OPERA
OCEAN PREDICTION ENHANCEMENT IN REGIONS OF AFRICA

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Ocean Prediction UN DECADE COLLABORATIVE CENTRE

2021 2030 United Nations Decade of Ocean Science for Sustainable Development

MERCATOR OCEAN INTERNATIONAL

BENIN Institute of Fisheries and Oceanological Research (IRHOB)

Website: http://www.nodc.ioc-africa.org/benin/

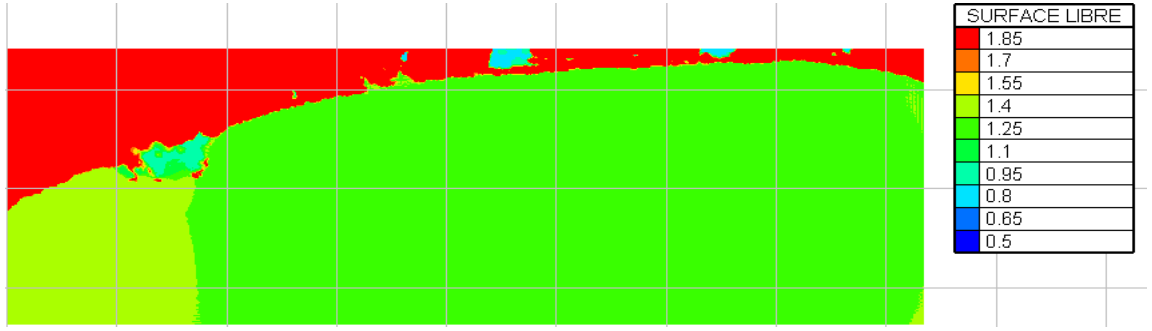
Country: BENIN

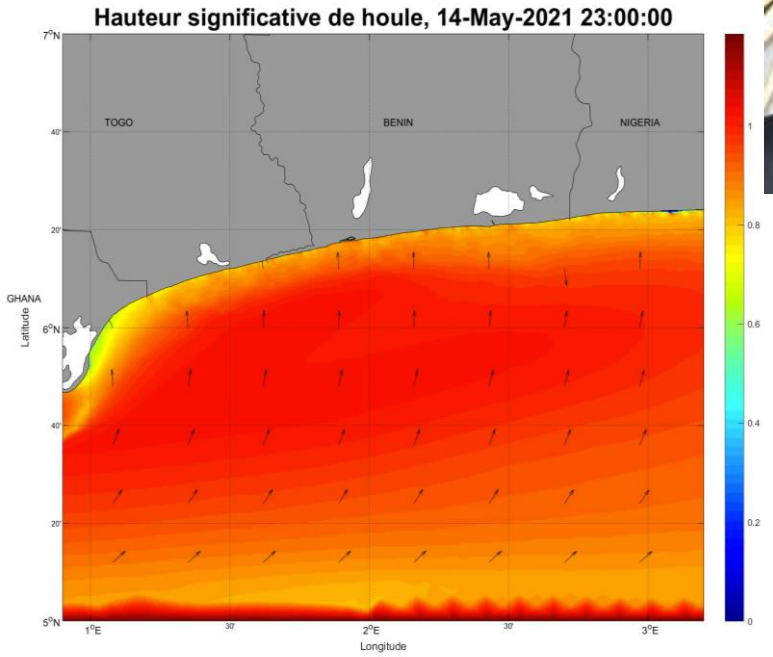
Director of IRHOB : Prof. Zacharie Sohou

