

2ND INTERNATIONAL CONFERENCE OF SUSTAINABLE
EARTH RESOURCES ENGINEERING 2022 (SERIES 2022)
18-20 October 2022 | Langkawi, Malaysia



ORGANISING COMMITTEE

ADVISOR
Associate Prof. Dr. Ahmad Tarmizi
Bin Haron
Associate Prof. Ts. Dr. Mohd Yusri
bin Mohd Yunus

CHAIRPERSON:
Associate Prof. Dr. Mohd
Fakhrurrazi bin Ishak

SECRETARY I:
Dr. Noormazlinah binti Ahmad

SECRETARY II:
Dr. Nurul Ain binti Ismail

TREASURER I:
Dr. Noor Intan Shafinas
binti Muhammad

TREASURER II:
Mohd Hashim bin Mohd
Saad

JOURNAL &
PUBLICATION:
Ts. Dr. Amir bin Abdul Razak
Dr. Sajjad Khudhur Abbas Al-
amshawe

PAPER
PRESENTATION:
Associate Prof. Dr. Mazrul Nizam
bin Abu Seman

SPONSORSHIP:
Dr. Mohd Aizudin bin Abdul Aziz

TASK FORCE:
Dr. Abdul Halim bin Abdul Razik
Mohd Naffidi bin Abd Latif
Safuan bin Shariff
Ain Fatimah binti Johar
Suzlina binti Mohamad
Norazlia binti Maliki

CONTACT US:

Secretariat SERiES 2022
Centre for Sustainability of
Ecosystem & Earth Resources
(Earth Centre)
Universiti Malaysia Pahang
Lebuhraya Tun Razak
26300 Gambang Kuantan
Pahang Darul Makmur
Malaysia
E-mail: series@ump.my
Tel: +609 431 6831

Our Ref.: UMP.SERIES2022/AA (022)
Date : 20th June 2022

MUHAMMAD MAZMIRUL ABD RAHMAN

Kulliyah of Science
International Islamic University Malaysia
Kuantan, Pahang
25300, Malaysia

Dear author,

ACCEPTANCE OF ABSTRACT

We are pleased to inform you that the following abstract:

Title : **SENSITIVITY ANALYSIS AND APPLICATION OF XBEACH AT
CHEROK PALOH BEACH, PAHANG, MALAYSIA**
Authors : **MUHAMMAD MAZMIRUL ABD RAHMAN**
Paper ID : **SERIES22-22**
Category : **ENVIRONMENTAL & WATER RESOURCES**

has been **accepted for ORAL presentation** at the 2nd International Conference of Sustainable Earth Resources Engineering 2022 (SERiES2022) which will be held at the **Bayview Hotel, Langkawi Island, Kedah, Malaysia on October 18 - 20, 2022**. The specific details of the day and time of your presentation will be included in the conference program which will be available in October. Please use the given paper ID for any future correspondence.

All participant must complete the **registration and payment for SERiES2022 before 4th November 2022**. The organizing committee does not provide any financial support for visa, travel or accommodation.

Thank you for your interest in participating in the 2nd International Conference of Sustainable Earth Resources Engineering 2022 (SERiES2022). We look forward to seeing you in Langkawi Island.

Thank you

Yours Sincerely

ASSOC. PROF. DR. MOHD FAKHRURRAZI BIN ISHAK

Chairperson of SERiES 2022
Centre for Sustainability of Ecosystem & Earth Resources
(Earth Centre)
Universiti Malaysia Pahang

This is computer generated, no signature required

SERIES 2022 LIST OF VIDEO PRESENTATION PARTICIPANTS

NO.	NAME	PAPER ID	TITLE	CATEGORY
26	MUHAMMAD MAZMIRUL ABD RAHMAN	SERIES22-22	SENSITIVITY ANALYSIS AND APPLICATION OF XBEACH AT CHEROK PALOH BEACH, PAHANG, MALAYSIA	ENVIRONMENTAL AND WATER RESOURCES
27	MOH SHOLICHIN	SERIES22-38	MULTI ANALYSIS OF WATER QUALITY INDEX AND POLLUTION LOAD CAPACITY AT SUTAMI RESERVOIR, EAST EAST JAVA INDONESIA	
28	CHUANQI LI	SERIES22-40	IDENTIFICATION OF RIVER CONTAMINANT SOURCES USING A CELLULAR AUTOMATA MODEL AND BAYESIAN MCMC METHOD	
29	MOHD AMIRUL MUKMIN BIN ABDULLAH	SERIES22-43	TRACEABLE OF BMIM BF ₄ ON WATER SPINACH GERMINATION AND GROWTH	
30	SAJJAD AL-AMSHAWEE	SERIES22-44	ELECTRODIALYSIS MEMBRANE DESALINATION FOR WATER AND WASTEWATER TREATMENT: DIAGONAL MEMBRANE SPACERS WITH A 45° SPACER-BULK ATTACK ANGLE	
31	SAJJAD AL-AMSHAWEE	SERIES22-45	ELECTRODIALYSIS MEMBRANE TECHNOLOGY FOR WATER AND WASTEWATER PROCESSING: APPLICATION OF LADDER-TYPE (90°) MEMBRANE SPACERS TO IMPACT SOLUTION CONCENTRATION AND FLOW DYNAMICS	
32	SAJJAD AL-AMSHAWEE	SERIES22-46	IRREGULAR FLOW ATTACK ANGLES OF MEMBRANE SPACERS POSITIONED IN ELECTRODIALYSIS MEMBRANE TECHNOLOGY FOR WATER AND WASTEWATER PROCESSING: A SYSTEMATIC REVIEW	
33	HOANG BÍCH	SERIES22-54	UTILIZATION OF RICE HUSK AS A MATERIAL FOR PRODUCTION OF ACTIVATED CARBON FOR ENVIRONMENTAL TREATMENT: A REVIEW	
34	MOHAMMED ABDULQAWI AHMED MOHAMMED	SERIES22-81	OILY SLUDGE TREATMENT METHODS: CURRENT TRENDS REVIEW	
35	CHE KU MOHAMMAD FAIZAL BIN CHE KU YAHYA	SERIES22-80	AN EVALUATION OF NATURAL DISINFECTANT FOR THE TREATMENT OF FUNGAL CONTAMINATION IN DRINKING WATER DISTRIBUTION SYSTEM	
36	MOHD SYAZWAN NIZAM BIN MOHD MONI	SERIES22-94	THE WATER FOOTPRINT OF DAILY ACTIVITIES AMONG UNIVERSITI MALAYSIA PAHANG COMMUNITY	

Sensitivity Analysis and Application of XBeach at Cherok Paloh Beach, Pahang, Malaysia

M.M. Abd Rahman¹, M.Z. Ramli², M.S. Ab Razak³

¹Department of Marine Science, Kulliyah of Science, International Islamic University Malaysia, 25300, Kuantan, Pahang, Malaysia.

²Institute of Oceanography and Maritime Studies (INOCEM), International Islamic University Malaysia, Kampung Cherok Paloh, 26060, Kuantan, Pahang, Malaysia.

³Faculty of Engineering, Universiti Putra Malaysia, 43400 Serdang, Malaysia.
e-mail: mzbr@iium.edu.my

XBeach, a coastal response numerical model, developed to stimulate the nearshore and coastal processes (Roelvink *et al.*, 2009). It is 2HD open-source process-based which includes short wave propagation, sediment transport, flow and bathymetry changes from difference wave spectral and flow boundary conditions. The mode is focus on horizontal circulations and effects of coastal evolution due to anthropogenic measures (Ab Razak *et al.*, 2013). In this case, the application of XBeach was used at Cherok Paloh Beach located in Pahang, Malaysia. The model stimulated an extreme storm event during Typhoon Rai, 11 to 21 December 2021. The case of the event was tested using 1D beach erosion test during the storm conditions. The evaluation of the sensitivity analysis for the profile (morphological changes) was compared and determine using an error indicator (Brier Skill Score) proposed by van Rijn *et al.*, (2003). The sensitivity was tested using different morphological influenced parameters (*facua*, *wetslp* and *dryslp*) and been compared with the final beach profile to calculate the BSS. Based on the BSS, the validated value obtained then replicated to other 1D profile around Cherok Paloh Beach. Based on stimulated the default parameters tested shows overestimated erosion volume. The result obtained from the BSS, it revealed that the best model was obtained by changing the calibration parameter *facua* and *wetslp*.

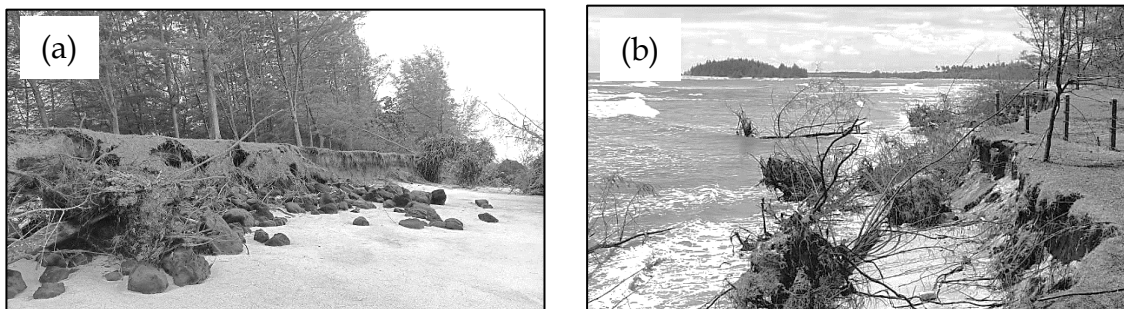


Fig. 1. Beach condition before storm event, (b) Beach condition after storm event.

This work was funded by the Ministry of Higher Education (MOHE) of Malaysia under the Long Term Research Grant Scheme (LRGS) No. LRGS21-001-0005 and LRGS/1/2020/UMT/01/14.

References

- [1] D. Roelvink, A. Reniers, A. Dongeren, J.T. Vries, R. McCall, and J. Lescinski, *Coastal Engineering*, 56(11-12), 1133-1152 (2009).
- [2] L.C. van Rijn, D.J.R. Walstra, B. Grasmeijer, J. Sutherland, S. Pan, and J.P. Sierra, *Coastal engineering*, 47(3), 295-327 (2003).
- [3] M.S. Ab Razak, A. Dastgheib, D. Roelvink, *Journal of Coastal Research*, 65(sp2), 2083-2088 (2013).

