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How to monitor the Ocean?



MONITORING COASTS

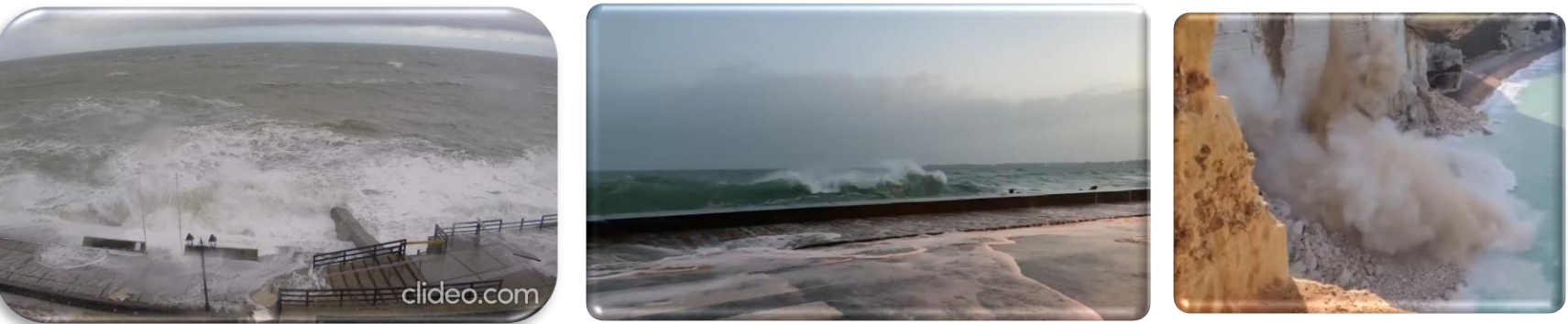
Em. Imen TURKI

CNRS- Rouen Normandy University

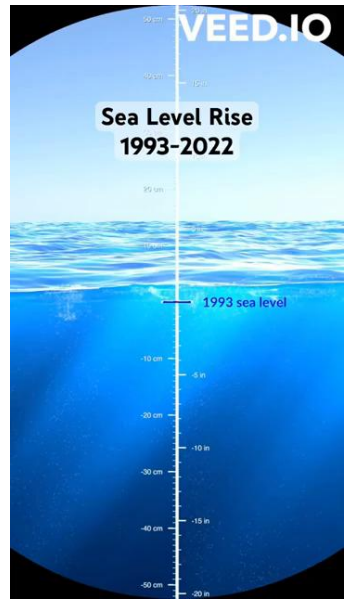
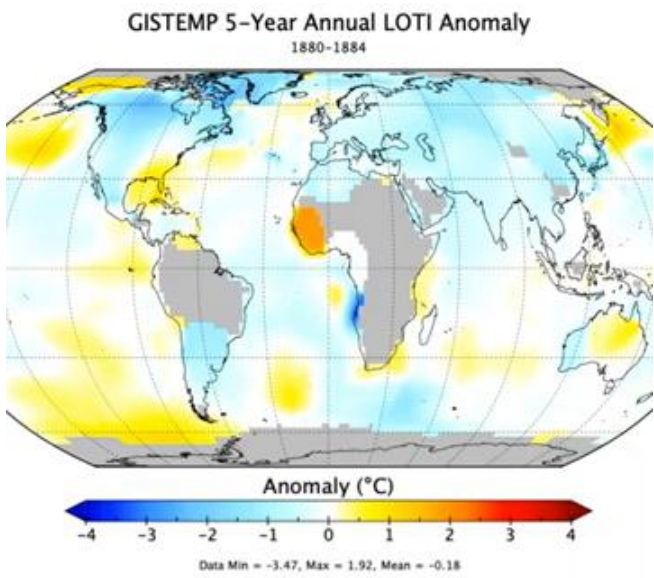


WHY WE NEED TO MONITOR COASTS ?

COASTAL RISKS : Flooding - Erosion



CHANGING CLIMATE : Sea Level Rise – Atmospheric Circulation





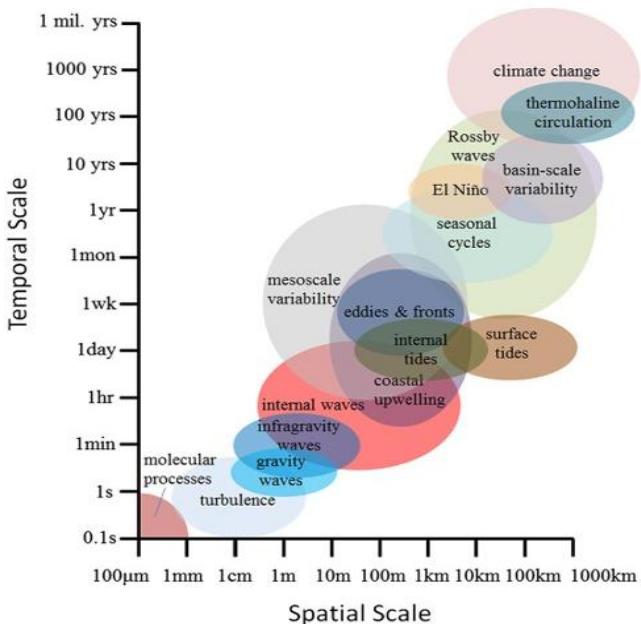
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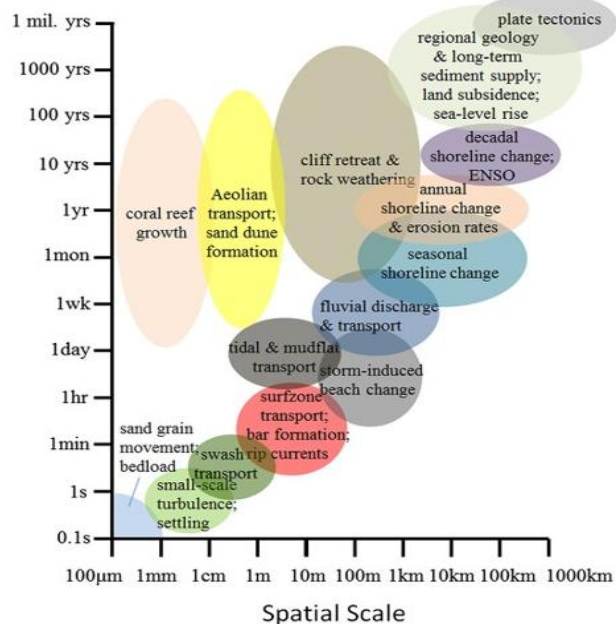