Name of participant: Dr. Frederic BONOU

Position of participant: Researcher and Lecturer

Email: fredericbonou@yahoo.fr





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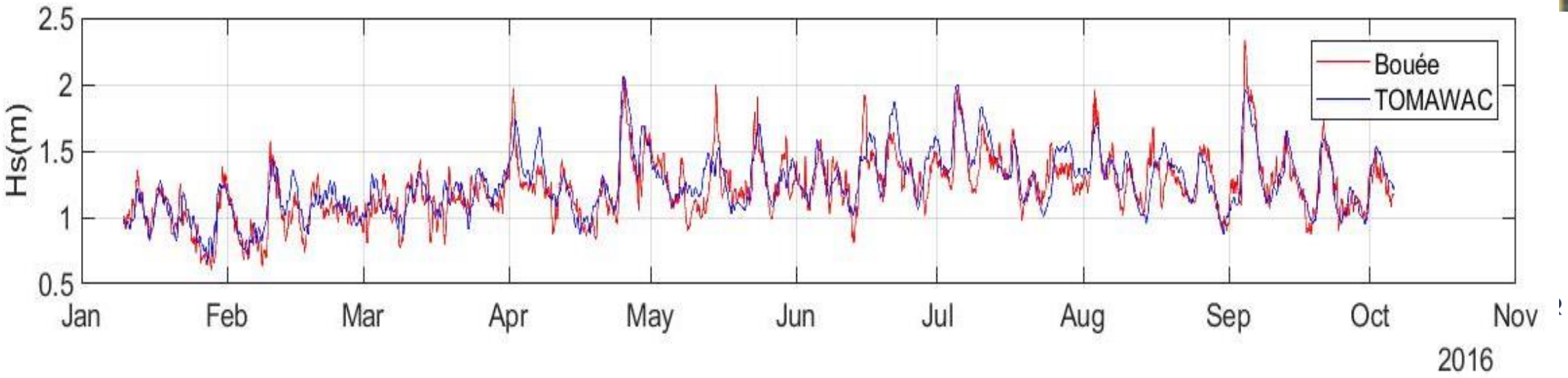
Description of ocean forecasting system

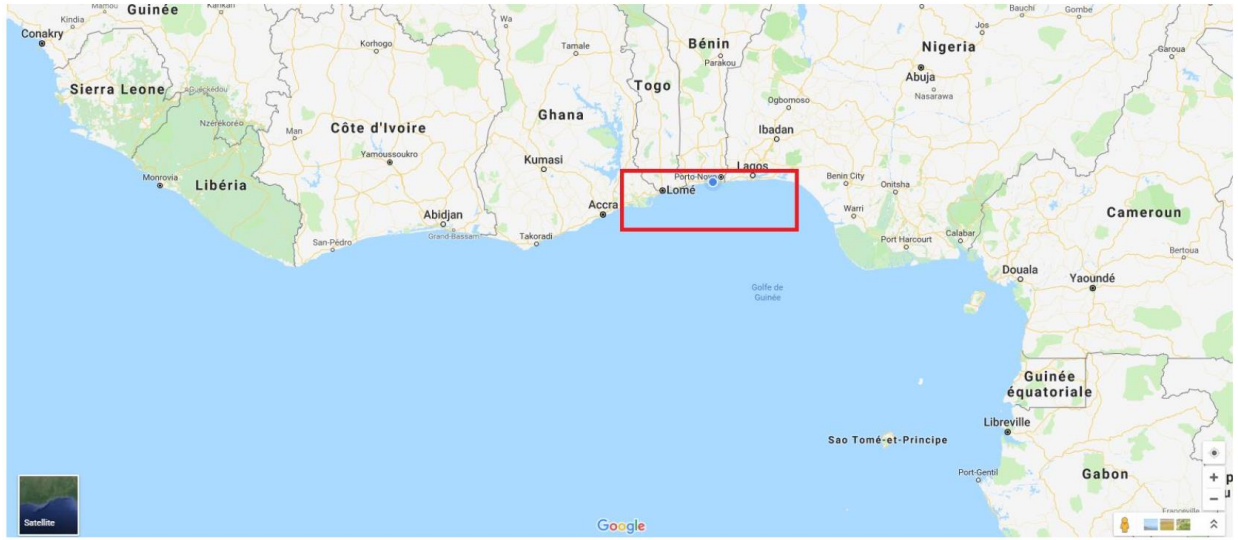
- Name of the system: *TOMAWAC-TELEMAC*
- Type of system: *Predict ocean State in Benin, Significant Wave height, wave direction, wave period .*
- Start of operation of the system: 2018
- System website (if available): http://www.nodc.ioc-africa.org/benin/alerte.html
- Describe your data sharing policy: wave forecast each 2 or 3 days