3RD TROPICAL OCEAN AND MARINE SCIENCES SYMPOSIUM 2022

SENSITIVITY ANALYSIS AND APPLICATION OF XBEACH AT CHEROK PALOH BEACH, PAHANG, MALAYSIA

MR. MUHAMMAD MAZMIRUL BIN ABD RAHMAN, IUM
DR. MUHAMMAD ZAHIR BIN RAMLI, INOCEM, IUM
DR. MOHD SHAHRIZAL BIN AB RAZAK, UPM



CONTENT



INTRODUCTION



PROBLEM STATEMENT



METHODOLOGY



RESULT



DISCUSSION





INTRODUCTION

XBeach is an open-source numerical model to simulate the **hydrodynamic** and **morphodynamic** processes and the impact on sandy beaches.

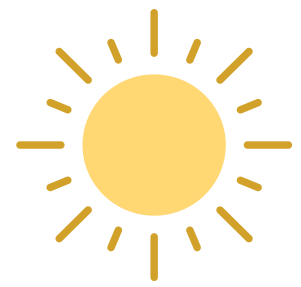
2DH-based model solution for wave propagation, long wave and mean flow, sediment transport, and **morphological changes nearshore**, beaches, and **dunes** due to **storms**.

Developed by **Delft University of Technology** and University of Miami





INTRODUCTION

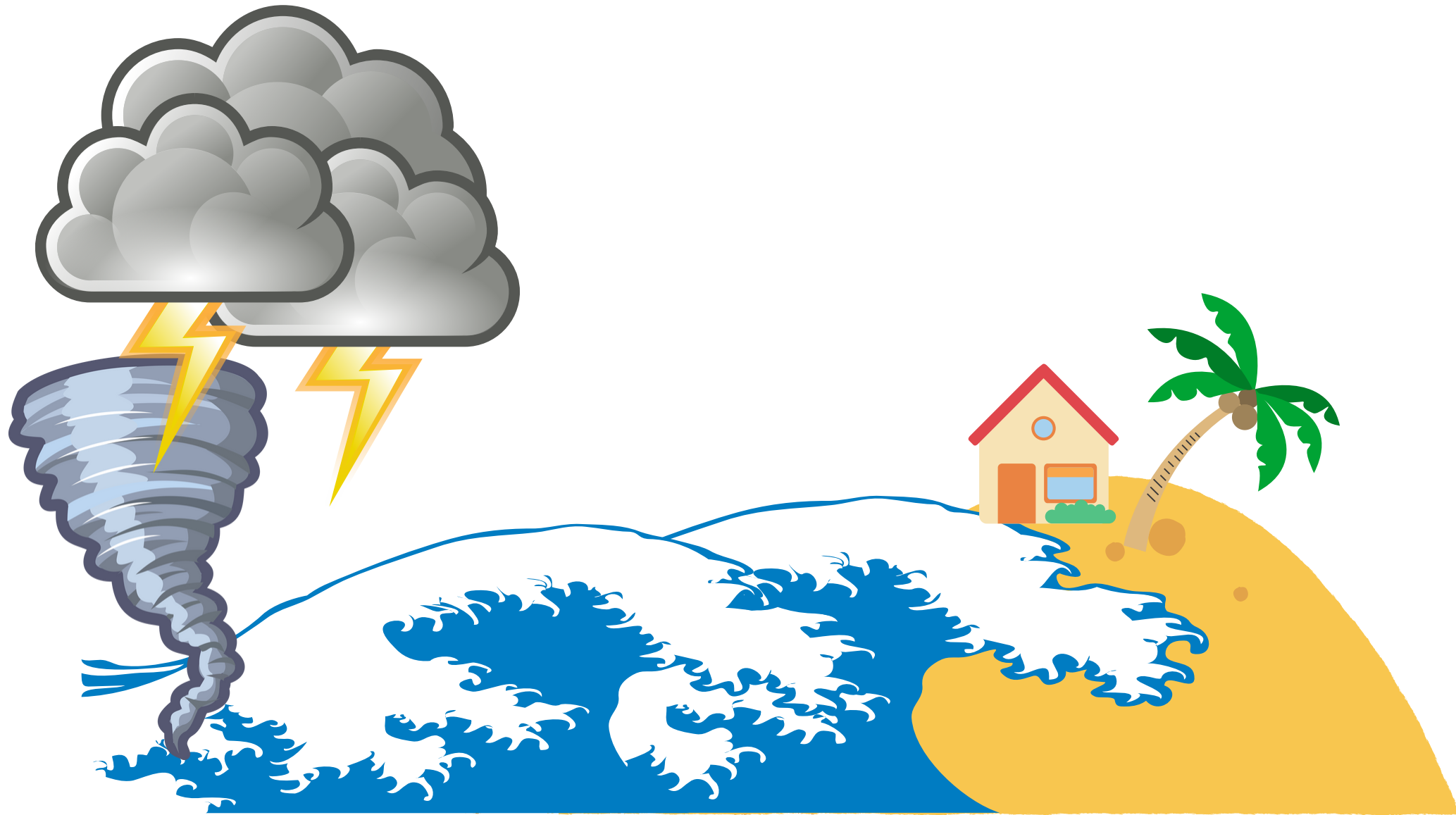


Storm surge is an **abnormal rise of water** generated by a **storm**, over and above the **predicted astronomical tide**.





INTRODUCTION



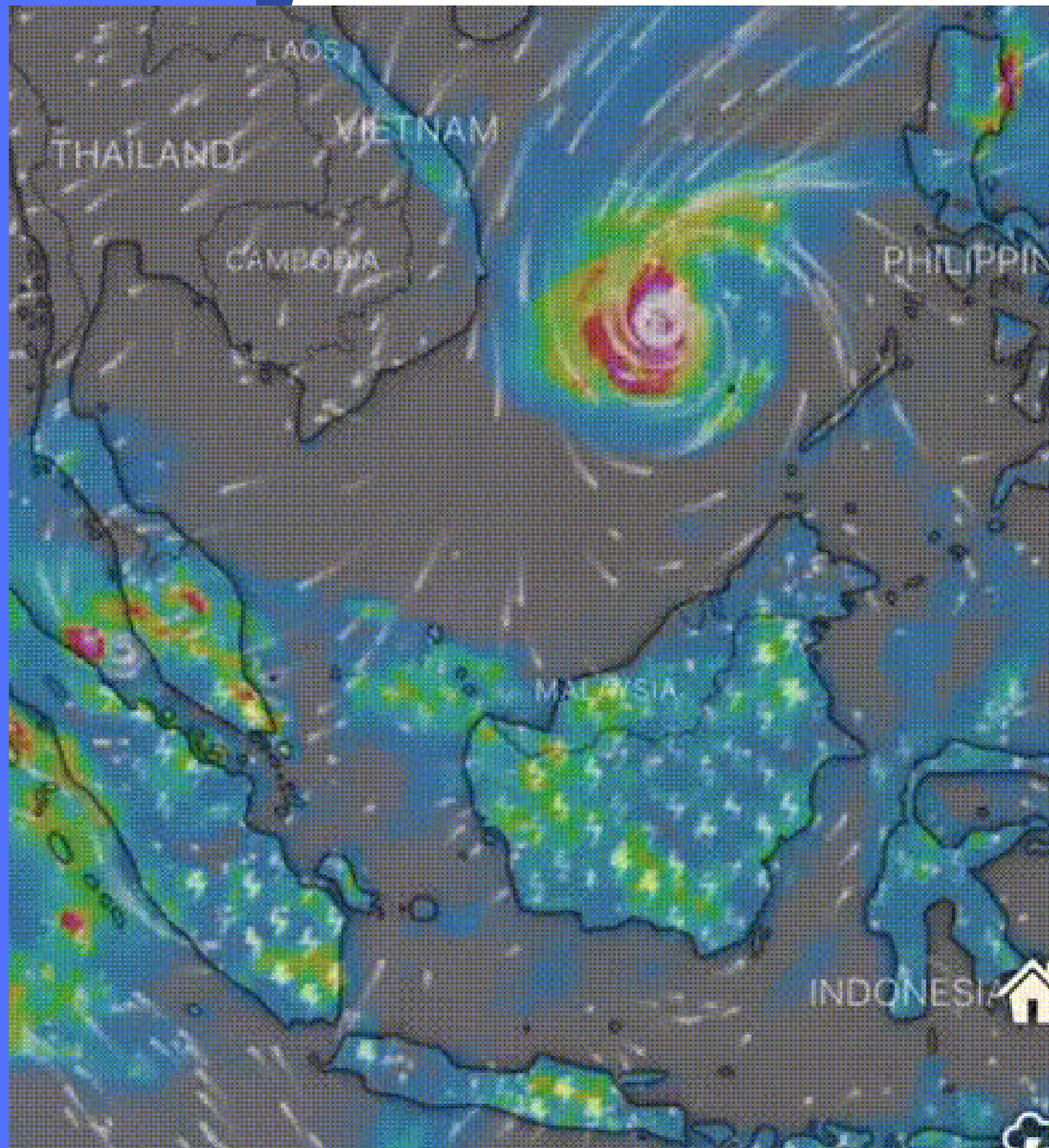
Storm surge is caused primarily by the **strong winds** in a **hurricane** or **tropical storm**.



PROBLEM STATEMENT

SUPER TYPHOON RAI (ODETTE)

**11 DEC 2021 - 21 DEC 2021
(16 DEC 2021)**



- Wind Speed : 267km/h
- Diameter: 185km/h
- Eye: 56km
- Air pressure : below 915mbar
- Saffir-Simpson scale : Cat 5

PROBLEM STATEMENT

1

TROPICAL DEPRESSION 29

*Categorized as a **rapidly rotating storm** system commonly referred to as a **tropical cyclone***

