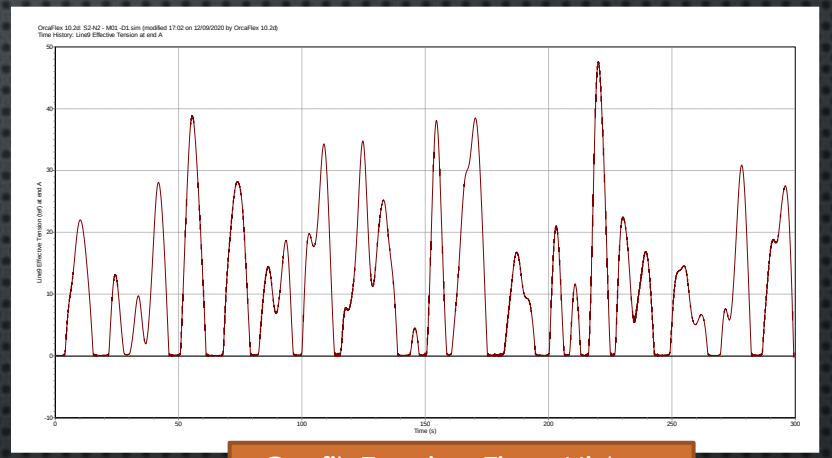


Pilih Waktu Analysis

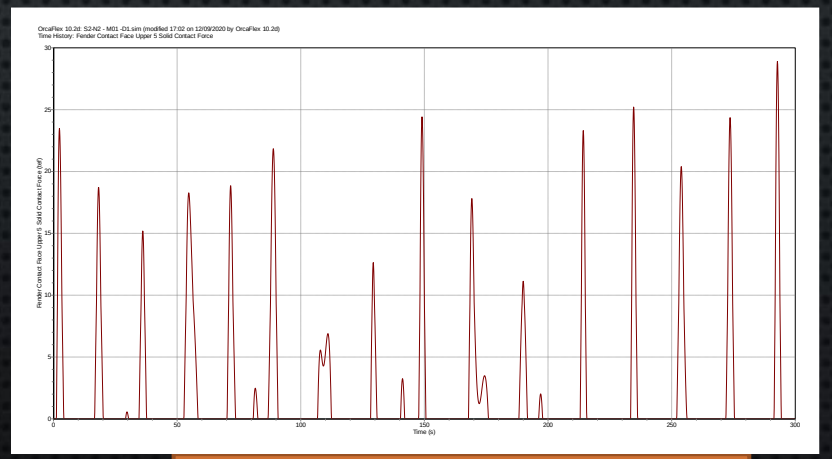
Pilih jenis Output

Pilih Object pada **Dynamics Analysis**

Pilih hasil data yang diperlukan



Grafik Tension Time History



Grafik Bollard contact Time History

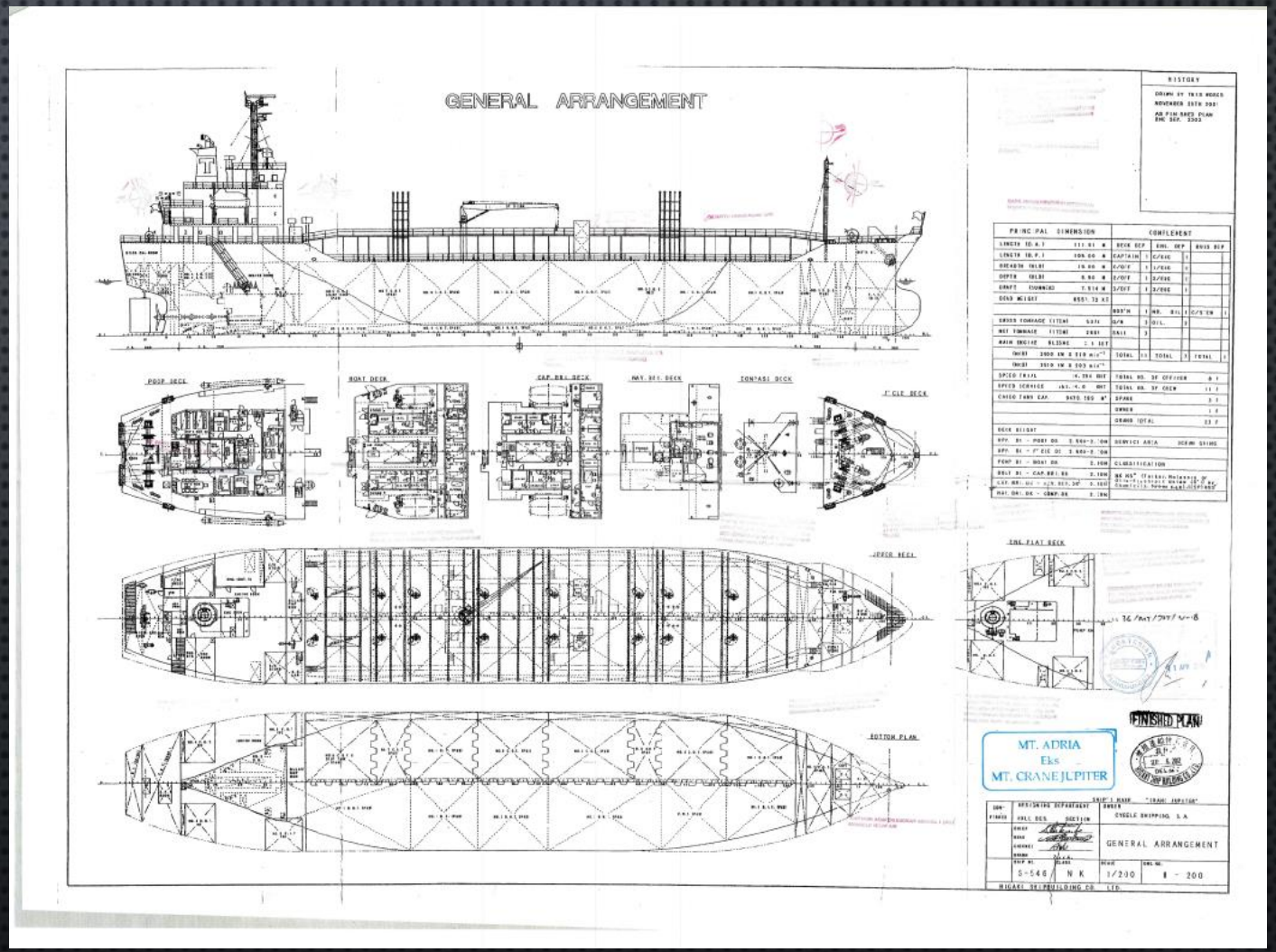
End of Slide

TERIMA KASIH

Principal Dimension

PARAMETER	VALUES	UNIT
Capacity	8558	DWT
Length of all (LOA)	**111,910**	**m**
Length of perpendicular (LPP)	105,000	m
Breadth	**19,000**	**m**
Depth	**9,900**	**m**
Draft	7,514	m
Deadweight		

BALLAST DRAFT		
Displacement	**7759**	**t**
Draft	**4,510**	**m**
Trim	**0,000**	**deg**
KMT	8,390	m
KG	**6,700**	**m**
CoG_x	**51,700**	**m**
R_{xx}	**8,251**	**m**
R_{yy}	**30,311**	**m**
R_{zz}	**30,311**	**m**
GMT	1,400	m
MTC	80,600	m
WPA	1759,201	**m^2**
LCF	54,160	m
LCB	53,530	m
KML	173,600	m
BMT	6,110	m
BML	171,310	m



Back

Displacement RAO/Motion RAO from MOSES

```
*********************************************************************************************************
*                                          ***  MOSES   ***                                             *
*                                          ---------------                                              *
*         Diffraction Analysis                                                                          *
*                                                                                                       *
*   Draft            =   4,51 Meters      Trim Angle       =   0.00 Deg.     GMT             =   1.4 Meters *
*   Roll Gy. Radius  =   8.25 Meters      Pitch Gy. Radius = 30.31 Meters    Yaw Gy. Radius  = 30.31 Meters *
*   Heading          =   0.00 Deg.        Forward Speed    =  0.00 Knots     Linearization Based on 1/ 20    *
*                                                                                                       *
*********************************************************************************************************

                          +++ M O T I O N   R E S P O N S E   O P E R A T O R S +++
                          ========================================================

                    Process = DEFAULT: Units = Degrees, Meters, M-Tons, and MPA Unless Stated

                                        Results are in the Body System

                                  Of Point On Body Adria At X =  -51.7 Y =   0.0 Z =    6.7
```