Technical description

- Model employed: TOMAWAC-TELEMAC

Latitude 5°N à 6.5°N
Longitude 0°E à 4.5°E



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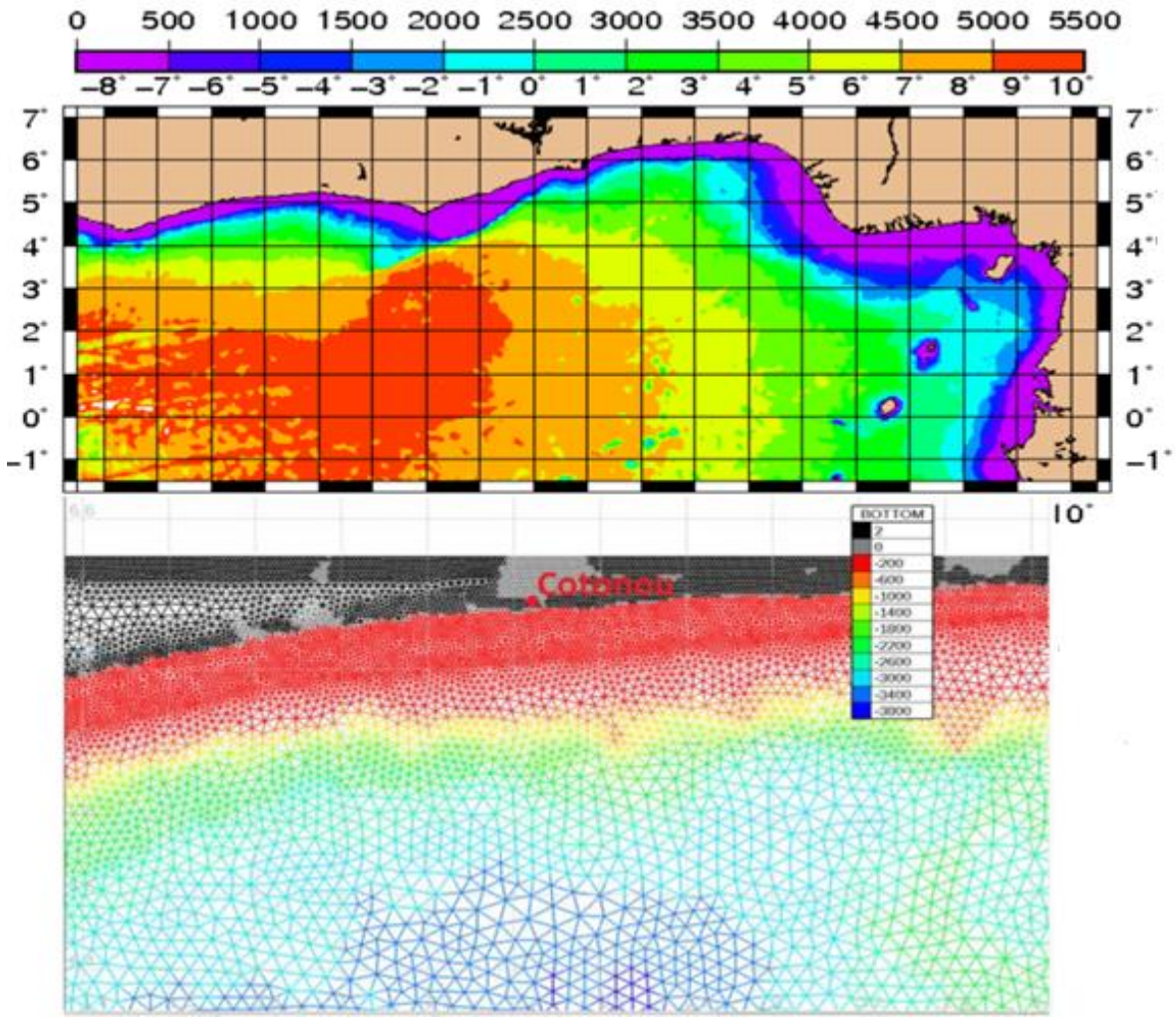
Technical description



