TIMING AND THE AMPHIBIOUS LANDING PLACE IN THE WATERS OF TUBAN BEACH BASED ON ASPECTS OF METEO – OCEANOGRAPHY

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ABSTRACT

Amphibious operation integrates various types of force that ships, aircraft, and landing troops in an attack on enemy beaches and or potentially controlled by the enemy and marine nature in the sense that the Navy took the lead role as reflected in the way the implementation of such operations. Wind and rainfall information, wave, depth, tide, and currents as well as the characteristics of known absolute Tuban beach. Plot Wr analysis method Tuban beach waters wind, waves and currents follow the pattern of monsoon circulation, while the harmonic analysis is known that the type of tidal waters Tuban beach entrance in a single daily group. Basic morphology Tuban coastal waters are generally very gentle slopes to a depth of 30 m and partly sandy, muddy, and quicksand coastal waters. Wind speed max of 14.87 knots. The rainfall max of 56 mm/hr. The significant wave height of 0.6 m and a wave period of 4.6 s.The High Waters Level of 180 cm and Low Waters Level of 40 cm and Mean Sea Level of 140 cm. The max speed of 76.47 cm/s.

Keywords*: Amphibious Operations, Meteo-Oceanographic aspects, Wr plot analysis method and harmonic analysis, bathymetry.*

1 INTRODUCTION

Tuban coastal waters are one example of some areas that will be used as landing sites. Historically Tuban is the main port city on the rich north coast of Java and has many Chinese residents. The Chinese call Tuban by the name Duban or another name is Chemin. Chinese-Mongolian troops (Tartar army), which in 1292 came to attack eastern Java (the event that caused the founding of the Majapahit empire) to land on the coast of Tuban (BPS Tuban, 2012).

The landing beach is part of the landing line which can be used for landing troops and their elements or part of the landing site chosen for landing operations. Often referred to as a colored beach or numbered beach. Determination of landing beaches is part of the basic decision on Amphibian operation planning (PUM AL 1.01-1.31). The purpose of this research is to be able to determine the right choice of time and place of landing based on aspects of Meteo-Oceanography in Tuban coastal waters.

2 RESEARCH METHODS

This research was conducted in an area of the Tuban coast along Demari, Sugih Waras, and Tg. Awar-awar, Demari Beach is located at Coordinate 06 ° 53'47.32 "S - 112 ° 04'57.36" T, Sugih Waras Beach at Coordinate 6 ° 51'55.62 "S - 112 ° 01'55.54" T And the Awar-Awar Capes at Coordinate 6 ° 45'46.42 "S - 111 ° 57'50.42" T. Whereas the Tidal Station at Coordinates 06 ° 47 '24.66 "S - 111 ° 59 '11.37" T, Meteo Station at Coordinates 06 ° 86'35.67 "S - 112 ° 03'04.00" T