E N C O U N T E R		Surge / Wave Ampl.		Sway / Wave Ampl.		Heave / Wave Ampl.		Roll / Wave Ampl.		Pitch / Wave Ampl.		Yaw / Wave Ampl.	
Frequency -(Rad/Sec)-	Period -(Sec)-	Ampl.	Phase	Ampl.	Phase	Ampl.	Phase	Ampl.	Phase	Ampl.	Phase	Ampl.	Phase
0.2513	25.00	0.994	67	0.000	0	0.971	-23	0.000	0	0.363	-112	0.000	0
0.2968	21.17	0.923	58	0.000	0	0.943	-33	0.000	0	0.499	-121	0.000	0
0.3423	18.35	0.880	47	0.000	0	0.900	-43	0.000	0	0.648	-132	0.000	0
0.3878	16.20	0.823	35	0.000	0	0.835	-56	0.000	0	0.801	-143	0.000	0
0.4333	14.50	0.750	22	0.000	0	0.746	-69	0.000	0	0.947	-156	0.000	0
0.4788	13.12	0.662	7	0.000	0	0.629	-84	0.001	131	1.071	-171	0.000	0
0.5243	11.98	0.558	-10	0.000	0	0.487	-100	0.001	-58	1.153	173	0.000	0
0.5698	11.03	0.441	-27	0.000	0	0.328	-114	0.000	0	1.167	156	0.000	0
0.6153	10.21	0.317	-45	0.000	0	0.170	-120	0.000	0	1.091	138	0.000	0
0.6608	9.51	0.198	-62	0.000	0	0.079	-70	0.000	0	0.916	120	0.000	0
0.7063	8.90	0.098	-70	0.000	0	0.172	-36	0.000	0	0.669	107	0.000	0
0.7518	8.36	0.045	-39	0.000	0	0.276	-50	0.000	0	0.425	108	0.000	0
0.7974	7.88	0.062	-9	0.000	0	0.333	-73	0.000	0	0.373	135	0.000	0
0.8428	7.45	0.078	-22	0.000	0	0.309	-99	0.000	0	0.565	142	0.000	0
0.8883	7.07	0.072	-47	0.000	0	0.217	-117	0.000	0	0.744	124	0.000	0
0.9337	6.73	0.048	-77	0.000	0	0.160	-112	0.000	0	0.737	99	0.000	0
0.9793	6.42	0.021	-106	0.000	0	0.174	-112	0.000	0	0.563	78	0.000	0
1.0248	6.13	0.004	-126	0.000	0	0.160	-127	0.000	0	0.404	75	0.000	0
1.0704	5.87	0.003	133	0.000	0	0.114	-145	0.000	0	0.374	82	0.000	0
1.1158	5.63	0.008	128	0.000	0	0.072	-156	0.000	0	0.343	74	0.000	0
1.1614	5.41	0.013	108	0.000	0	0.055	-145	0.000	0	0.261	59	0.000	0
1.2069	5.21	0.015	86	0.000	0	0.052	-134	0.000	0	0.182	50	0.000	0
1.2524	5.02	0.015	81	0.000	0	0.045	-138	0.000	0	0.151	58	0.000	0
1.2979	4.84	0.013	91	0.000	0	0.036	-147	0.000	0	0.138	62	0.000	0
1.3434	4.68	0.012	95	0.000	0	0.017	-95	0.000	0	0.103	59	0.000	0
1.3889	4.52	0.015	89	0.000	0	0.023	-119	0.000	0	0.087	64	0.000	0
1.4342	4.38	0.012	96	0.000	0	0.018	-121	0.000	0	0.083	76	0.000	0
1.4798	4.25	0.011	97	0.000	0	0.015	-128	0.000	0	0.064	69	0.000	0
1.5254	4.12	0.011	94	0.000	0	0.014	-116	0.000	0	0.055	65	0.000	0
1.5708	4.00	0.011	99	0.000	0	0.011	-113	0.000	0	0.044	76	0.000	0