COASTAL PROCESSES

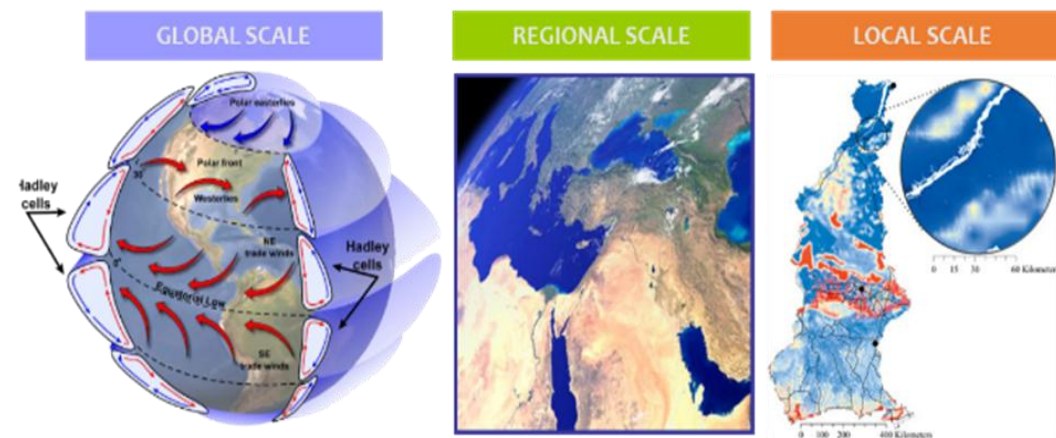
PHYSICAL DRIVERS



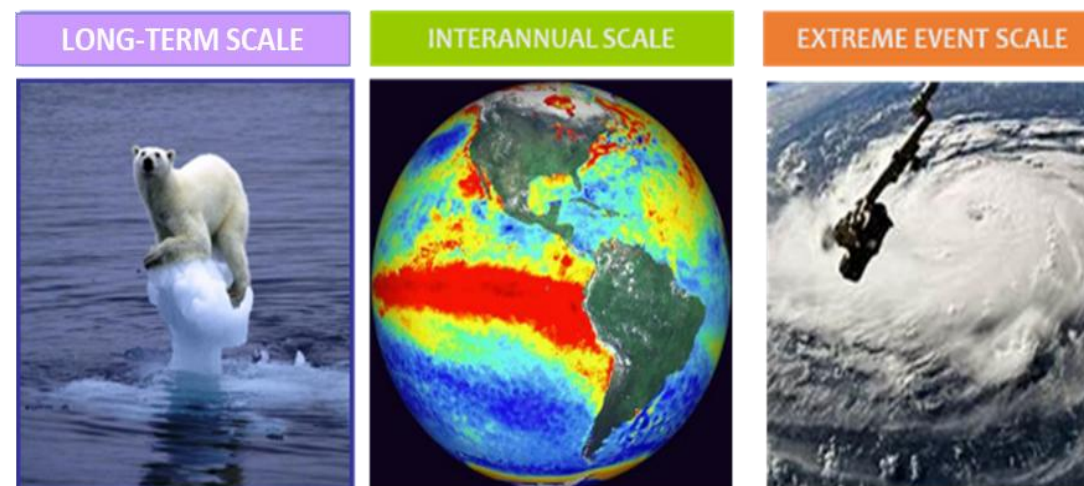
MORPHOLOGICAL RESPONSES



Spatial scales



Time scales





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**HOW ARE COASTS
DIFFERENT ?**

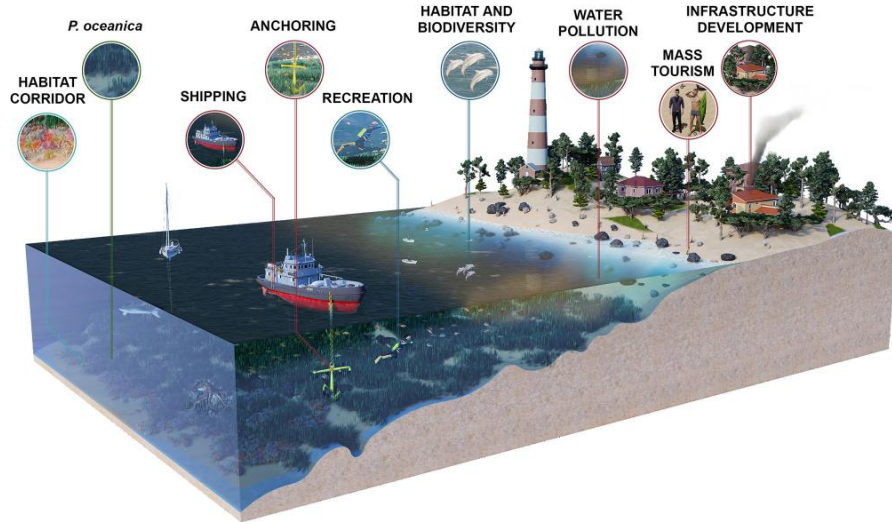
**WHAT ARE THE
DIFFERENT
FEATURES OF THE
COAST ?**





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COASTAL FUNCTIONALITIES



USERS / TOURISME/SPORT



ECOLOGICAL HABITAT



DEFENSE



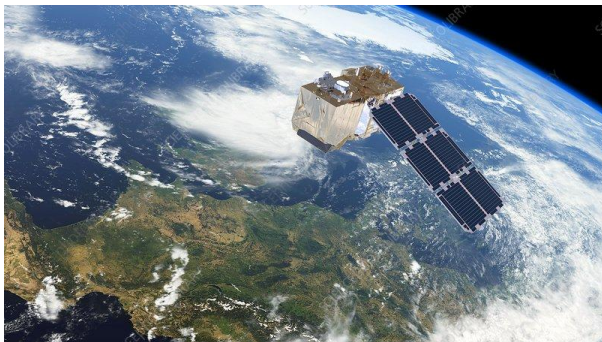


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SPATIAL AND TEMPORAL MONITORING FROM SPACE



*For 3 decades, Radar Altimetry
were providing with high precision
Sea Level Rise, Waves, Winds with
evolving accuracy !!*