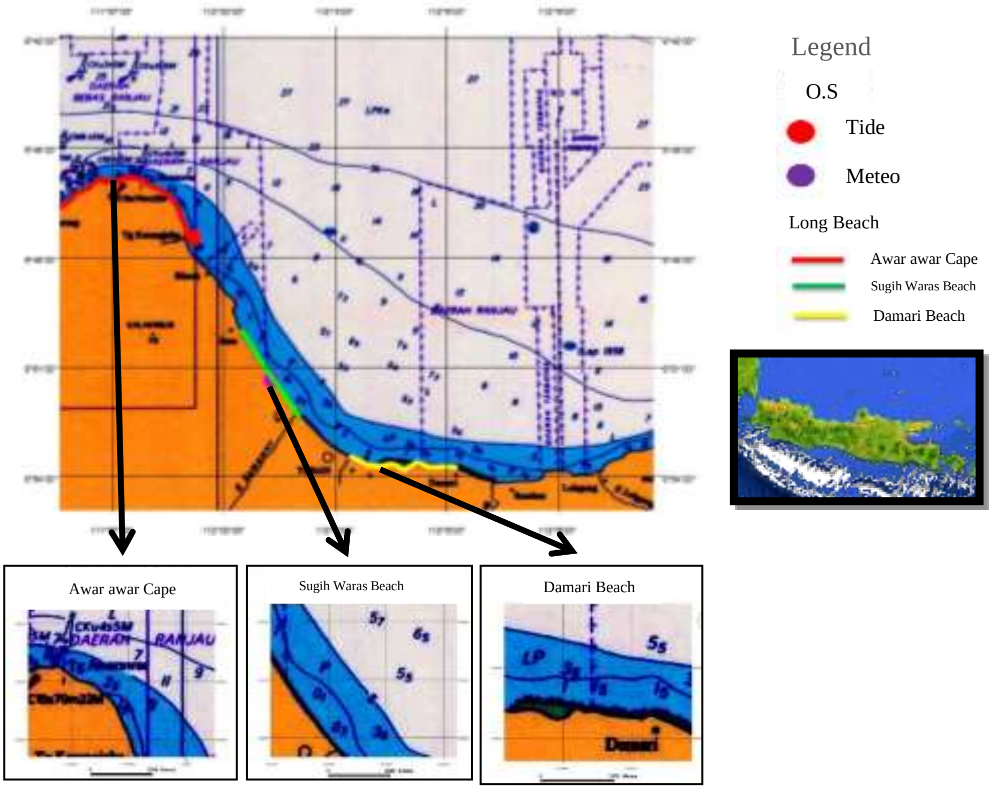


Figure 1. Image Map of Research Locations in Tuban Coast Waters.

General Condition of Tuban Regency

2.1. Geographical Location

Tuban Regency East Java Province is an area located on the northern coastline (Pantura) of the island of Java, located at coordinates 111 ° 30 'to 112 ° 35' East Longitude and 6 ° 40 'to 7 ° 18' South Latitude boundaries region north of the Java Sea, east of Lamongan Regency, south of Bojonegoro Regency, west of Rembang and Blora Regencies (Central Java).

2.2. Geology

Geologically, Tuban Regency is included in the northern part of the East Java basin which extends westward and eastward from Semarang to Surabaya. Most of the Tuban Regency is included in the Rembang Zone which is dominated by sediment which is generally in the form of carbonate rocks. The Rembang Zone is dominated by limestone hills.

2.3. Topography

The height of the land in the Tuban Regency ranges from 5-182 meters above sea level (asl). The northern part of the lowlands with an altitude of 0-15 meters above sea level, the southern and middle is also a lowland with an altitude of 5-500 meters. Areas with elevations of 0-25 m are located around the coast and with Bengawan Solo, while areas with elevations above 100 meters are located in Montong District. The area of agricultural land in the Tuban Regency is 183,994,562 Ha consisting of 54,860,530 Ha of paddy fields and 129,134,031 Ha of dry land.

2.4. Climate

Tuban Regency is a dry climate area with a somewhat dry to very dry variation covering an area of 174,298.06 Ha (94.73%) of the Tuban area, while the rest is approximately 9,696.51 Ha (5.27%) is an area that is quite wet. (BPS Tuban, 2012)