2

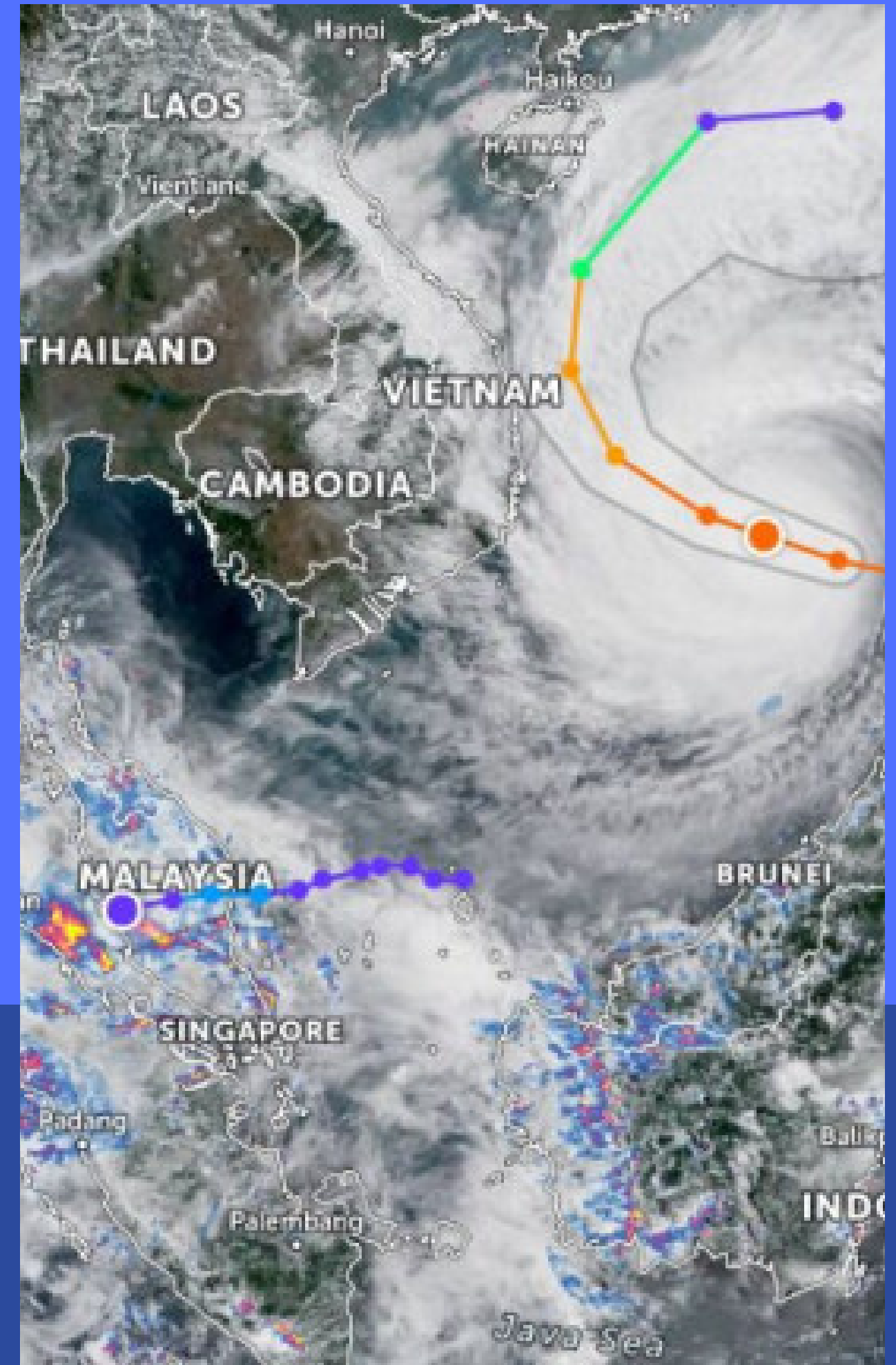
WIND

*Sustains between **50km/h to 60 km/h***

3

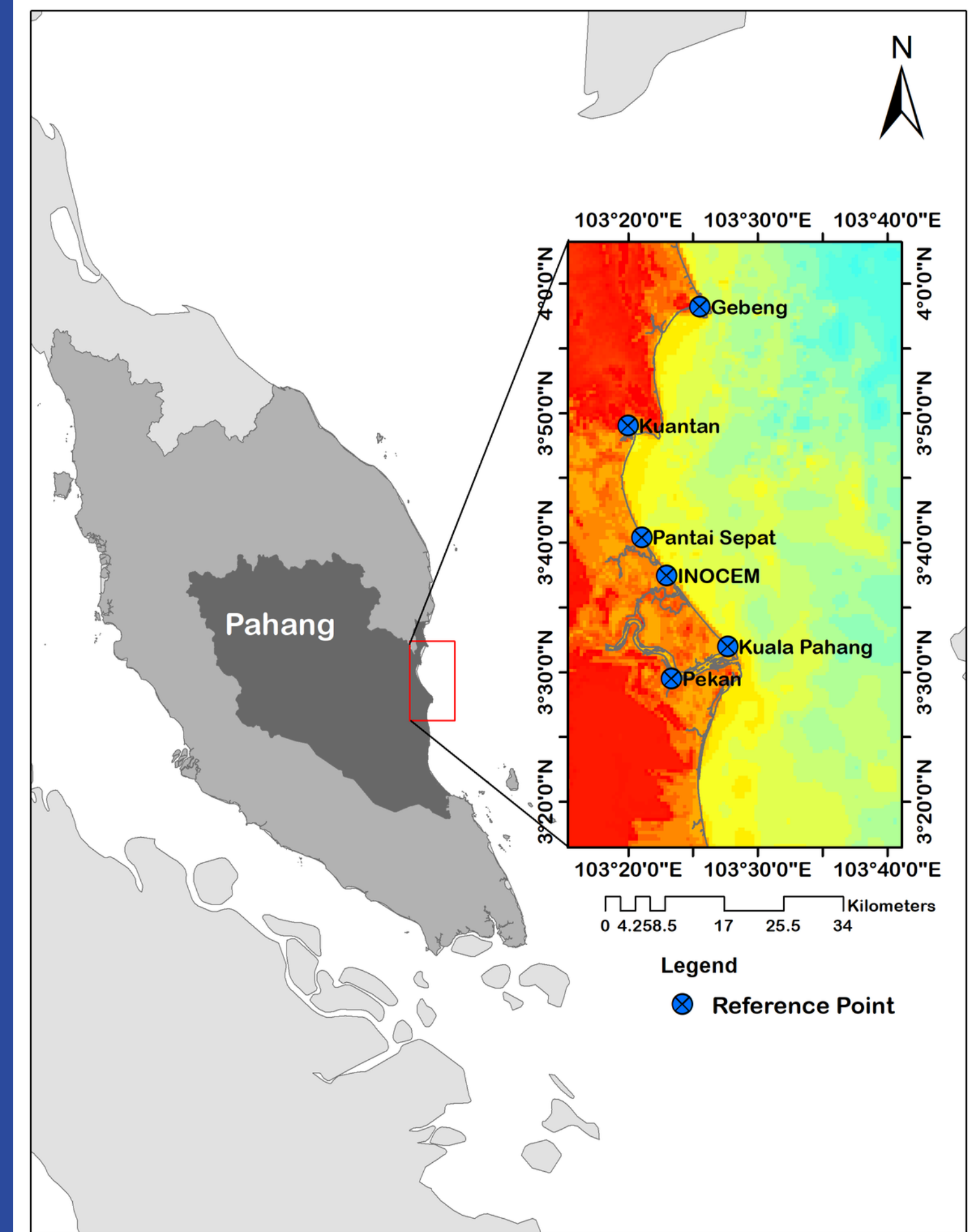
PATHWAYS

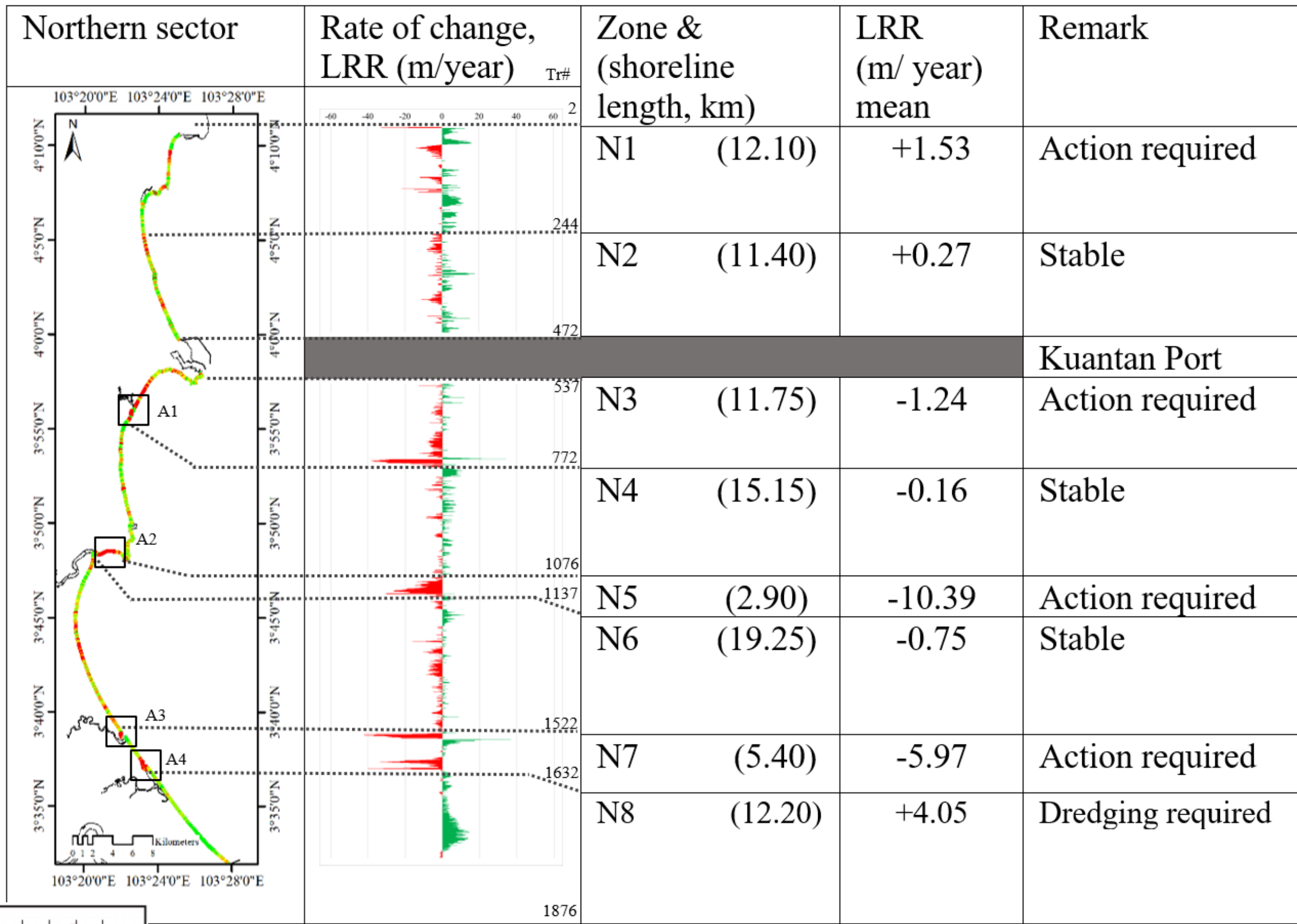
*Make landfall at **Terengganu coast** and move to **Straits of Malacca***