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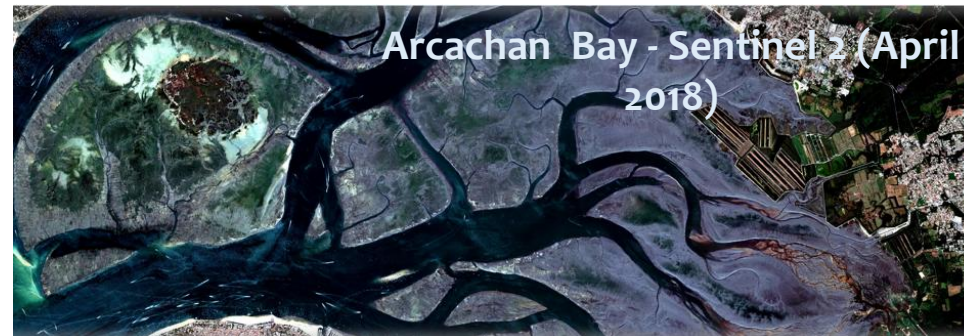
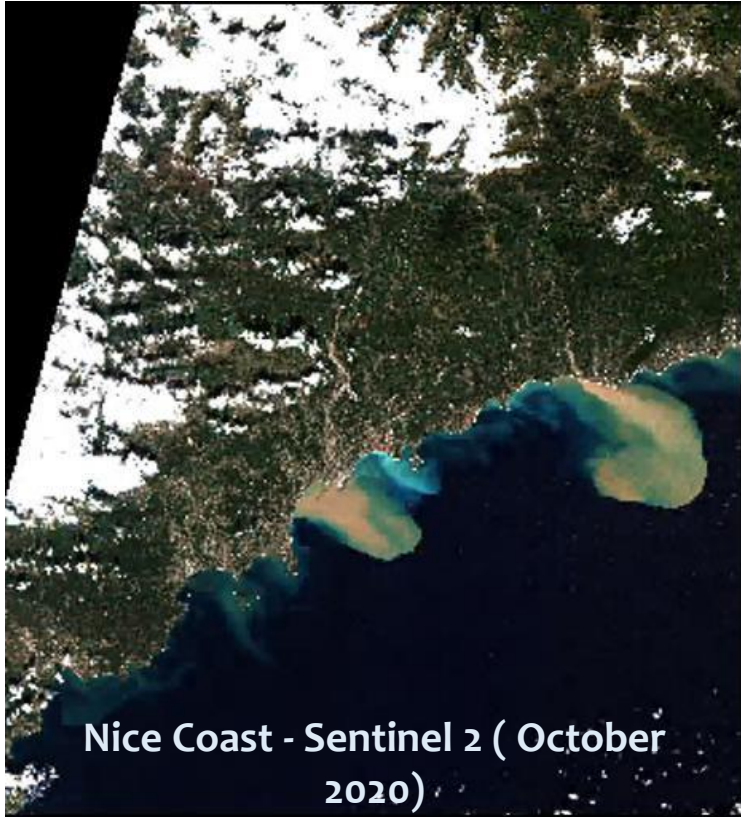
**WHEN A SATELLITE
OBSERVES THE COAST ?**