Merging Bathymetry from GEBCO and Observation data

Un regular resolution
From 8km to 680 m
High resolution near coast

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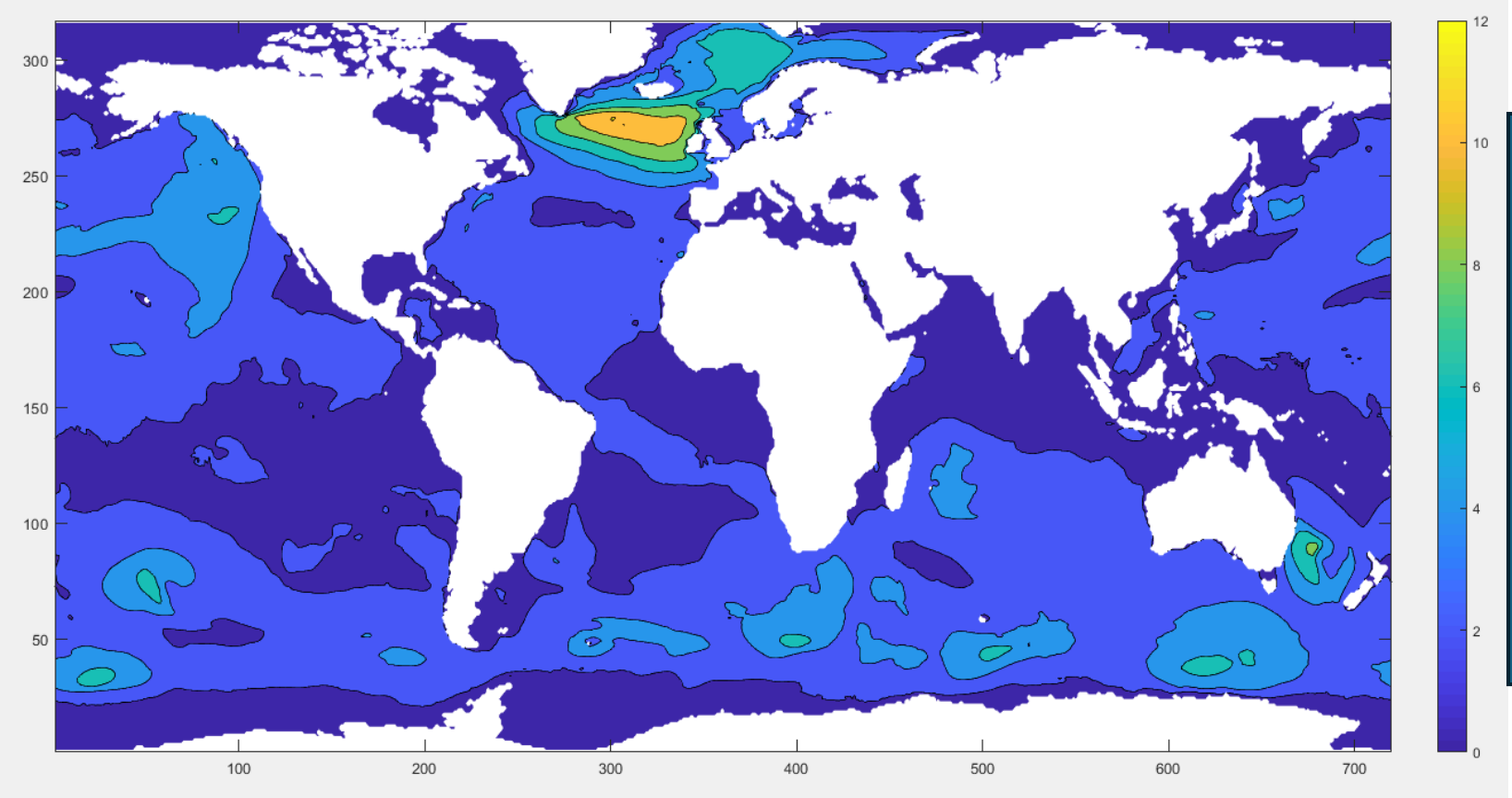
Technical description