STUDY AREA

CHEROK PALOH
20 KM SOUTH OF KUANTAN
LOCATION OF INOCEM





- Preliminary erosion study using DSAS

METHODOLOGY

Field Observation

Bathymetric Survey

5 Dec 2021

- Echo sounder

Pre-Storm profile

6 Dec 2021

Post-Storm Profile

21 Dec 2021

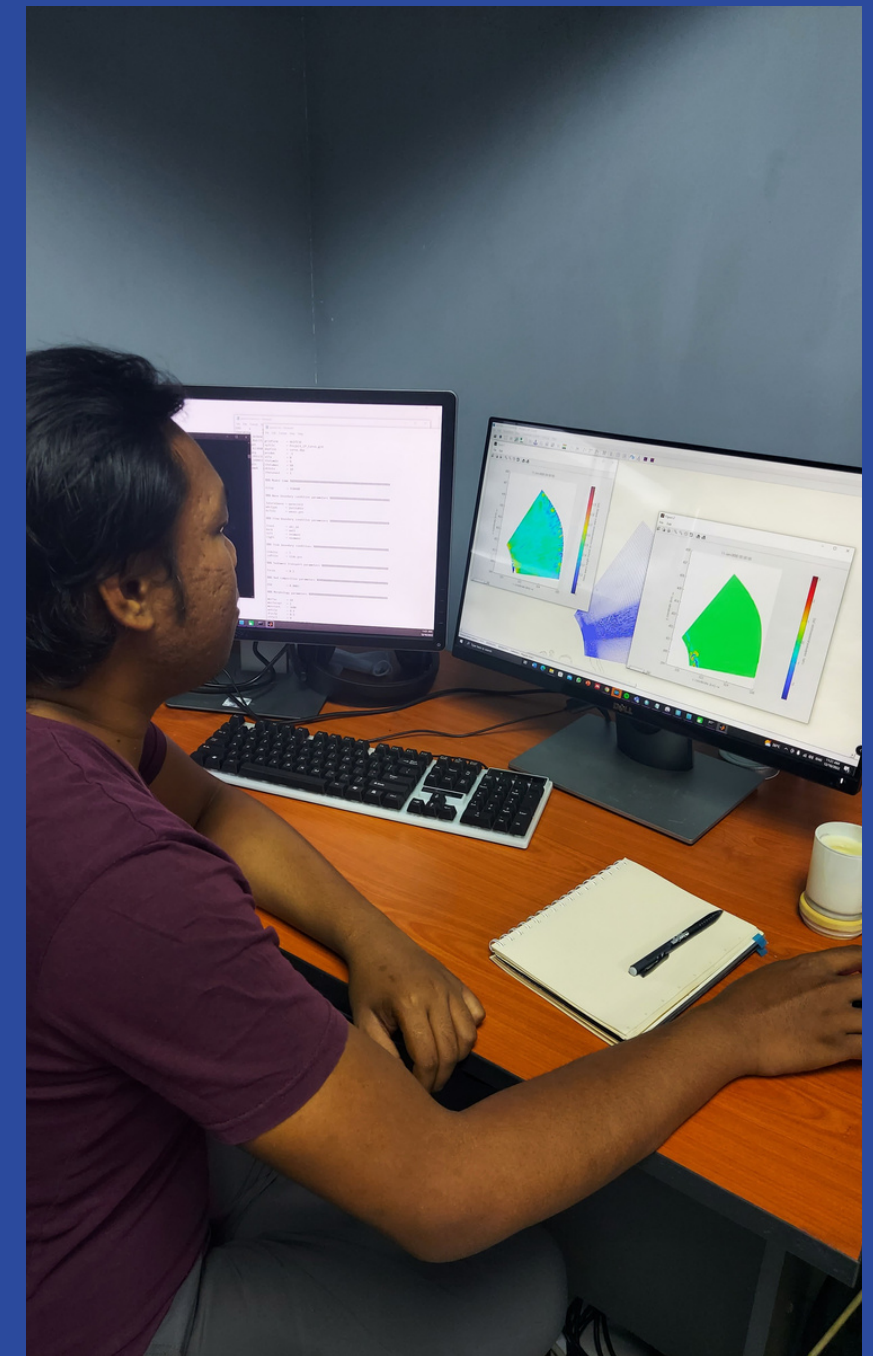
- Total station



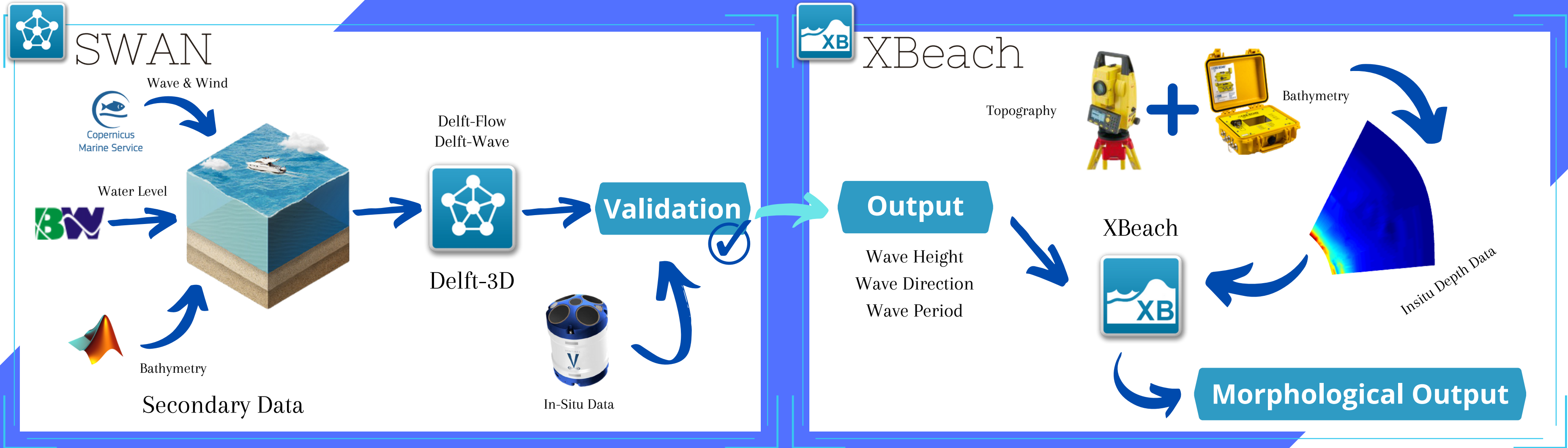
Numerical Modelling

SWAN - XBeach
Coupling Model

- Secondary data (Copernicus Marine)
- Bed level data (Field sampling)



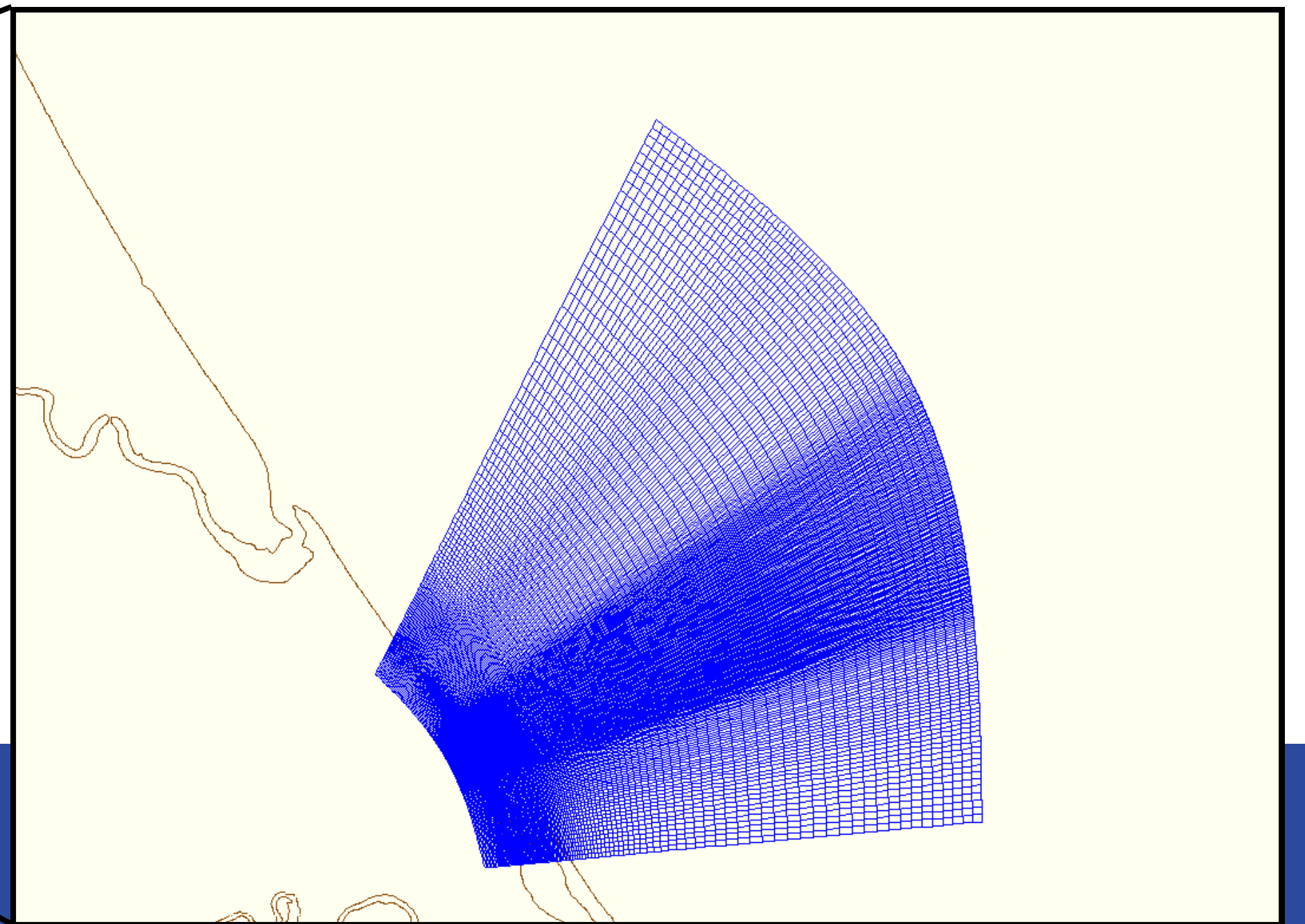
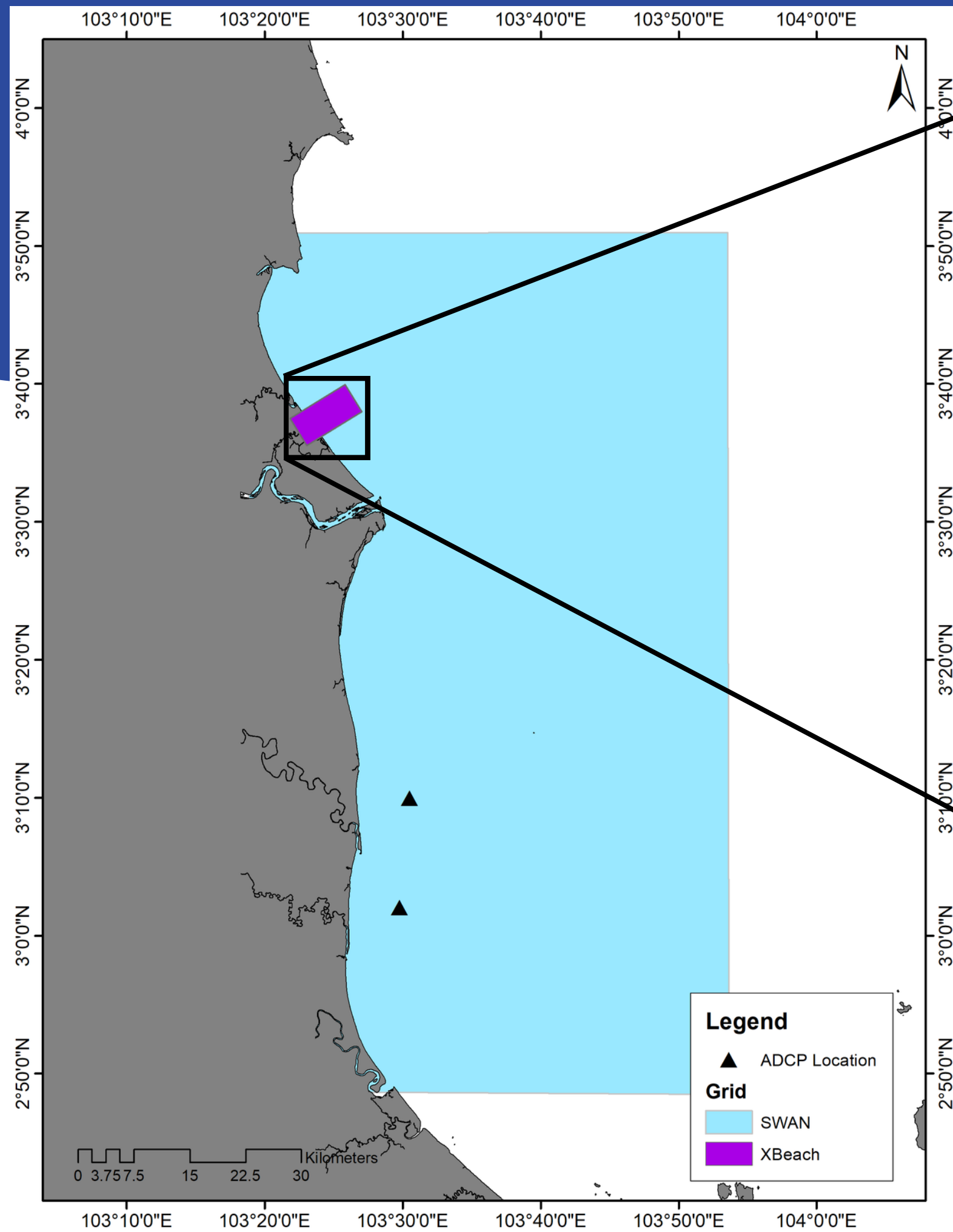
SWAN – XBeach Coupling Model