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COASTAL APPLICATIONS





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MULTI-TIMESCALE SHORELINE

DYNAMICS

Etretat, Gravel
Beach

500 images; 1985 -2025

Sentinel 2

Landsat 6,7,8,9

UK

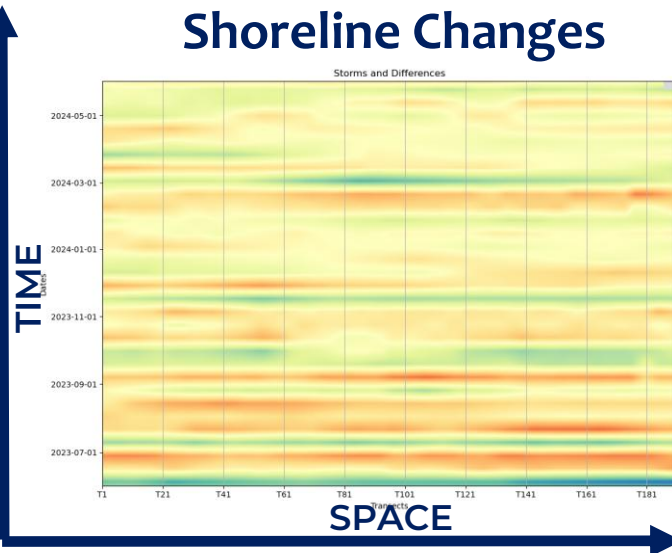
English
Channel

Etretat

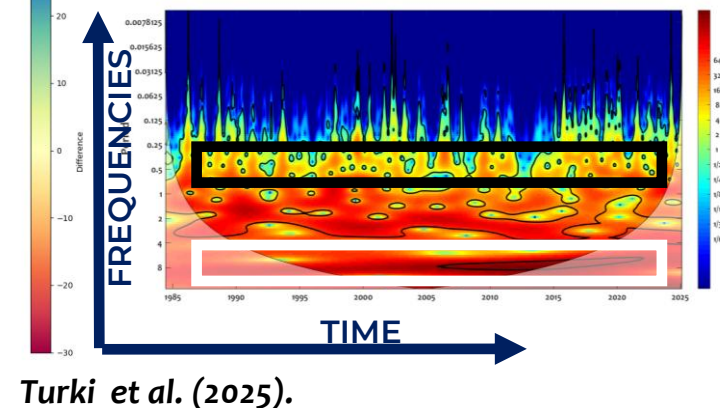
FRANCE



Shoreline Changes

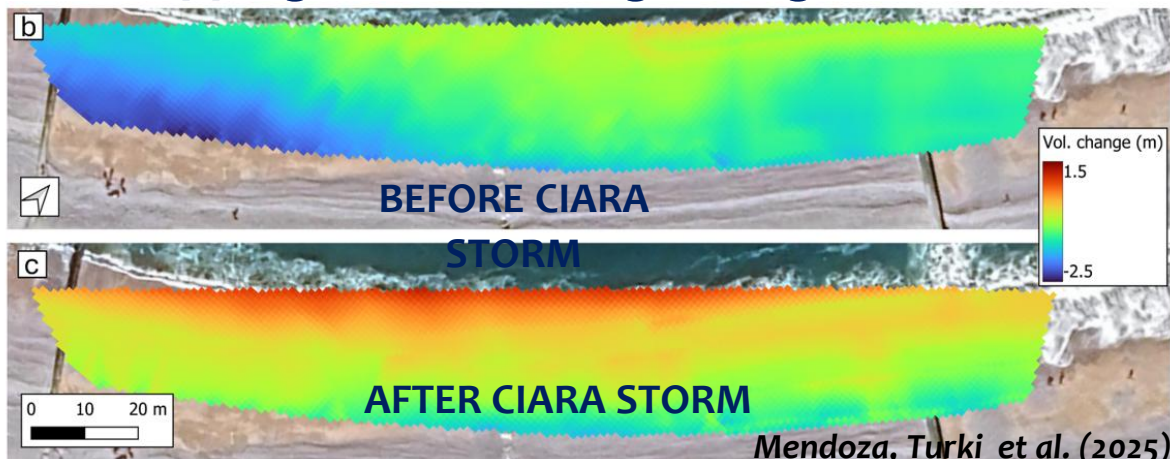


Shoreline Variability

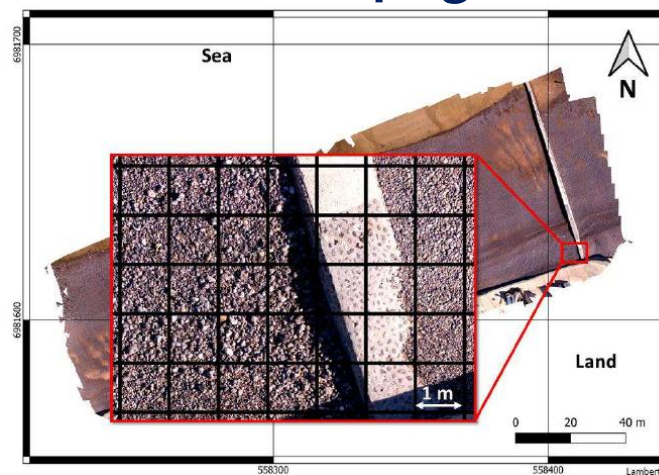


Turki et al. (2025).

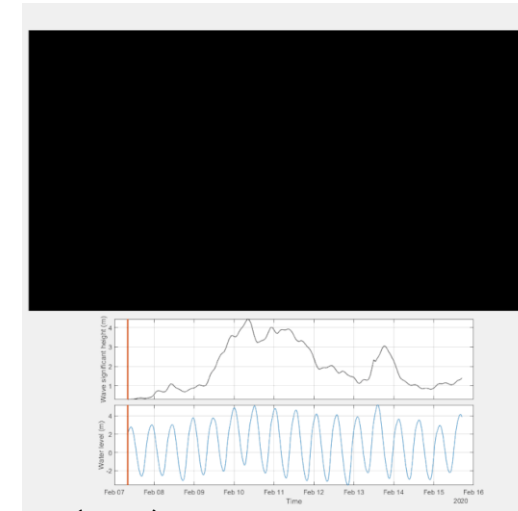
Mapping Volume Change using Sentinel 2



UAV Campaigns



Video Cameras



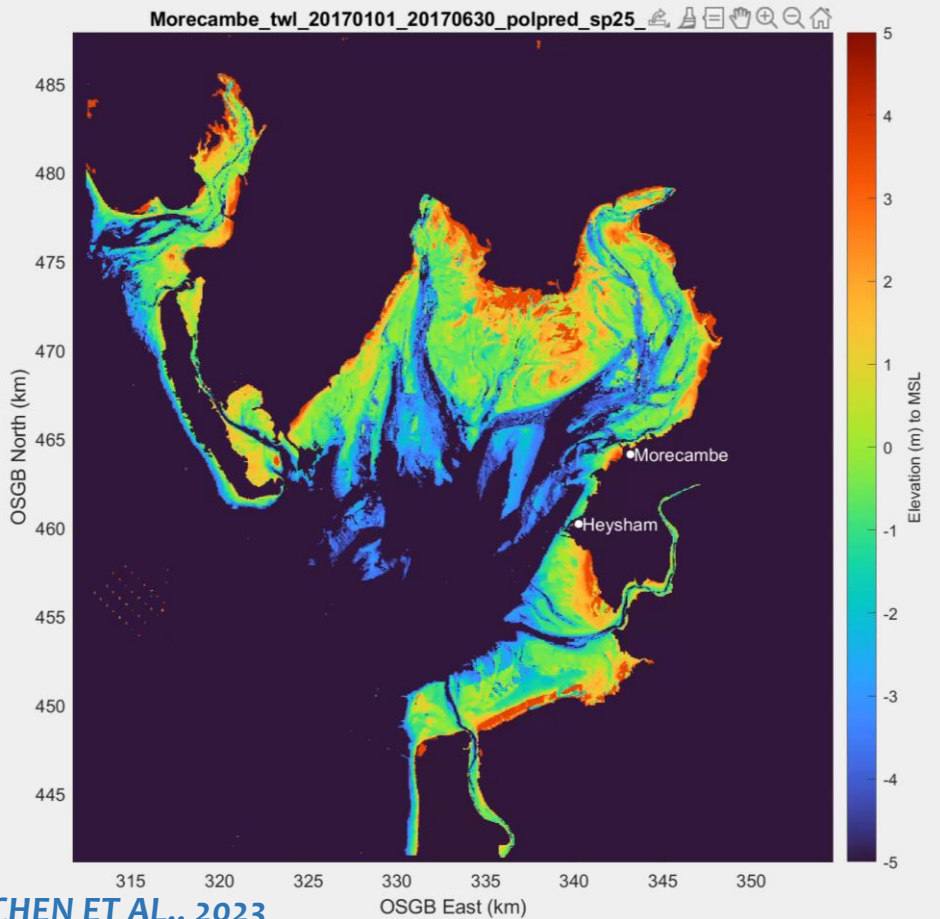


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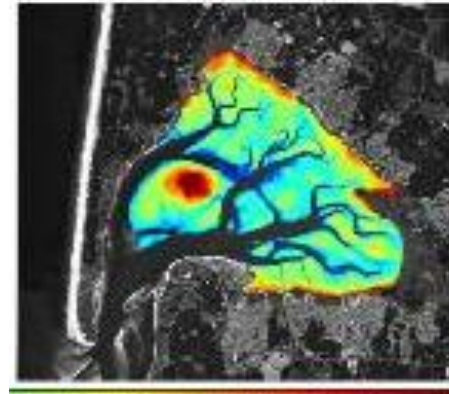