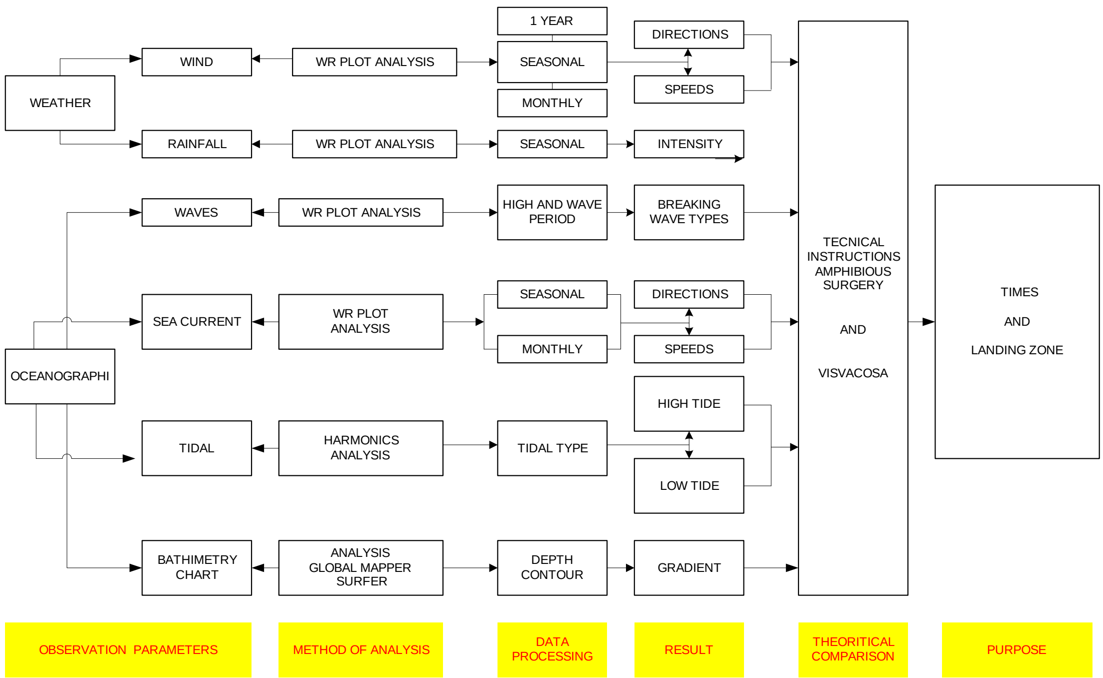
Tools and materials

The tools used in this study consisted of hardware and software. Hardware includes 1 unit of Laptop, printer. The software used includes WR Plot Application Software, Global Mapper, Arcview 3.3, Surfer 10, Microsoft Office, Microsoft Excel.

No	Data	Status	Year	Source
1	Rainfall And Wind	Secondary	2013	Maritime BMKG East Java
2	Waves	Secondary	2013	Naval Hidro-Oceanographi and BMKG
3	Tidal	Secondary	2013	Naval Hidro-Oceanographi
4	Sea Current	Secondary	2013	Naval Hidro-Oceanographi and BMKG
5	Tuban district general condotions		2012	Tuban district BPS

Data processing

Wind data, rainfall, surface sea currents, and waves are processed in several stages using WR Plot application software and tidal data are processed using the Admiralty method, while bathymetry maps are processed with Arcview, a global mapper and Surfer application software.



WR Plot Analysis

There are three types of wind data analysis performed, namely 1-year mouthly wind data, seasonal wind data, and 1-year hourly wind data from January-December 2013

- Monthly wind data

  Monthly wind data obtained from hourly wind data, processed and presented in the form of diagrams called wind roses that serves to determine the dominant wind direction. The processing is done as follows:

  Wind data are grouped according to direction and speed. In each direction of the wind, the speed is divided into seven parts, namely the wind with speeds <1 knot, 1-4 knots, 4-7 knots, 7-11 knots, 11-17 knots, 17-21 knots, and> 22 knots. The amount of wind data that has been divided according to direction and speed is regrouped based on the wind month that blows, so that monthly wind data is obtained within 1 year. Then the percentage is calculated for each direction and speed and presented in graphical form.

- Seasonal wind data

  Seasonal wind data is obtained from hourly wind data each season, processed, and presented in diagram form. The processing is done utilizing wind data grouped based on their direction and speed. In each direction of the wind, the speed is divided into seven parts namely wind with speeds <1 knot, 1-4knot, 4-7knot, 7-11 knots, 11-17 knots, 17-21 knots, and > 22 knots. The number of wind data that have been divided according to direction and speed are regrouped based on the blowing wind season, so that seasonal wind data is obtained within a period of 1 year, namely the west season December-March, the transition season beginning in April-May, the east season June-September and the season the transition from the end of October to November, then the percentage is calculated for each direction and speed, and presented in graphical form.