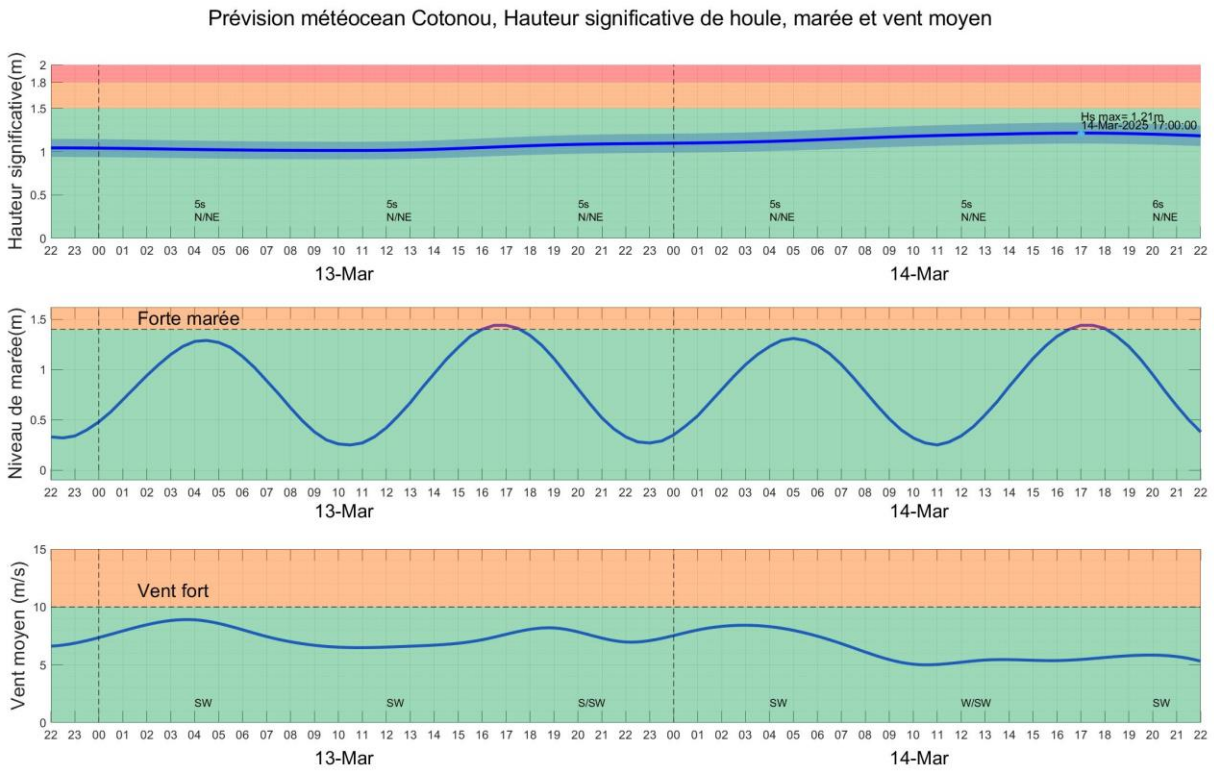


Global Previmer Wave data
Resolution 0.5 degree
Temporal resolution : 3h

Forcast system : 1 hour
Each 2 or 3 days runs

Description of System Results

Forecast of significant wave height



The model is launched every 2 or 3 days to predict the next 2 to 3 days, respectively

Alert message sent to the Ministry (with the figure)

Pour la période du mercredi 12 au vendredi 14 mars 2025, la situation est **VERTE.**

En effet, les prévisions indiquent que les paramètres océanographiques (vagues, marée et vent) sont modérés durant cette période.