INTERTIDAL TOPOGRAPHY MAPPING USING SAR IMAGERY



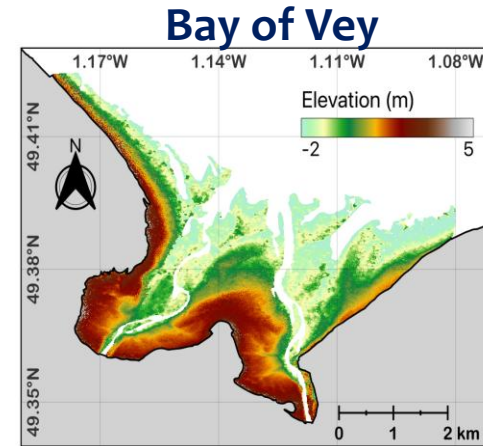
CHEN ET AL., 2023

SENTINEL-1B



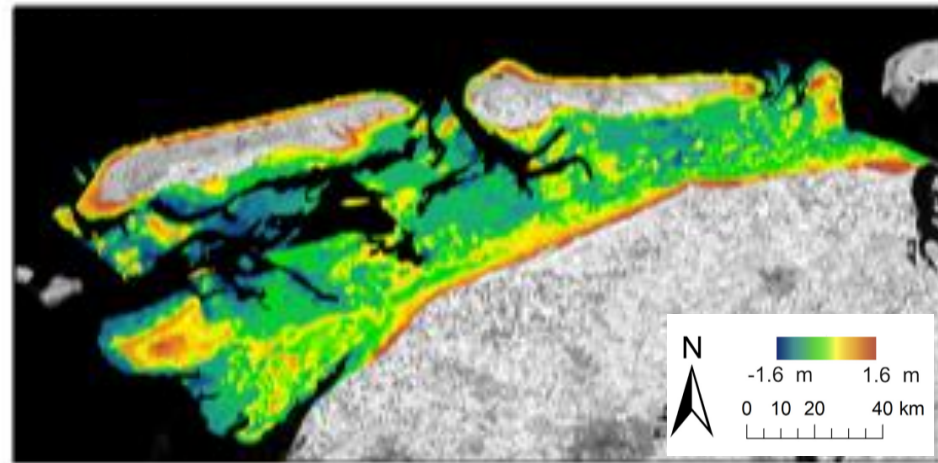
SALAMEH ET AL., 2020

SWOT



SALAMEH ET AL., 2024

Dutch Coast



ZHANG ET AL., 2025



INPUTS FOR ENHANCING THE ACCURACY OF NUMERICAL MODELL



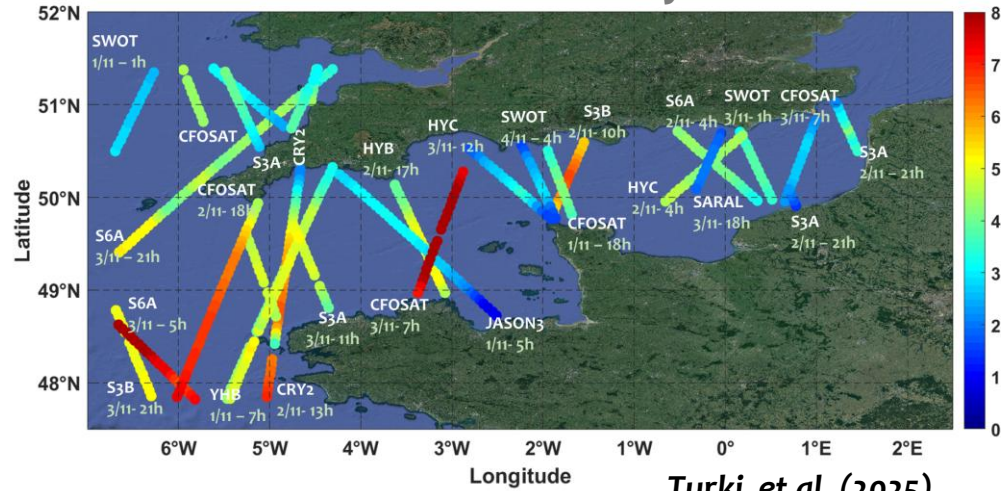
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NUMERICAL MODELLING: Regional Scales

Multi-source Altimetry Dataset

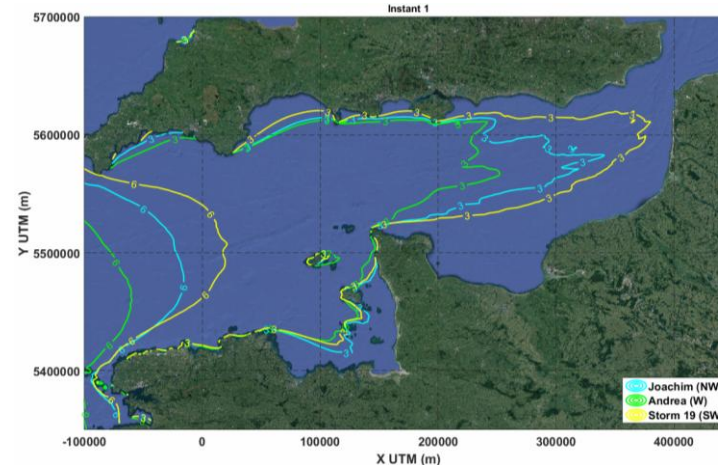


Turki et al. (2025).