- 1-year wind data

  One-year wind data obtained from hourly wind data, processed and presented in diagram form. Wind data are grouped according to direction and speed. Each direction of the wind, the speed is divided into seven parts namely wind with speeds <1 knot, 1-4knot, 4-7knot, 7-11 knots, 11-17 knots, 17-21 knots, and> 22 knots. The amount of wind data has been divided according to direction and speed, so that wind data obtained within A period of 1 year.

For breaking waves after a significant wave height value is obtained, then grouping H Significant and T significant every month for 1 year, using the equation formula.

H_{10} = average wave height of the highest 10% wave. average wave height of 33% highest wave height This wave height is usually called a significant wave height (significant wave height) while to determine the wave period the same method is used but for a significant wave height. The period is done in two ways T_{33} = $T_{1/3}$ = the average wave period of the 33% highest wave or the average wave period of all records (not so different) except when the energy spectrum is caused by two types of waves namely sea and swell. The breaking wave boundary conditions are expressed in equation (1)

$$\left(\frac{H}{L}\right)_{MAX} = \frac{1}{7}\tanh\left(\frac{2\pi d}{L}\right) \qquad (1)$$

At sea in the equation becomes equation (2)

$$\left(\frac{H_0}{L_0}\right)_{MAX} = \frac{1}{7} = 0{,}142 \qquad (2)$$

If the wave moves towards the shallow sea, the slope of the boundary depends on the relative depth of d / L and the slope of the seabed.

Waves from the deep sea that moves towards the coast will increase its slope until finally it is unstable and breaks at a certain depth. The formula for determining the height and depth of a breaking wave with equation (3)

$$\frac{db}{Hb} = \frac{1}{b - \left(\frac{aHb}{gT^2}\right)} \qquad (3)$$

b and a are beach slope functions m and are given by equations (4) and (5)

$$a = 43,75\,(1-e^{-19m}) \qquad (4)$$

$$b = \frac{1,56}{(1+e^{-19,5m})} \qquad (5)$$

Determination of breaking wave height and depth of the breaking wave using Graphs

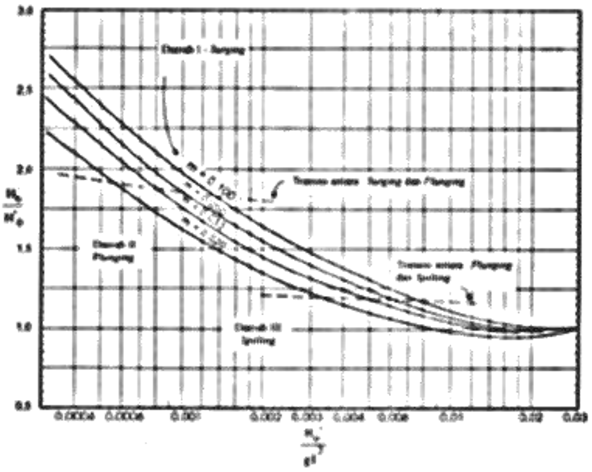


Figure Determination of Breaking Wave Height
(Source: Triatmodjo, 2008)

With known wave height and wave period, beach slope and angle of incidence, the refraction coefficient will be known so that the calculation will produce a value Hb/H'0 dan H'0/gT² so that through the wave determination chart, we will get the type of breaking wave, whether it is Spilling, Plunging, Surging or Collapsing. Harmonic Analysis

Analysis of tidal data from January to December is processed by Microsoft Excel and office using the Admiralty method. Formzahl values will be obtained.

$$F = \frac{A(K1)+A(O1)}{A(M2)+A(S2)}$$

With

F = Formzahl values
A = Amplitude Values
K_1 = Pricipal lunar diurnal with estimate 25.82 time
O_1 = Luni-solar diurnal with istimate 23.93 time
M_2 = Principal solar with estimate 12.00 time
S_2 = Principal lunar with estimate 23.93 time