Back

Load RAO (linearized wave forces) -1st order from MOSES

```
*****************************************************************************************************
*                                          ***  MOSES   ***                                         *
*                                          ----------------                                         *
*         Diffraction Analysis                                                                      *
*                                                                                                   *
*                        Draft       =   4.51 Meters            Trim Angle  =   0.00 Deg.         *
*                        Heading     =   0.00 Deg.              Linearization Based on 1/ 20      *
*                                                                                                   *
*****************************************************************************************************

                    +++ L I N E A R I Z E D   W A V E   F R E Q U E N C Y   F O R C E S +++
                    ======================================================================

                Process = DEFAULT: Units = Degrees, Meters, M-Tons, and MPA Unless Stated

                                    Results are in the Body System

                            At Point On Body Adria At X =  -51.7 Y =   -0.0 Z =    6.7
```

E N C O U N T E R		Surge Force / Wave Ampl.		Sway Force / Wave Ampl.		Heave Force / Wave Ampl.		Roll Moment / Wave Ampl.		Pitch Moment / Wave Ampl.		Yaw Moment / Wave Ampl.	
Frequency -(Rad/Sec)-	Period -(Sec)-	Ampl.	Phase	Ampl.	Phase	Ampl.	Phase	Ampl.	Phase	Ampl.	Phase	Ampl.	Phase
0.2513	25.00	114	-112	0	0	2400	-19	0	0	26803	-128	0	0
0.2968	21.17	150	-121	0	0	2195	-26	0	0	34553	-132	0	161
0.3423	18.35	183	-131	0	0	1968	-33	0	0	41858	-139	0	142
0.3878	16.20	209	-143	0	0	1724	-41	0	0	47706	-148	0	109
0.4333	14.50	224	-154	0	0	1461	-50	0	0	51306	-158	0	74
0.4788	13.12	226	-166	0	0	1177	-59	0	0	52302	-168	0	29
0.5243	11.98	214	-178	0	0	877	-68	0	0	50757	-179	0	-23
0.5698	11.03	190	171	0	0	575	-75	0	0	46909	171	1	-64
0.6153	10.21	154	162	0	0	314	-70	0	0	40895	160	1	-103
0.6608	9.51	110	156	0	0	193	-33	0	0	32851	151	1	-138
0.7063	8.90	70	166	0	0	258	-4	0	0	23430	145	1	-172
0.7518	8.36	63	-163	0	0	331	-2	0	0	14950	152	1	153
0.7974	7.88	84	-151	0	0	348	-9	0	0	12337	179	1	114
0.8428	7.45	101	-155	0	0	306	-16	0	0	15241	-166	0	19
0.8883	7.07	101	-163	0	0	231	-15	0	0	17620	-169	1	-96
0.9337	6.73	85	-168	0	0	189	1	0	0	17063	-176	1	-126
0.9793	6.42	66	-165	0	0	216	16	0	40	13696	179	2	179
1.0248	6.13	62	-152	0	0	239	16	0	35	10823	-172	1	140
1.0704	5.87	69	-141	0	0	216	9	0	30	11530	-155	0	46
1.1158	5.63	68	-134	0	0	170	5	0	25	12809	-151	0	-160
1.1614	5.41	64	-129	0	0	150	19	0	26	11643	-156	2	-163
1.2069	5.21	64	-128	0	0	160	32	0	24	9418	-158	2	174
1.2524	5.02	68	-124	0	0	155	33	0	21	8924	-146	1	113
1.2979	4.84	64	-116	0	0	134	31	0	18	9430	-137	0	158
1.3434	4.68	61	-111	0	0	140	38	0	14	8696	-139	2	-174
1.3889	4.52	63	-114	0	0	131	47	0	6	7320	-141	2	164
1.4342	4.38	65	-108	0	0	117	46	0	6	7330	-132	1	76
1.4798	4.25	57	-96	0	0	106	48	0	6	7390	-122	1	166
1.5254	4.12	58	-95	0	0	112	60	0	5	6283	-122	2	-168
1.5708	4.00	67	-90	0	0	96	67	0	2	6702	-114	1	77

Back

Wave Drift Quadratic Transfer Function (QTF) 2nd order from MOSES

```
*********************************************************************************************************
*                                          *** MOSES   ***                                              *
*                                          ---------------                                              *
*         Diffraction Analysis                                                                          *
*                                                                                                       *
*                                      Heading     =    0.00 Deg.                                       *
*                                                                                                       *
*********************************************************************************************************
```