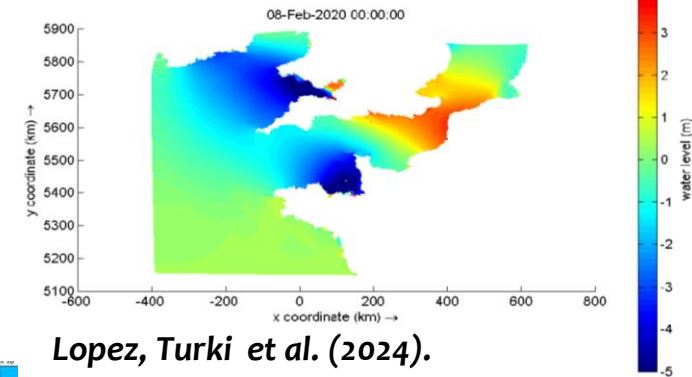
NUMERICAL MODELLING: Local Scales

MODEL CALIBRATION

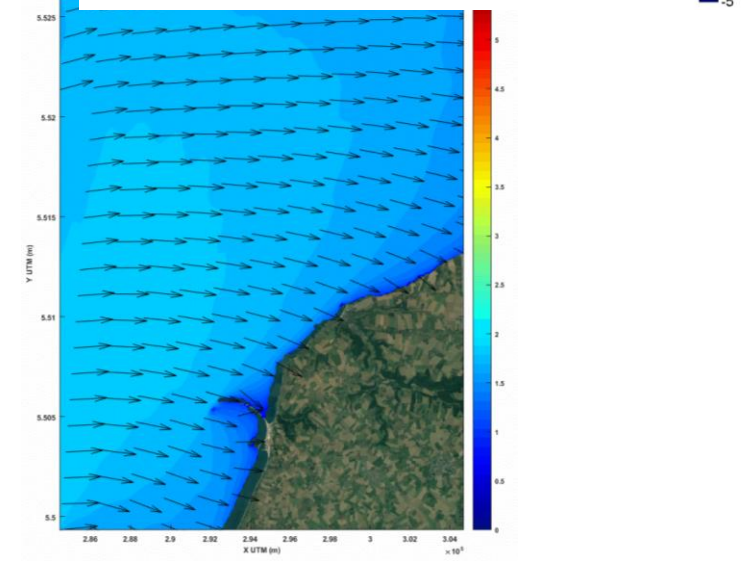
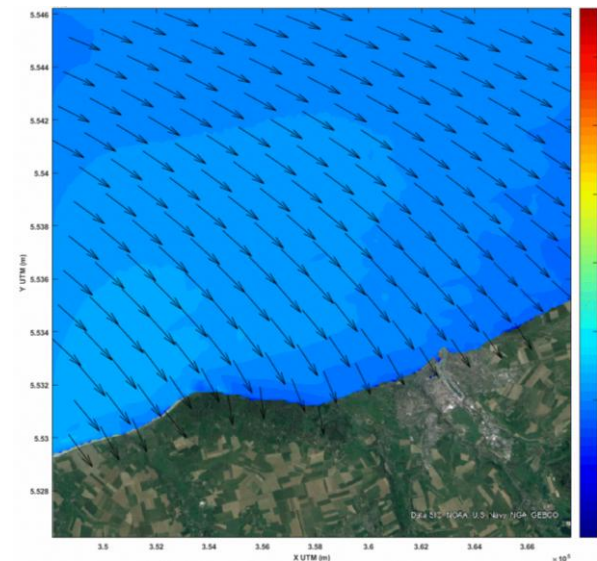
Modelling of wave storms



Modelling of water levels

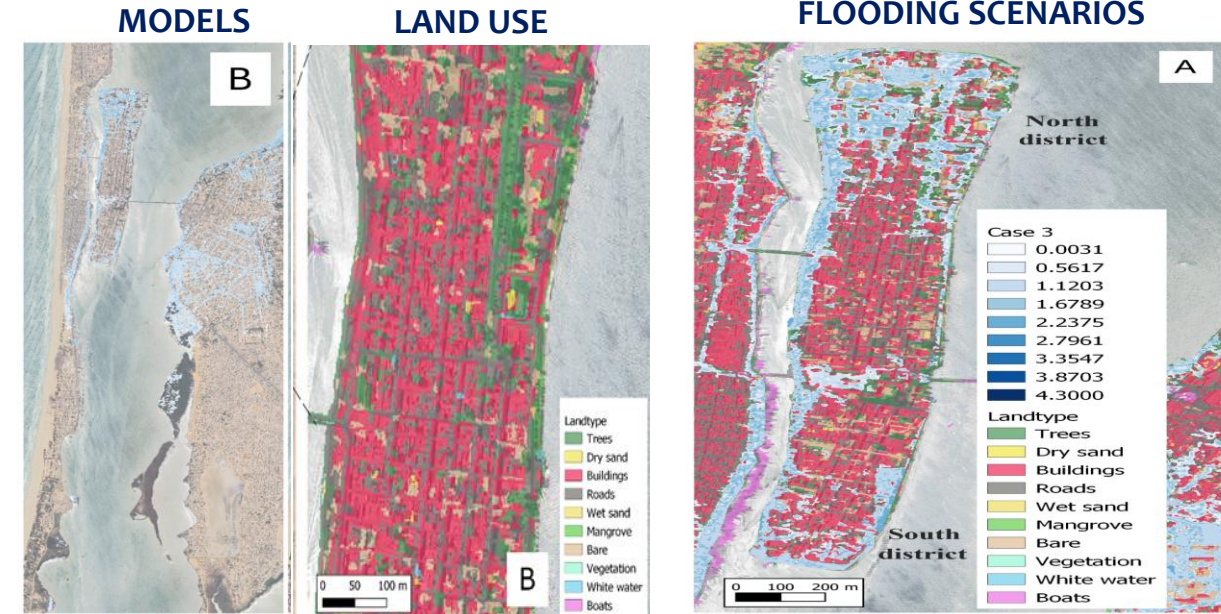


Lopez, Turki et al. (2024).



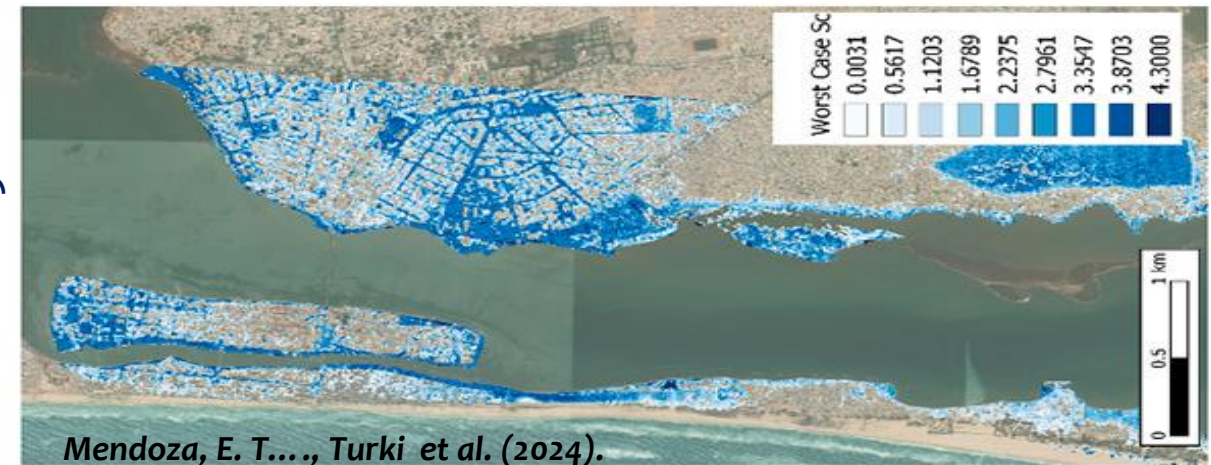


NUMERICAL SIMULATIONS OF FLOODING



PROJECTIONS

RCP 8.5



Mendoza, E. T..., Turki et al. (2024).