La figure ci-dessous montre les prévisions de Hauteurs significatives de houle (en m), des hauteurs de la marée (en m) et de la vitesse moyenne du vent (en m/s).

Description of System Results

The criteria for sea state (wave height) have been defined to alert ANPC and then the populations: green, orange, red.

Criteria for Sea State (Wave Height) to Alert ANPC and Populations:

Green (Vert): Low wave height (Hs < 1.5m)

Orange (Orange): Moderate wave height (1.5m < Hs < 1.8m)

Red (Rouge): High wave height (Hs > 1.8m).

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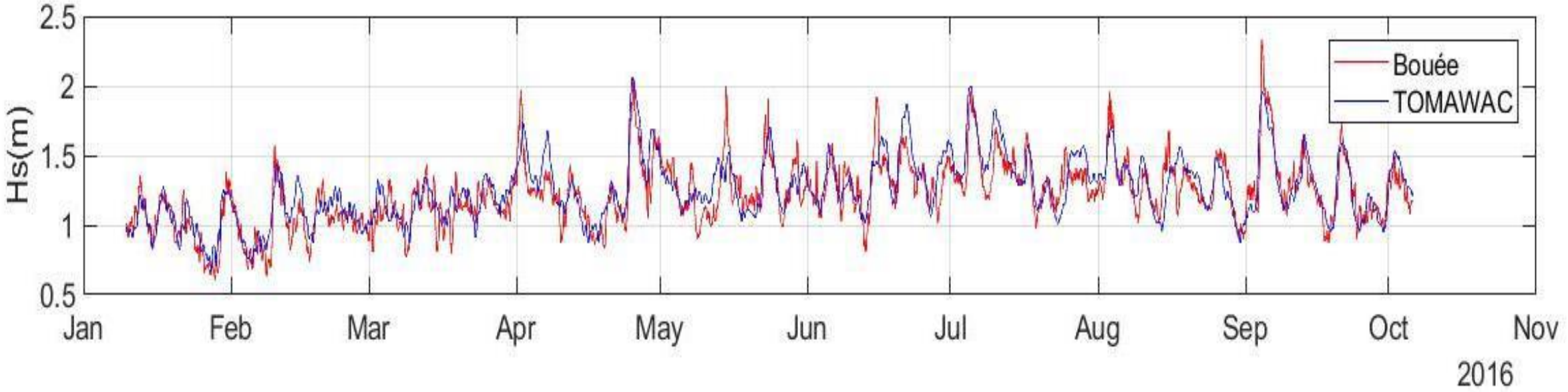
System validations: Model validation