Sea Map Analysis in determining the beach gradient

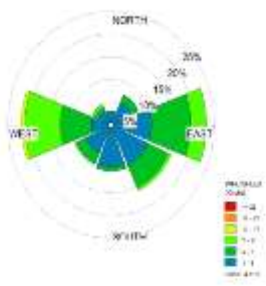
$$\tan \emptyset = \frac{\Delta y}{\Delta x}$$

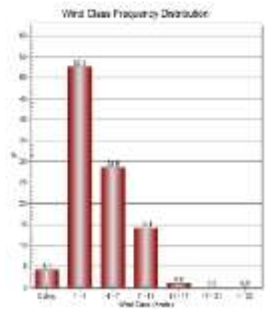
For y are the sea depth to bottom and X horizontal line from zero coastlines to a certain depth. Positive tangent values in quadrants I and III and negative in quadrants II and IV.

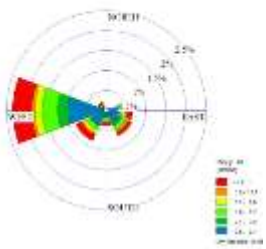
3 RESULT AND DISCUSSION

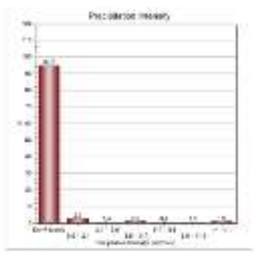
3.1 Wind and rainfall

In the coastal waters of the Tuban, the most winds blow from the east to reach 23.5%, while from the west 21.5%, from the southeast 16% with a maximum speed of 14.87 knots. Most rainfall from the west reached 2.4%, from the southwest 0.8%, and from the southeast, 0.65% with a maximum rainfall intensity of 56 mm / h weather prediction in 2013 showed a long dry season.





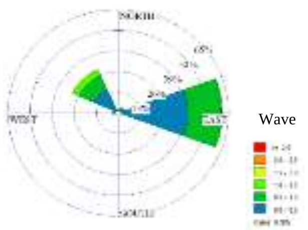


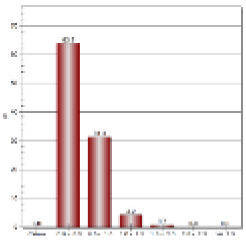


Thematic Records of Wind Roses and Rain Roses for one year

3.2. Ocean waves

From the analysis of the wave data presented in the Wave Rose and Wave Class, it can be seen that differences occur during the season, in the west season during December-March the maximum wave height reaches 2 m, the transition period early in the year ie April-May the maximum wave height reaches 1 m and in the east monsoon during June-September the maximum wave height is equal to the beginning of the year transition season which reaches 1 m.



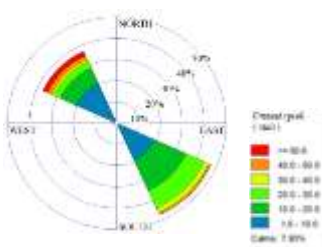


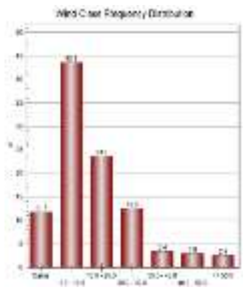
WAVE HEIGHT DATA, PERIOD AND WAVE TYPES THE COASTAL WATER OF TUBAN IN 2013					
Month	Significant H (m)	Significant T (s)	Hb / H'0	H'0 / gT²	Wave Types
JANUARY	1,15	5,10	1,02	0,0042	SPILLING
FEBRUARY	0,97	4,93	1,07	0,0037	SPILLING
MARCH	0,47	4,19	1,21	0,0026	SPILLING
APRIL	0,39	4,20	1,28	0,0021	TRANSITION
MAY	0,51	4,49	1,23	0,0024	SPILLING
JUNE	0,48	4,70	1,30	0,0021	TRANSITION
JULY	0,83	5,12	1,16	0,0029	SPILLING
AUGUST	0,72	4,81	1,15	0,0029	SPILLING
SEPTEMBER	0,70	4,89	1,17	0,0027	SPILLING
OCTOBER	0,43	4,18	1,23	0,0023	TRANSITION
NOVEMBER	0,35	4,08	1,29	0,002	TRANSITION
DECEMBER	0,72	4,73	1,14	0,003	SPILLING

Wave Rose Thematic Record and Wave Data for one year

3.3. Ocean currents

In Tuban coastal waters during 2013 the maximum surface sea current velocity of 76.47 cm / s reached 2.4%. the dominant flow to the southeast reaches 49% and to the northwest reaches 38% and slightly to the west 3%.