+++ M E A N D R I F T F O R C E S +++

Process = DEFAULT: Units = Degrees, Meters, M-Tons, and MPA Unless Stated

Reported in the Body System

Body Name = Adria Drift Name = Adria Drift Method = Near Field

Force Factor = 1.0000 Radiation Factor = 1.0000 Coriolis Factor = 0.0000

Mean Drift Force / (Wave Amplitude)**2

E N C O U N T E R		T R A N S L A T I O N			R O T A T I O N		
Frequency	Period	Surge	Sway	Heave	Roll	Pitch	Yaw
0.2513	25.000	80.5	-0.0	5.0	0.0	1444.5	-5.2
0.2968	21.168	129.2	-0.0	2.1	0.0	1599.1	-8.9
0.3423	18.354	192.9	0.0	-0.9	-0.1	1855.7	-14.5
0.3878	16.201	266.9	0.0	-3.9	-0.1	2176.6	-20.8
0.4333	14.500	359.4	0.0	-7.1	-0.1	2621.9	-28.8
0.4788	13.122	509.3	-0.0	-10.5	-0.1	3492.5	-41.9
0.5243	11.983	761.8	0.0	-14.1	-0.2	5159.1	-65.0
0.5698	11.027	1090.9	-0.0	-17.2	-0.2	7468.1	-95.2
0.6153	10.211	1415.8	-0.0	-19.3	-0.3	9854.9	-125.9
0.6608	9.508	1823.0	-0.0	-20.7	-0.4	13032.4	-164.9
0.7063	8.896	2518.3	-0.0	-22.0	-0.6	18596.7	-232.4
0.7518	8.357	3381.1	-0.0	-22.7	-0.8	25564.3	-319.0
0.7974	7.880	4255.5	-0.0	-22.8	-1.0	32617.5	-409.3
0.8428	7.455	5560.4	-0.0	-24.7	-1.3	42870.2	-545.1
0.8883	7.073	7213.2	-0.0	-28.8	-1.7	55624.7	-720.9
0.9337	6.729	8985.8	-0.0	-34.7	-2.1	69165.0	-918.3
0.9793	6.416	11100.6	-0.0	-42.0	-2.7	85399.1	-1162.0
1.0248	6.131	13311.4	-0.0	-48.2	-3.4	102537.8	-1423.6
1.0704	5.870	16309.2	-0.0	-55.1	-4.2	125903.7	-1785.2
1.1158	5.631	19124.9	-0.1	-62.0	-5.1	147739.9	-2141.9
1.1614	5.410	22865.5	-0.1	-72.0	-6.2	176678.8	-2615.6
1.2069	5.206	26102.7	-0.1	-80.6	-7.2	201716.5	-3028.1
1.2524	5.017	29720.5	-0.1	-89.7	-8.3	229726.8	-3487.6
1.2979	4.841	32582.9	-0.1	-96.8	-9.1	251884.8	-3828.9
1.3434	4.677	39225.8	-0.1	-114.0	-10.9	303308.7	-4577.8
1.3889	4.524	43255.3	-0.1	-124.9	-11.7	334460.8	-4949.5
1.4342	4.381	52170.6	-0.1	-146.9	-13.8	403482.6	-5812.3
1.4798	4.246	54150.9	-0.1	-151.0	-13.7	418842.0	-5796.2
1.5254	4.119	59682.9	-0.1	-164.7	-14.6	461670.7	-6164.6
1.5708	4.000	70372.2	-0.2	-192.0	-16.6	544401.1	-6988.1

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Added mass & Damping matrices from MOSES