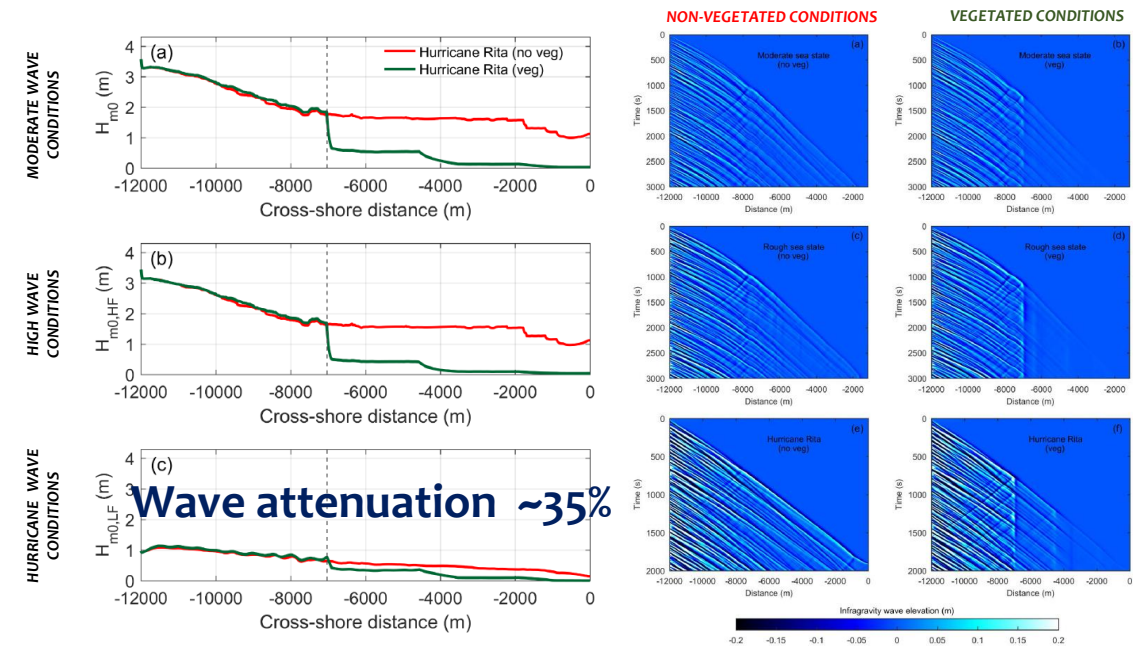
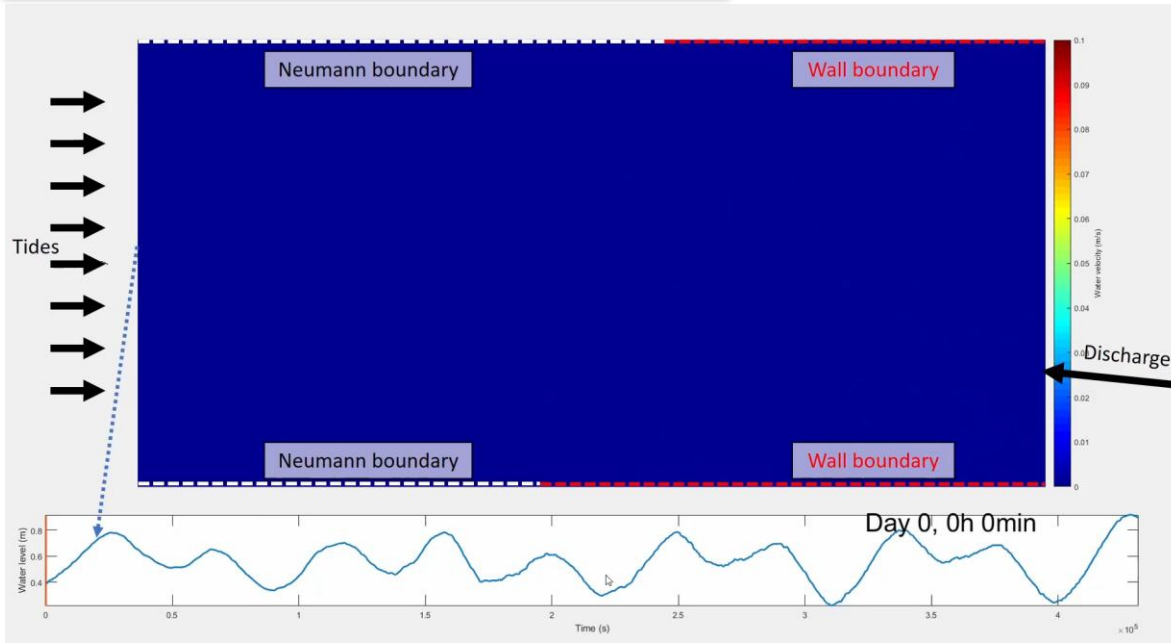
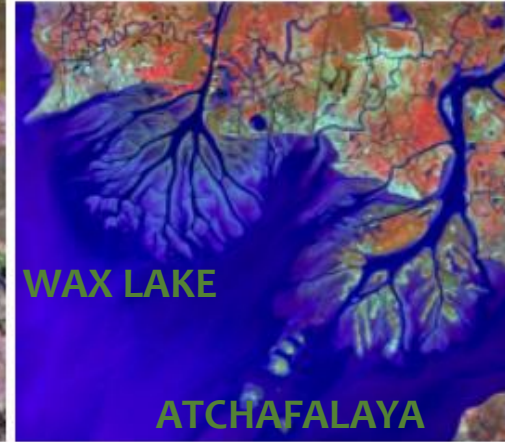
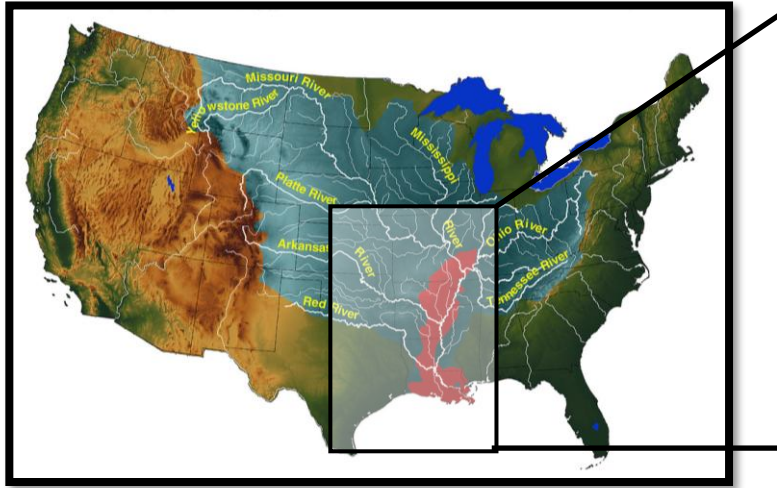