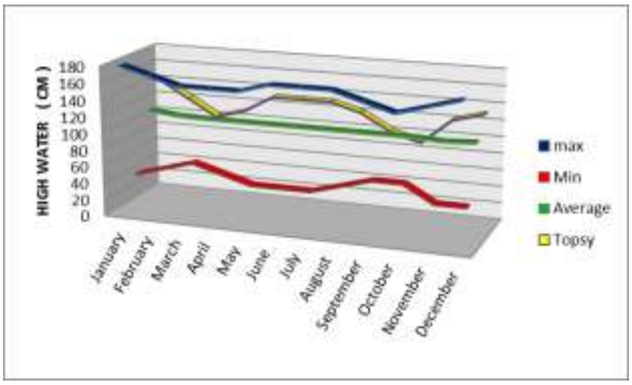




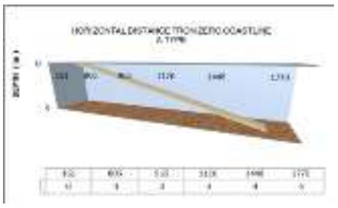
3.4. Tidal

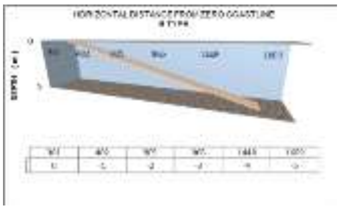
THE FINALY RESULT											F = 5.5	JANUARY
	S0	M2	S2	N2	K1	O1	M4	MS4	K2	P1		
A Cm	110	5	6	0	39	22	0	1	2	13	SINGEL	
g °		212	46	9	277	21	192	349	46	277	(DIURNAL)	
THE FINALY RESULT											F = 5.9	FEBRUARY
	S0	M2	S2	N2	K1	O1	M4	MS4	K2	P1		
A Cm	110	4	6	1	39	20	0	1	2	13	SINGEL	
g °		201	45	171	278	15	329	337	45	278	(DIURNAL)	
THE FINALY RESULT											F = 5.7	MARCH
	S0	M2	S2	N2	K1	O1	M4	MS4	K2	P1		
A Cm	105	4	7	2	38	25	0	1	2	13	SINGEL	
g °		231	48	93	277	17	19	17	48	277	(DIURNAL)	
THE FINALY RESULT											F = 5.2	APRIL
	S0	M2	S2	N2	K1	O1	M4	MS4	K2	P1		
A Cm	105	5	7	0	40	22	0	1	2	13	SINGEL	
g °		210	44	281	277	14	82	8	44	277	(DIURNAL)	
THE FINALY RESULT											F = 5.5	MAY
	S0	M2	S2	N2	K1	O1	M4	MS4	K2	P1		
A Cm	105	5	6	0	40	21	0	1	2	13	SINGEL	
g °		212	45	67	278	23	235	22	45	278	(DIURNAL)	
THE FINALY RESULT											F = 6.3	JUNE
	S0	M2	S2	N2	K1	O1	M4	MS4	K2	P1		
A Cm	105	5	5	1	39	24	0	1	1	13	SINGEL	
g °		222	45	259	278	25	312	329	45	278	(DIURNAL)	
THE FINALY RESULT											F = 5.3	JULY
	S0	M2	S2	N2	K1	O1	M4	MS4	K2	P1		
A Cm	105	5	6	1	38	20	0	1	2	13	SINGEL	
g °		216	53	233	277	14	299	11	53	277	(DIURNAL)	
THE FINALY RESULT											F = 5	AUGUST
	S0	M2	S2	N2	K1	O1	M4	MS4	K2	P1		
A Cm	105	6	6	1	38	22	0	1	2	13	SINGEL	
g °		211	52	78	277	25	252	3	52	277	(DIURNAL)	
THE FINALY RESULT											F = 4.9	SEPTEMBER
	S0	M2	S2	N2	K1	O1	M4	MS4	K2	P1		
A Cm	105	5	7	0	39	20	0	1	2	13	SINGEL	
g °		215	57	163	275	19	308	334	57	275	(DIURNAL)	
THE FINALY RESULT											F = 5.5	OCTOBER
	S0	M2	S2	N2	K1	O1	M4	MS4	K2	P1		
A Cm	105	5	6	0	40	21	0	1	2	13	SINGEL	
g °		217	52	48	276	20	97	23	52	276	(DIURNAL)	
THE FINALY RESULT											F = 6.1	NOVEMBER
	S0	M2	S2	N2	K1	O1	M4	MS4	K2	P1		
A Cm	105	5	5	1	39	22	0	0	1	13	SINGEL	
g °		218	53	43	277	26	89	13	53	277	(DIURNAL)	
THE FINALY RESULT											F = 6.2	DECEMBER
	S0	M2	S2	N2	K1	O1	M4	MS4	K2	P1		
A Cm	110	5	5	0	39	23	0	1	1	13	SINGEL	
g °		215	54	187	277	26	357	347	54	277	(DIURNAL)	