WAVE VALIDATION

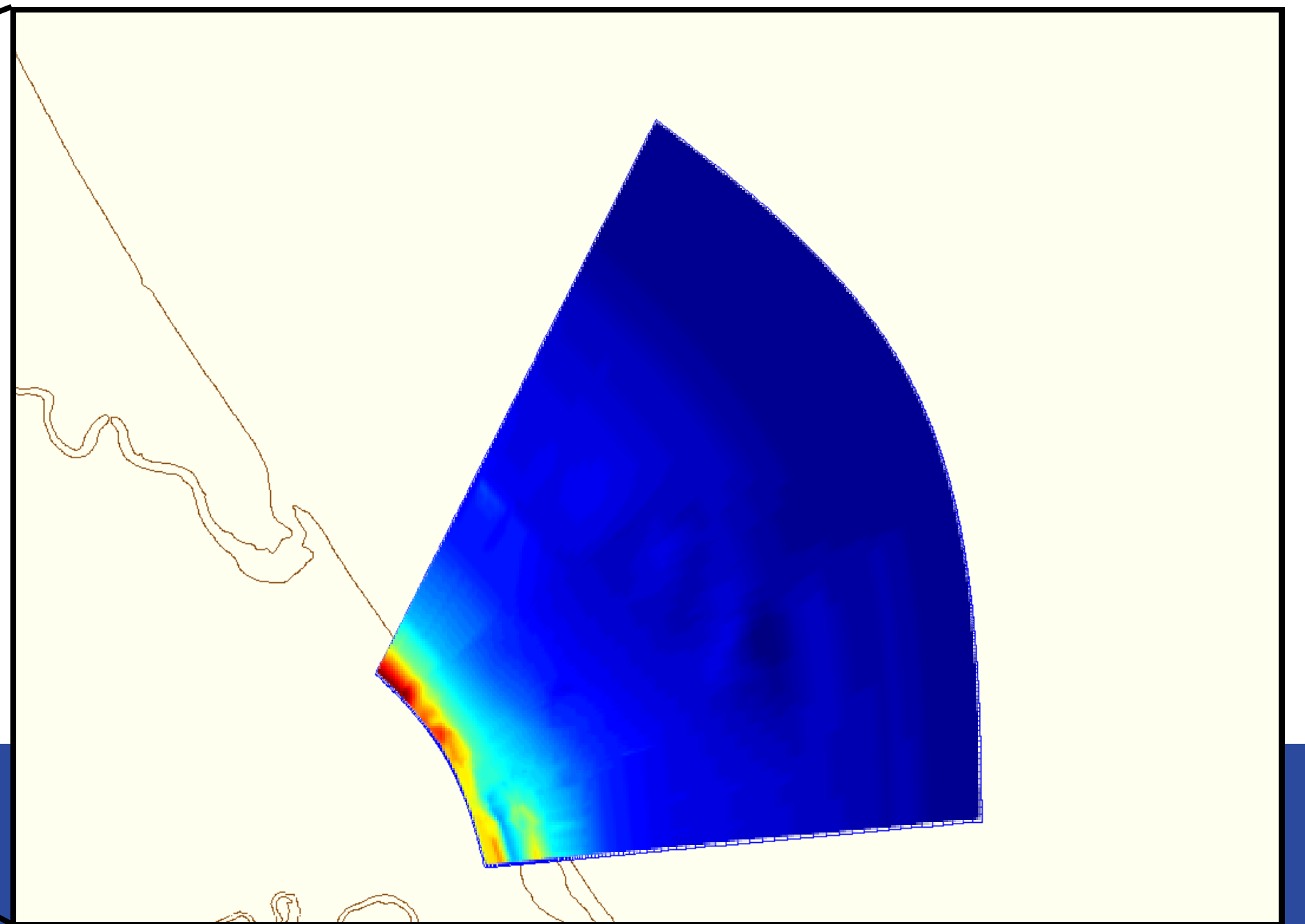
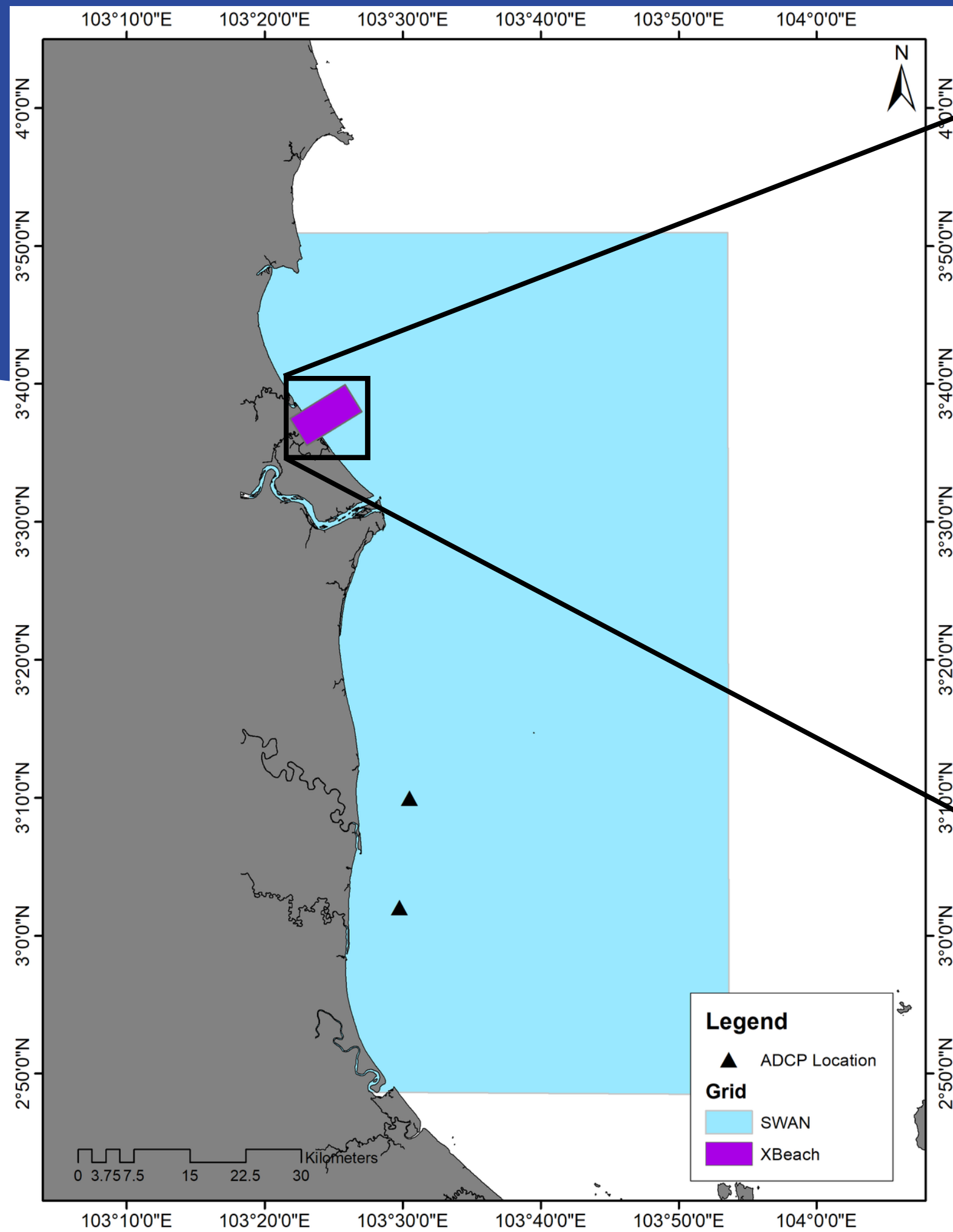
$RMSE = 0.08m$

$Index\ of\ agreement = 0.86$



XBeach Grid

- Grid Size varying (5m to 100 m)
- Finer at the study area.