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WAVE DISSIPATION OVER MANGROVES AND VEGETATION FIELD





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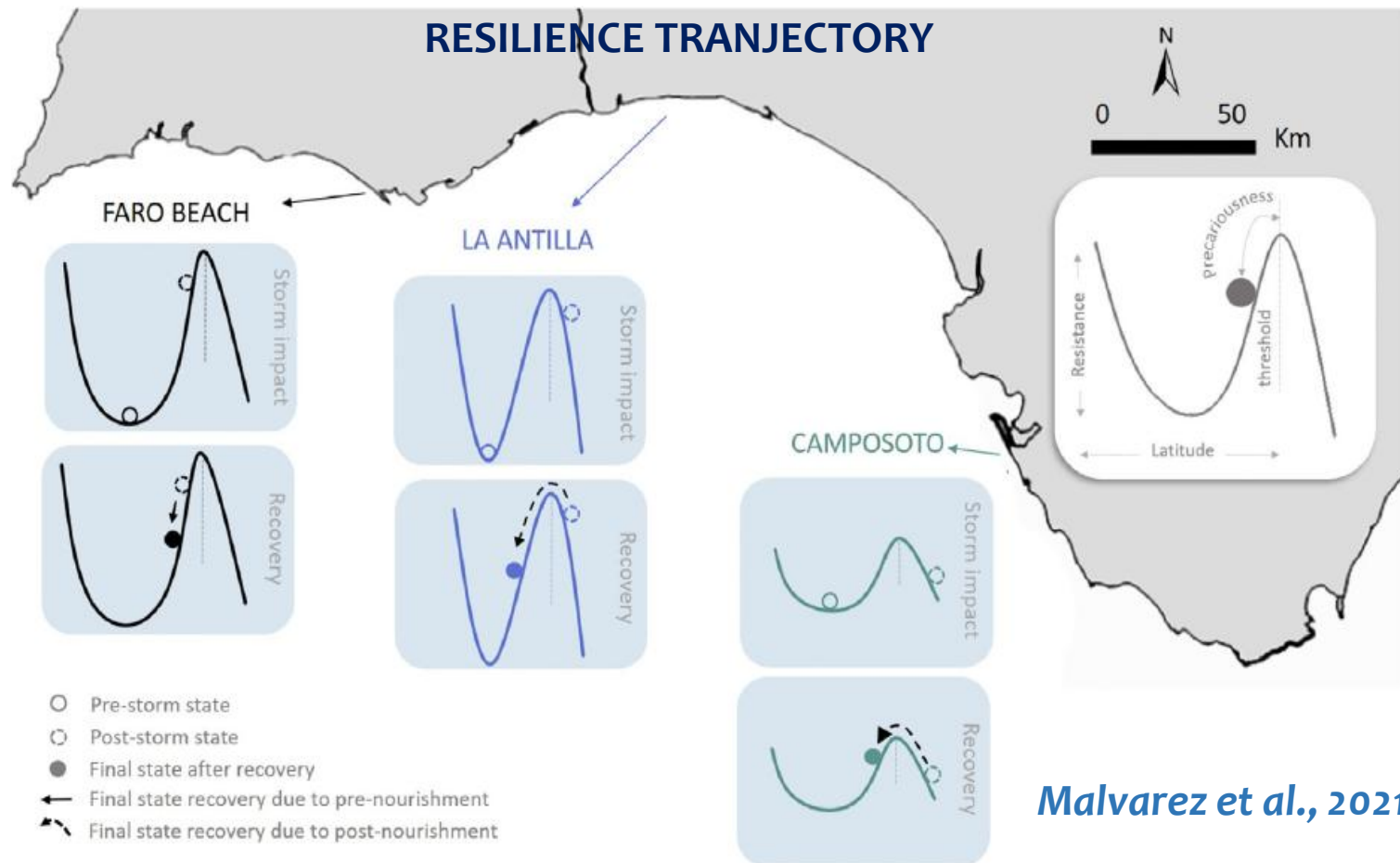
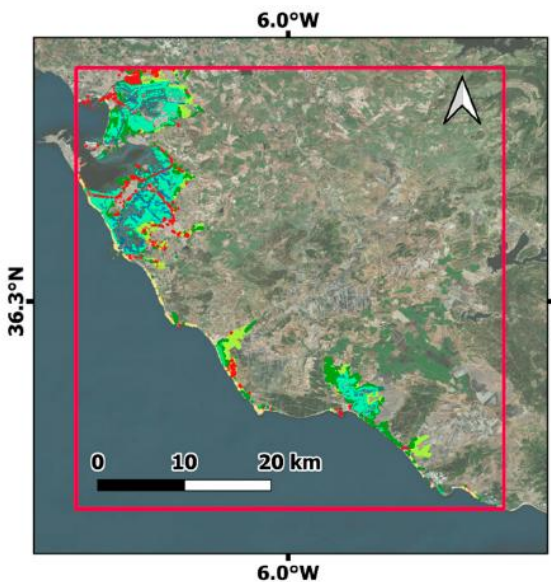
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ASSESSING COASTAL STABILITY



Sentinel 1 et Sentinel 2, UAV CAMPAIGNS



Malvarez et al., 2021

NATURAL FACTORS AND ANTHROPOGENIC
BEACH NOURISHMENT, MARITIME STRUCTURES, URBANIZATION

Grazo et Mont-blanc.. 2023



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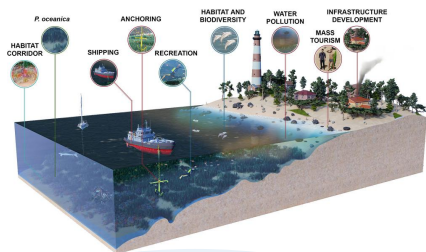
GEOMORPHOLOGICAL



PHYSICAL



ECOLOGICAL



ANTHROPOGENIC



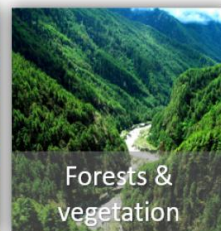
SOCIETAL



ECONOMIC



TOWARDS COASTAL RESILIENCE





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THANK YOU
FOR
YOUR ATTENTION