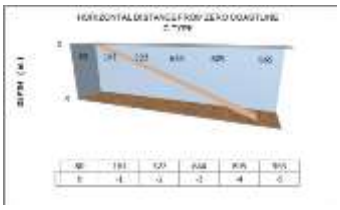
Based on the results of calculations and tables note that throughout the year in the coastal waters of Tuban has a Diurnal or a single daily type that is in one day occurs at high tide and once low tide.

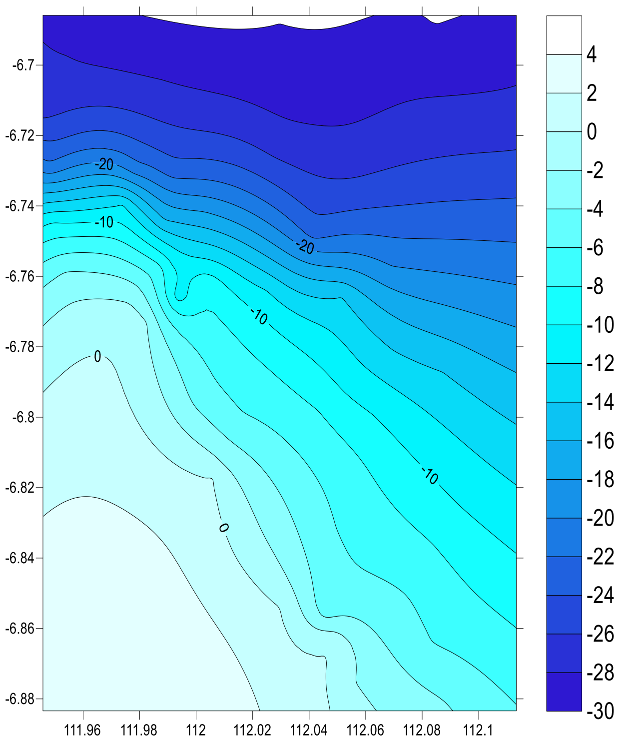


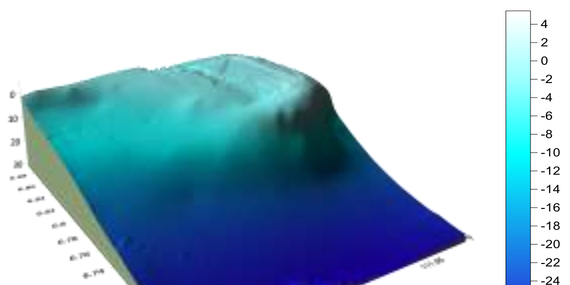
3.5. Bathymetry Map Analysis











4. CONCLUSION

From the results of the analysis, it can be concluded that the area of Tuban coastal waters throughout 2013 can be used as a landing site, with the Meteo-Oceanographic analysis the appropriate time to carry out the Amphibian landing ie in July to August while the right landing place is Sugih Waras Tuban beach.