XBeach Bedlevel

- Bedlevel (7m to -11m)
- Water depth at boundary required more than 10 m

METHODOLOGY

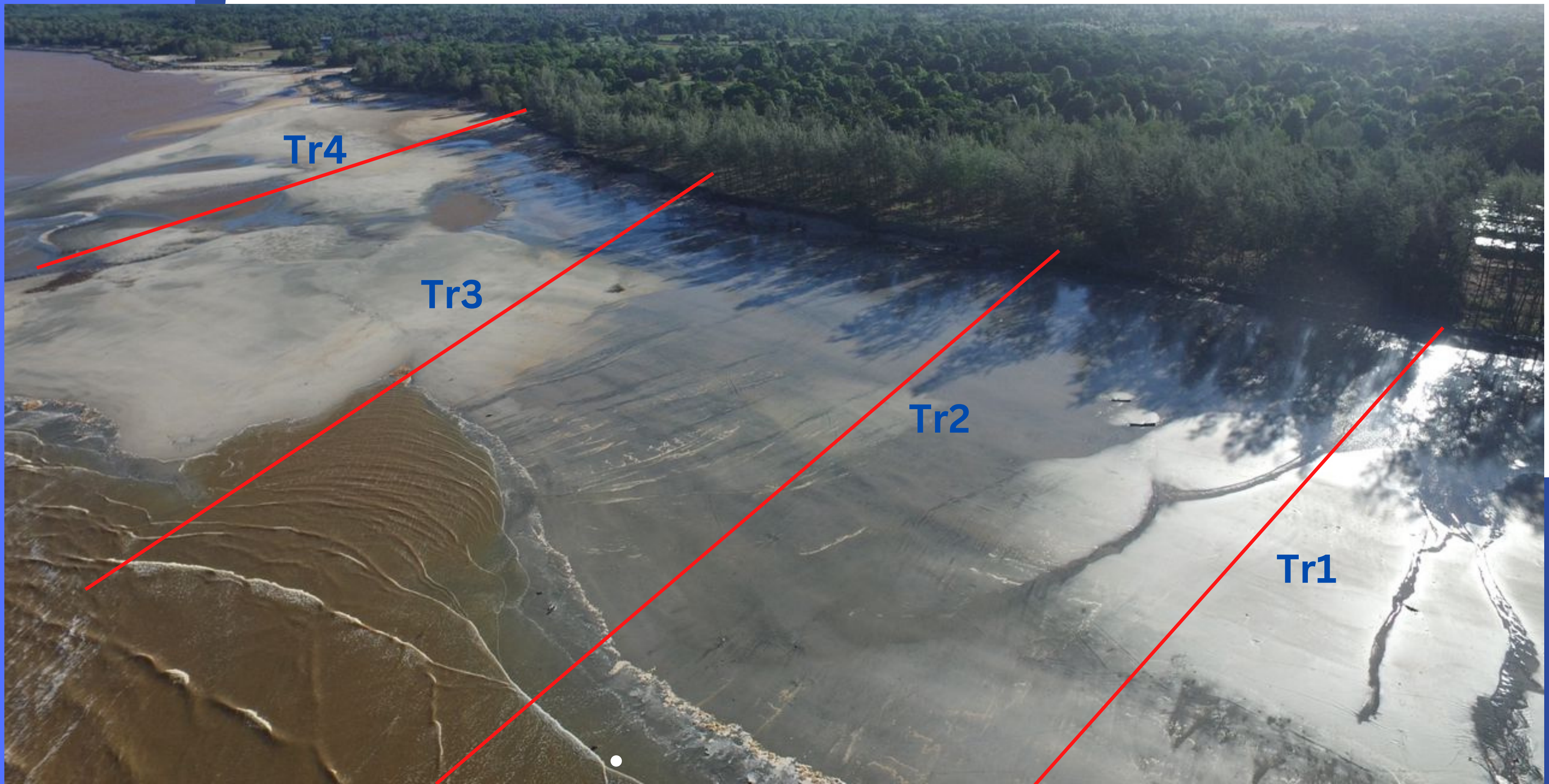
1 D

- Calibration of XBeach numerical model
- Calibrated parameter are analysed using Brier Skill Scoring Analysis

$$BSS = 1 - \frac{\sum(S_f - XB_f)^2}{\sum(S_f)^2}$$

Geomorphology Parameter

Parameters	Description	Default Value	Range Value	Used Value
Dryslope	Critical avalanching slope above water	1.0	0.1 – 2.0	0.9
Wetslope	Critical avalanching slope under water	0.3	0.1 – 1.0	0.4
Facua	Calibration factor time averaged flows due to wave skewness and asymmetry	0.1	0.0 – 1.0	0.2