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$ MATRICES
$ Dimensions are Meters   and M-Tons
Frequency     0.2513          Period       25.0000
Added Mass
  5.31290E-02 -4.45677E-06 -4.91690E-02  1.55577E-04  8.96847E+00  2.88300E-04
 -1.15822E-05  8.90914E-01 -1.93894E-05 -3.56361E-01 -1.87042E-03 -4.56011E+00
 -1.87390E-02 -1.40868E-05  2.87602E+00  1.30904E-04 -8.83921E+00  3.38300E-03
  1.55577E-04 -3.56361E-01  1.30904E-04  1.26467E+01  2.74101E-02 -1.87266E+01
  8.96847E+00 -1.87042E-03 -8.83921E+00 -1.25700E-02  2.47278E+03 -6.51453E-02
  2.88300E-04 -4.56011E+00  3.38300E-03 -1.81773E+01  4.54653E-02  9.15332E+02
Damping
  3.25778E-04  1.20127E-08 -3.30988E-03  1.13394E-06  6.04531E-02  2.41375E-06
 -9.76128E-08  1.02889E-03 -3.17768E-06 -1.19097E-03  3.60740E-06 -2.94474E-03
  1.40303E-04  2.20450E-07  2.50631E-01  1.94035E-05 -4.54861E-01  5.28570E-04
  1.13394E-06 -1.19097E-03  1.94035E-05  2.10030E-03  1.99213E-03 -1.02163E-03
  6.04531E-02  3.60740E-06 -4.54861E-01 -2.79862E-03 -2.60874E+00 -4.78248E-02
  2.41375E-06 -2.94474E-03  5.28570E-04  8.96607E-03  1.35685E-02 -1.03695E-02
Frequency     0.2968          Period       21.1680
Added Mass
  5.56997E-02 -3.92826E-06 -4.70875E-02  1.64880E-04  9.41491E+00  2.77952E-04
 -1.19641E-05  9.22430E-01 -1.44736E-05 -3.74016E-01 -1.82140E-03 -4.65040E+00
 -1.86290E-02 -1.51514E-05  2.69360E+00  1.05937E-04 -8.61064E+00  2.86538E-03
  1.64880E-04 -3.74016E-01  1.05937E-04  1.26902E+01  2.78555E-02 -1.89310E+01
  9.41491E+00 -1.82140E-03 -8.61064E+00 -8.58611E-03  2.59191E+03 -1.50698E-02
  2.77952E-04 -4.65040E+00  2.86538E-03 -1.83110E+01  3.04105E-02  9.30388E+02
Damping
  9.39229E-04  4.45867E-08 -4.78972E-03  3.24659E-06  1.73124E-01  5.31763E-06
 -2.73092E-07  3.27135E-03 -4.02029E-06 -3.66574E-03 -4.92542E-07 -9.31890E-03
  2.75379E-04  4.75598E-07  3.55283E-01  2.69575E-05 -6.63062E-01  7.38075E-04
  3.24659E-06 -3.66574E-03  2.69575E-05  6.45138E-03  3.22914E-03 -4.48060E-03
  1.73124E-01 -4.92542E-07 -6.63062E-01 -3.77882E-03  1.69486E+01 -6.73185E-02
  5.31763E-06 -9.31890E-03  7.38075E-04  2.59747E-02  2.01184E-02  5.53214E-03
Frequency     0.3423          Period       18.3540
Added Mass
  5.82161E-02 -3.18132E-06 -4.43517E-02  1.74368E-04  9.84321E+00  2.64774E-04
 -1.23575E-05  9.63141E-01 -9.39457E-06 -3.95734E-01 -1.87907E-03 -4.76629E+00
 -1.86200E-02 -1.41525E-05  2.47200E+00  9.90397E-05 -8.30670E+00  2.30151E-03
  1.74368E-04 -3.95734E-01  9.90397E-05  1.27423E+01  2.82694E-02 -1.92083E+01
  9.84321E+00 -1.87907E-03 -8.30670E+00 -5.58164E-03  2.70997E+03  3.83191E-02
  2.64774E-04 -4.76629E+00  2.30151E-03 -1.85184E+01  1.55523E-02  9.50384E+02
Damping
  2.19848E-03  1.40267E-07 -6.35294E-03  7.71755E-06  4.02196E-01  1.07991E-05
 -6.35760E-07  8.77807E-03 -4.50215E-06 -9.43529E-03  1.89855E-06 -2.49064E-02
  4.64004E-04  6.66442E-07  4.60124E-01  3.53162E-05 -8.96230E-01  9.28227E-04
  7.71755E-06 -9.43529E-03  3.53162E-05  1.64359E-02  5.14583E-03 -1.61504E-02
  4.02196E-01  1.89855E-06 -8.96230E-01 -4.75363E-03  6.42170E+01 -8.44028E-02
  1.07991E-05 -2.49064E-02  9.28227E-04  6.10699E-02  2.85522E-02  1.70540E-01
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