Meteo-Oceanographic Data Calculation and Processing Result

No	Month	Rainfall and Wind				Sea Wave			Tidal Sea			Sea Current	
		Speed (Knots)	Blowing From (°)	Intensity (mm/hr)	Blowing From (°)	High (m)	Period (s)	Surf	Tipes	Max (cm)	Min (cm)	Speed (cm/s)	Blowing To (°)
1	January	7,8	272	4,5	272	1,15	5,10	SPILLING	DIURNAL	180	40	27,7	27
2	February	5	233	4,9	233	0,97	4,93	SPILLING	DIURNAL	170	50	12,6	120
3	March	3,9	223	3,9	223	0,47	4,19	SPILLING	DIURNAL	160	60	8,6	78
4	April	4	142	4,7	142	0,39	4,20	TRANSITION	DIURNAL	160	50	5,0	119
5	May	3,5	138	2,9	138	0,51	4,49	SPILLING	DIURNAL	160	50	5,6	317
6	June	3	157	5	157	0,48	4,70	TRANSITION	DIURNAL	170	40	4,0	293
7	July	**4,3**	**128**	**2,6**	**128**	**0,83**	**5,12**	**SPILLING**	**DIURNAL**	**170**	**40**	**15,6**	**390**
8	August	**4,6**	**113**	**0**	**113**	**0,72**	**4,81**	**SPILLING**	**DIURNAL**	**170**	**40**	**24,9**	**297**
9	September	4	116	0	116	0,70	4,89	SPILLING	DIURNAL	160	60	23,0	296
10	October	3,1	141	2,8	141	0,43	4,18	TRANSITION	DIURNAL	150	60	9,6	71
11	November	3	188	2	188	0,35	4,08	TRANSITION	DIURNAL	160	40	7,0	70
12	December	4,7	229	2,5	229	0,72	4,73	SPILLING	DIURNAL	170	40	17,0	68
		Information											

Depth (m)	Demari Beach		Sugih Waras Beach		Awar awar Cape	
0	161	1:134	361	1:134	80	1:65
1	805	1:644	402	1:241	161	1:81
2	965	1:160	805	1:403	322	1:161
3	1126	1:161	965	1:160	644	1:322
4	1448	1:322	1448	1:483	805	1:161
5	1770	1:322	1609	1:161	965	1:160

Parameters Comparison of Ideal Conditions with Analysis Results

No	Oceanographic Weather Parameters	Ideal Condition	Analysis Results
1	Speed and Wind Direction	Direction Pararel to the beach Maximum Surface wind speed of 13 knots	Demari beach is not pararel Sugih Waras Beach is pararel Awar awar Cape is not pararel
2	Breaking Waves	Spilling Type	All three beaches have Spilling Type
3	Speed and Current Direction	Direction between 60° - 90° Maximum Speed Current	Demari beach is 45° Sugih Waras beach is 60° Awar awar Cape is 90°
4	Tidal	Diurnal Type	All three beaches have Diurnal Type
5	Beach Gradient	Minimum slope 1:30 - 1:60	Demari beach slope 1 : 134 Sugih Waras beach Slope 1 : 134 Awar awar Cape Slope 1 : 65
6	Sea floor Sediment	Sandy	Demari beach is Sandy Mudd Sugih Waras beach is Sandy Awar awar Cape is Muddy
7	Beach Shape	Straight	Demari beach is bumpy Sugih Waras is Straight Awar awar Cape is convex
8	Long beach	For one BTP is 500 meters	Demari beach which can be used 200 meters Sugih Waras beach can be used 500 meters Awar awar Cape can be used 100 meters

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