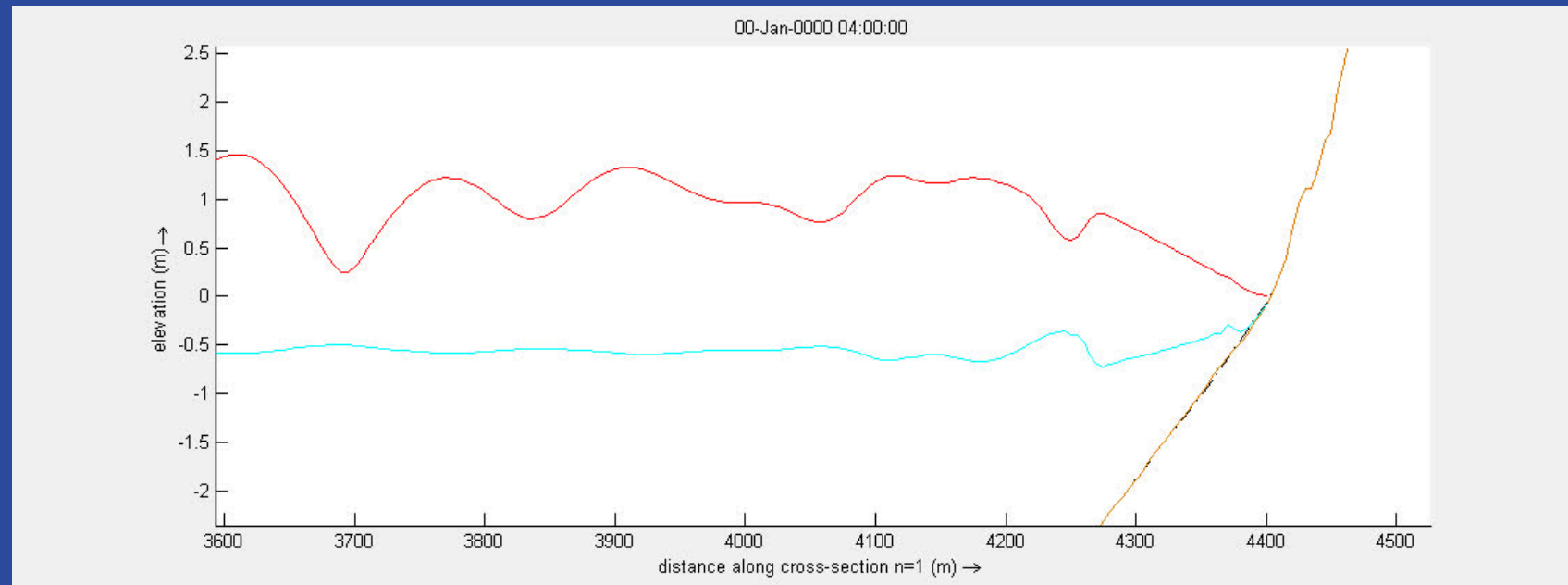


- Drone Imagery of Transect Location

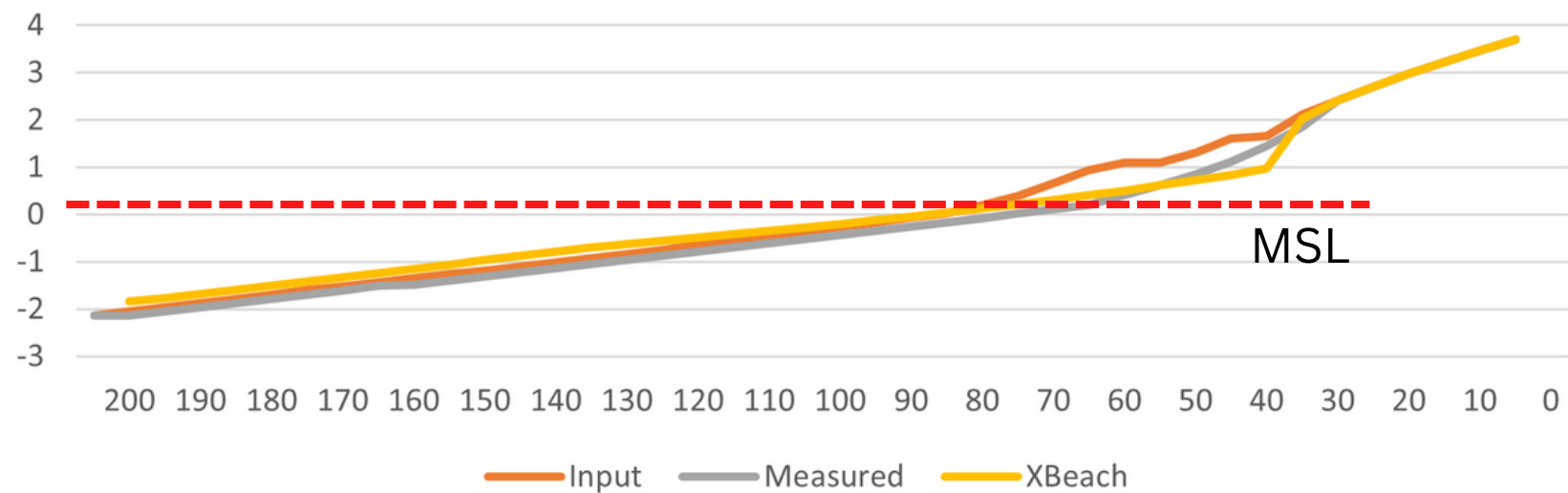
RESULT

TR 1

BSS = 0.976

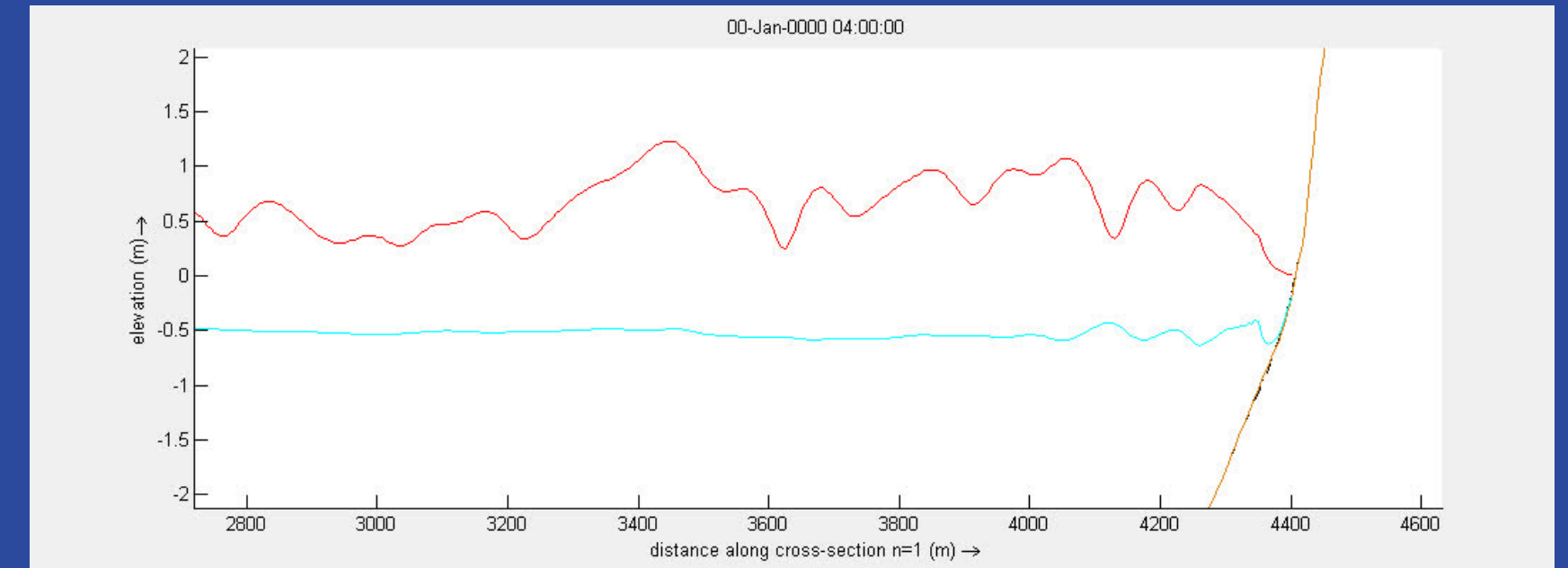


Transect 1

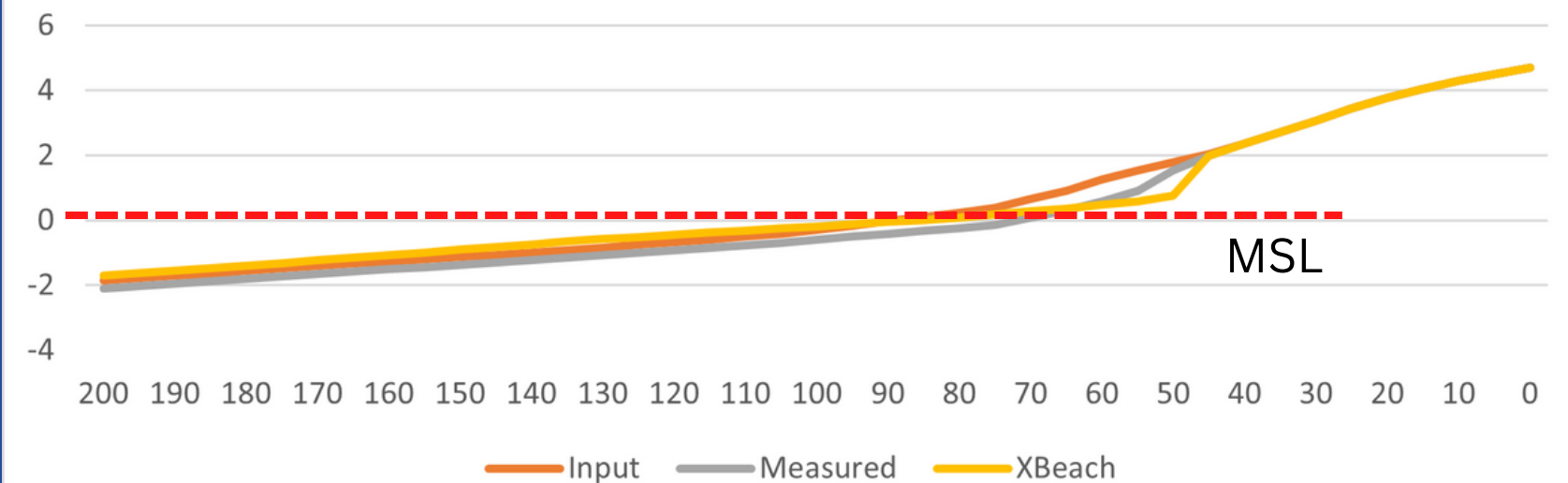


TR 2

BSS = 0.968



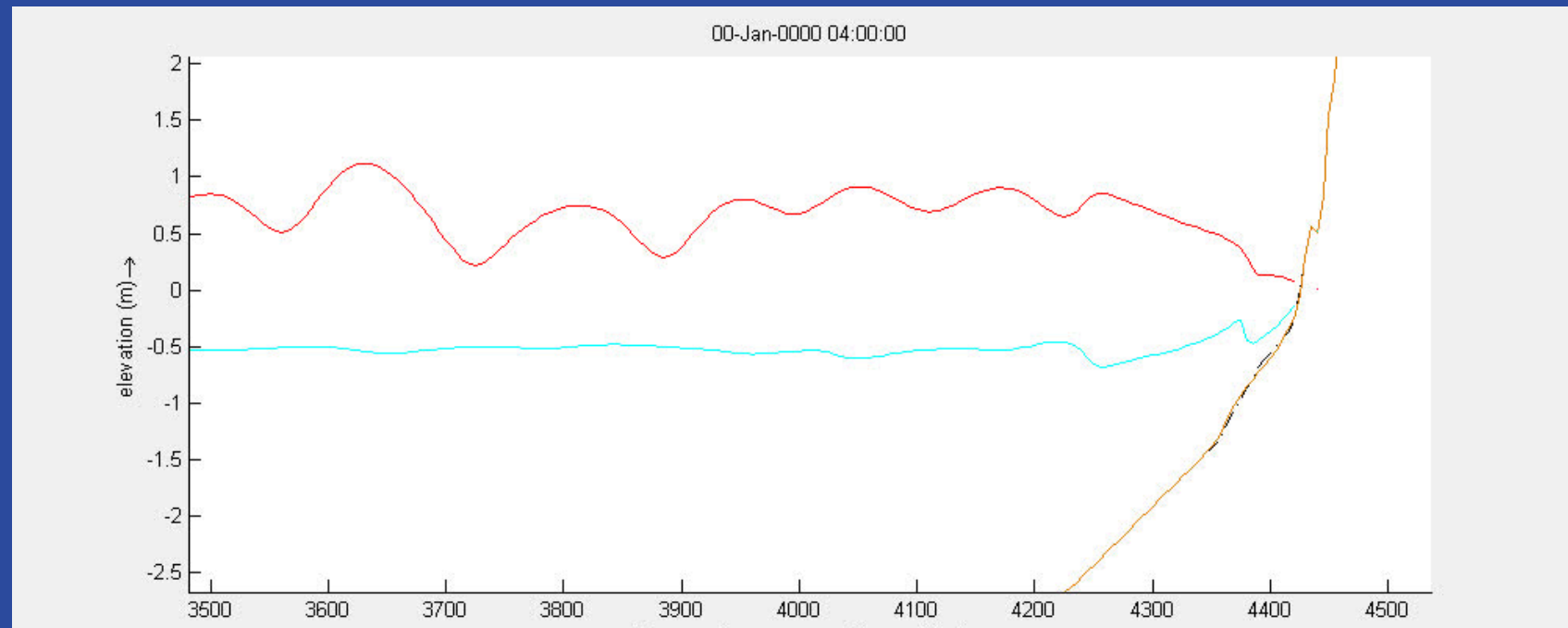
Transect 2



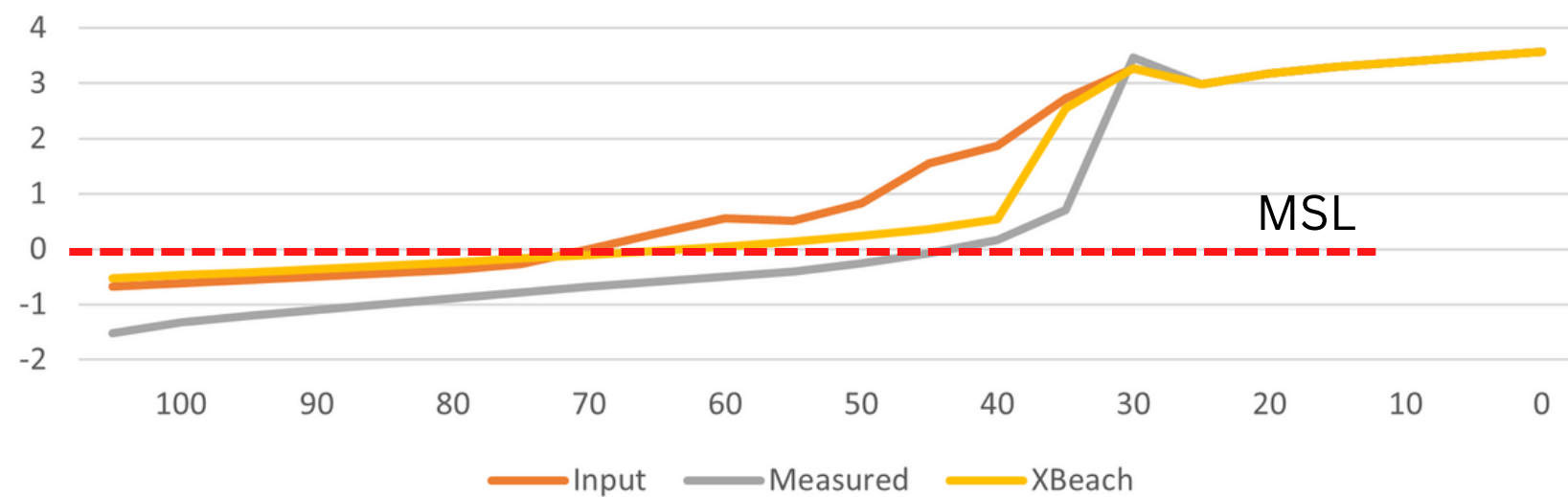
RESULT

TR 3

BSS = 0.825

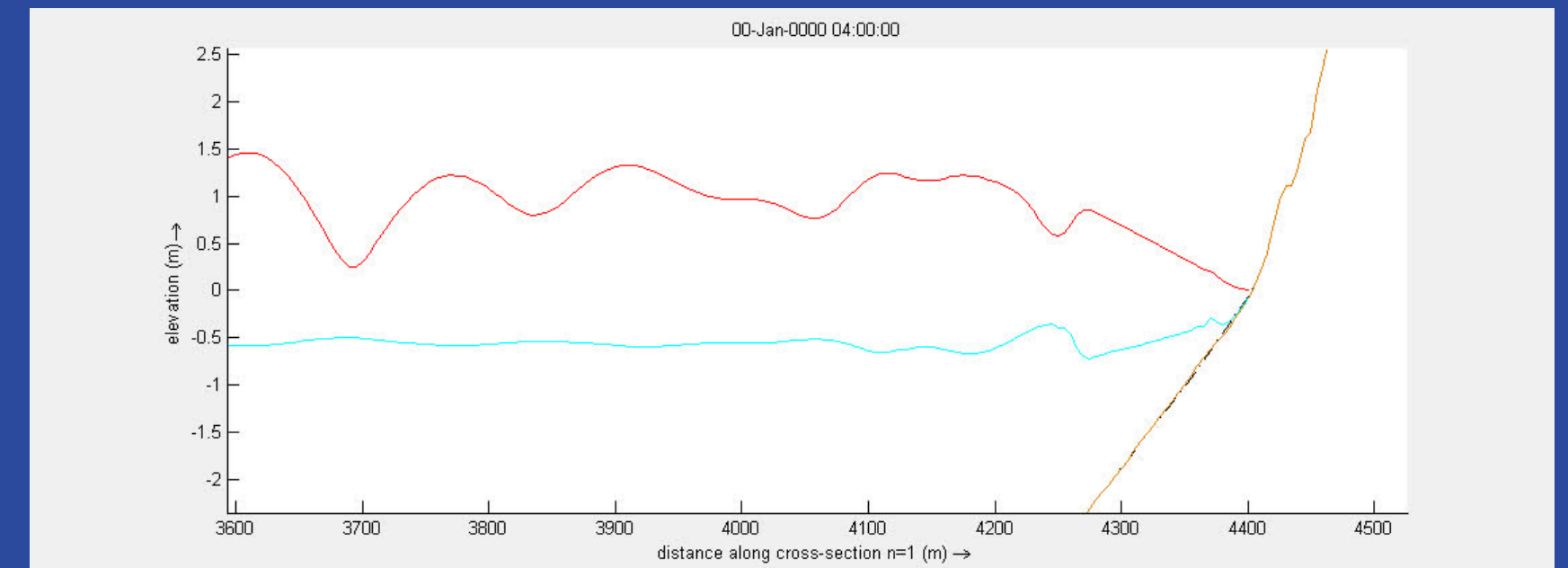


Transect 3

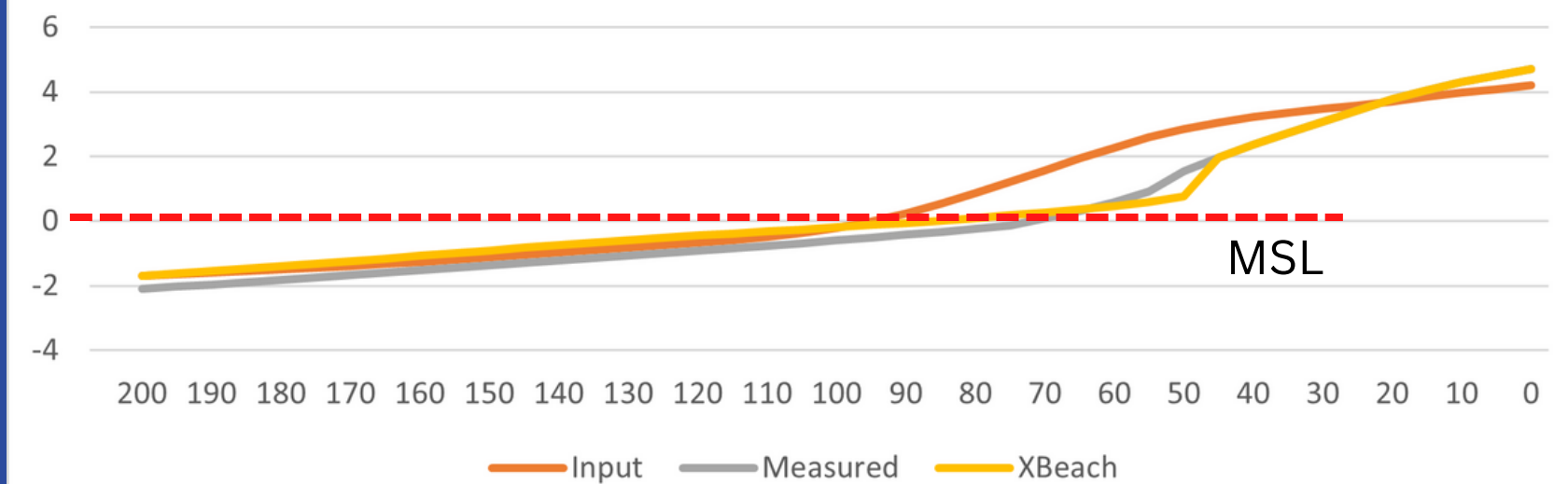


TR 4

BSS = 0.968



Transect 4



RESULT

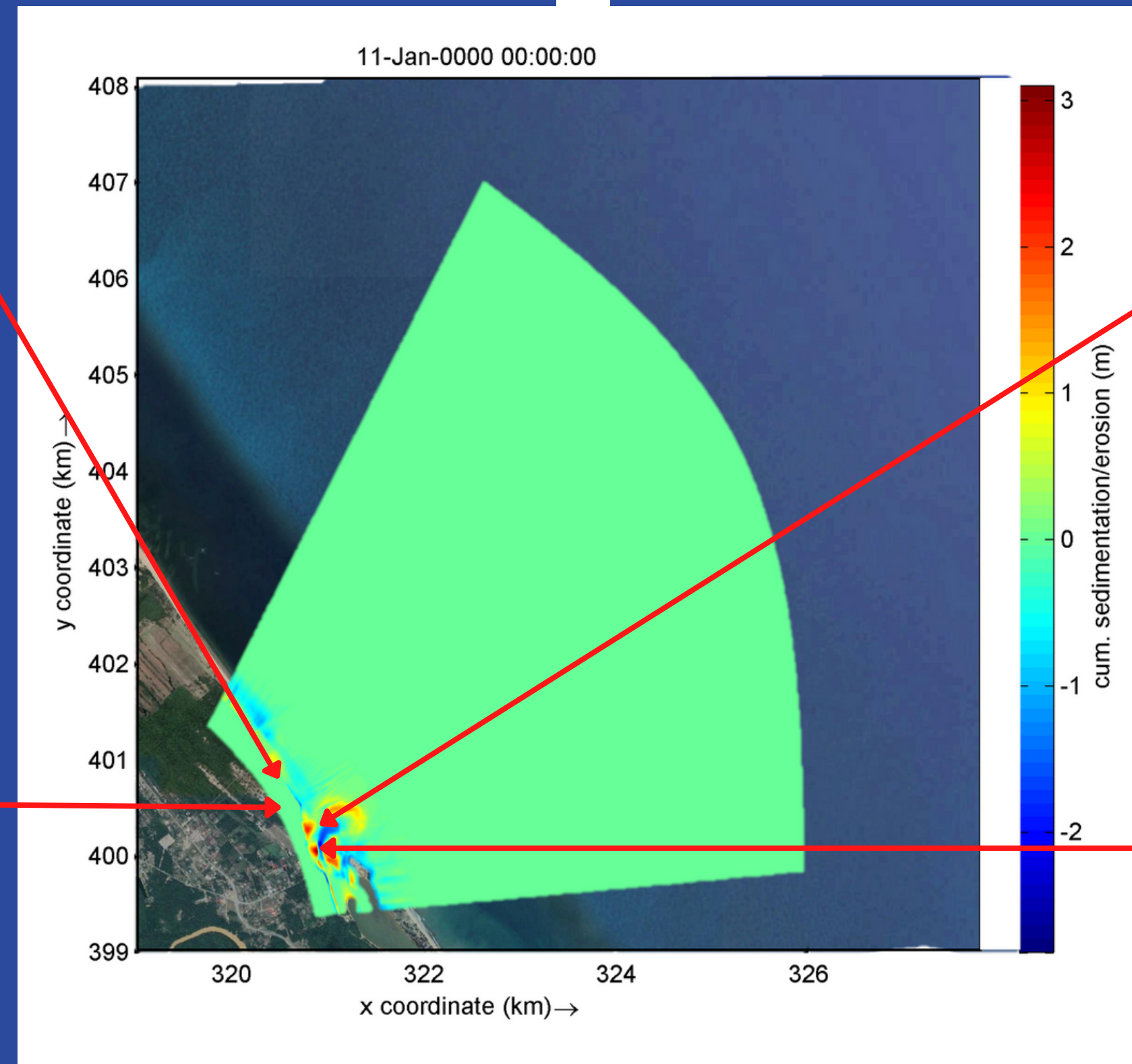
EROSION STIMULATION



23 Dec 2021 TR 2



23 Dec 2021 TR 3



3 Jan 2022



3 Jan 2022

DISCUSSION

1

NUMERICAL MODEL

The Set up of XBeach for Cherok Paloh beach is calibrated accordingly and the BSS score signifiys that is sufficient to be replicated onto other areas.

The Simulation is in line with the preliminary study that identifies the area to be experiencing coastal erosion with a rate of greater than 5 m.

2

RECOMENDATION

Required a wave calibration and validation for XBeach,



*Thank
You*



Mazmirul Abd Rahman