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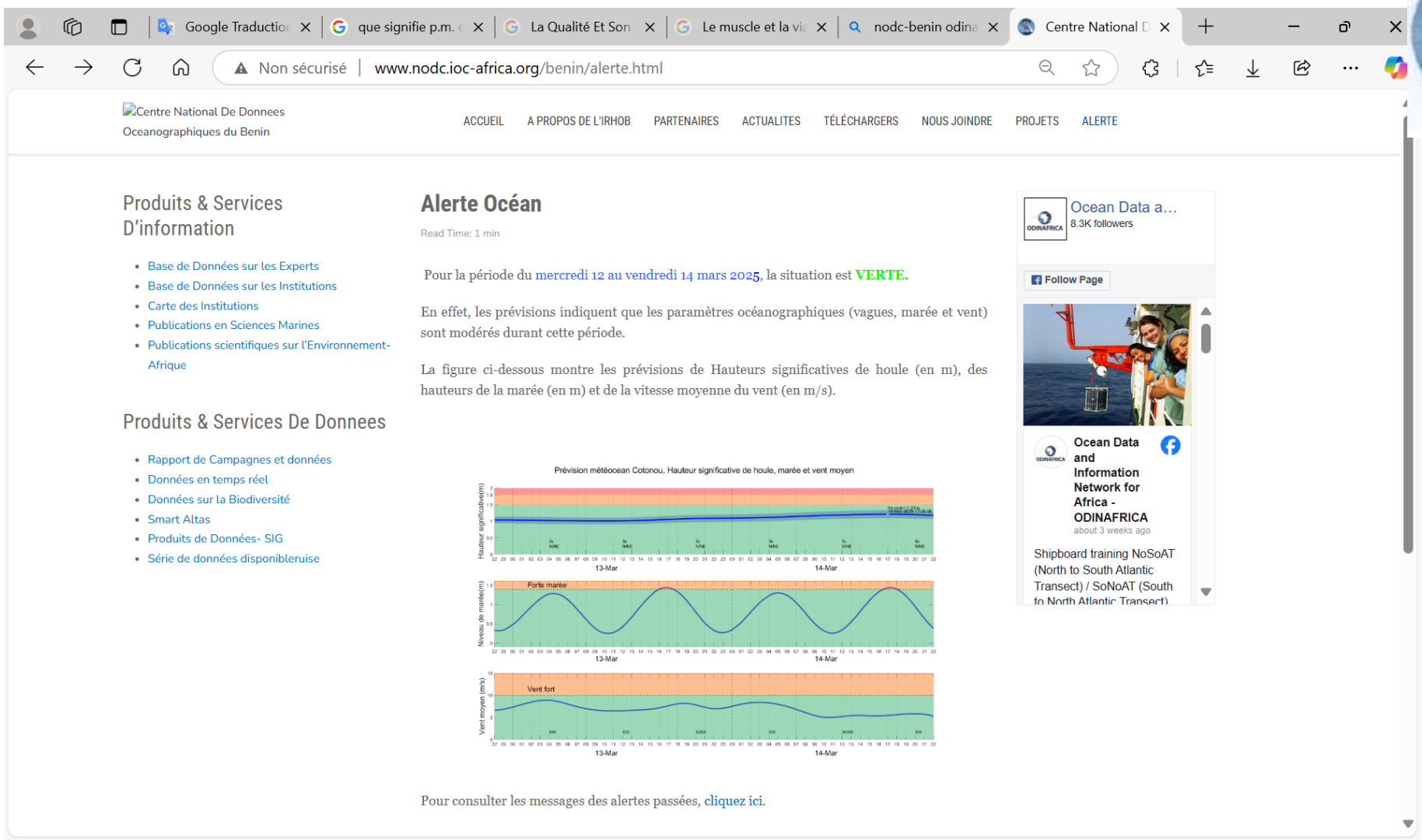
Applications

http://www.nodc.ioc-africa.org/benin/alerte.html



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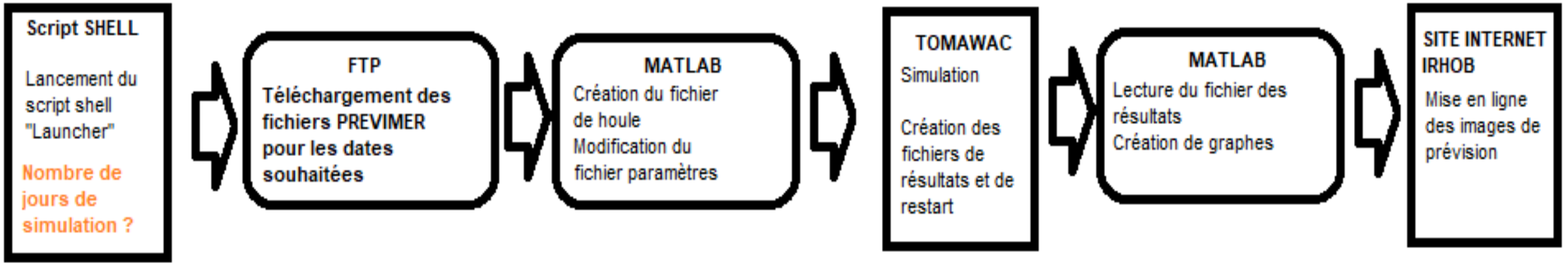
Applications



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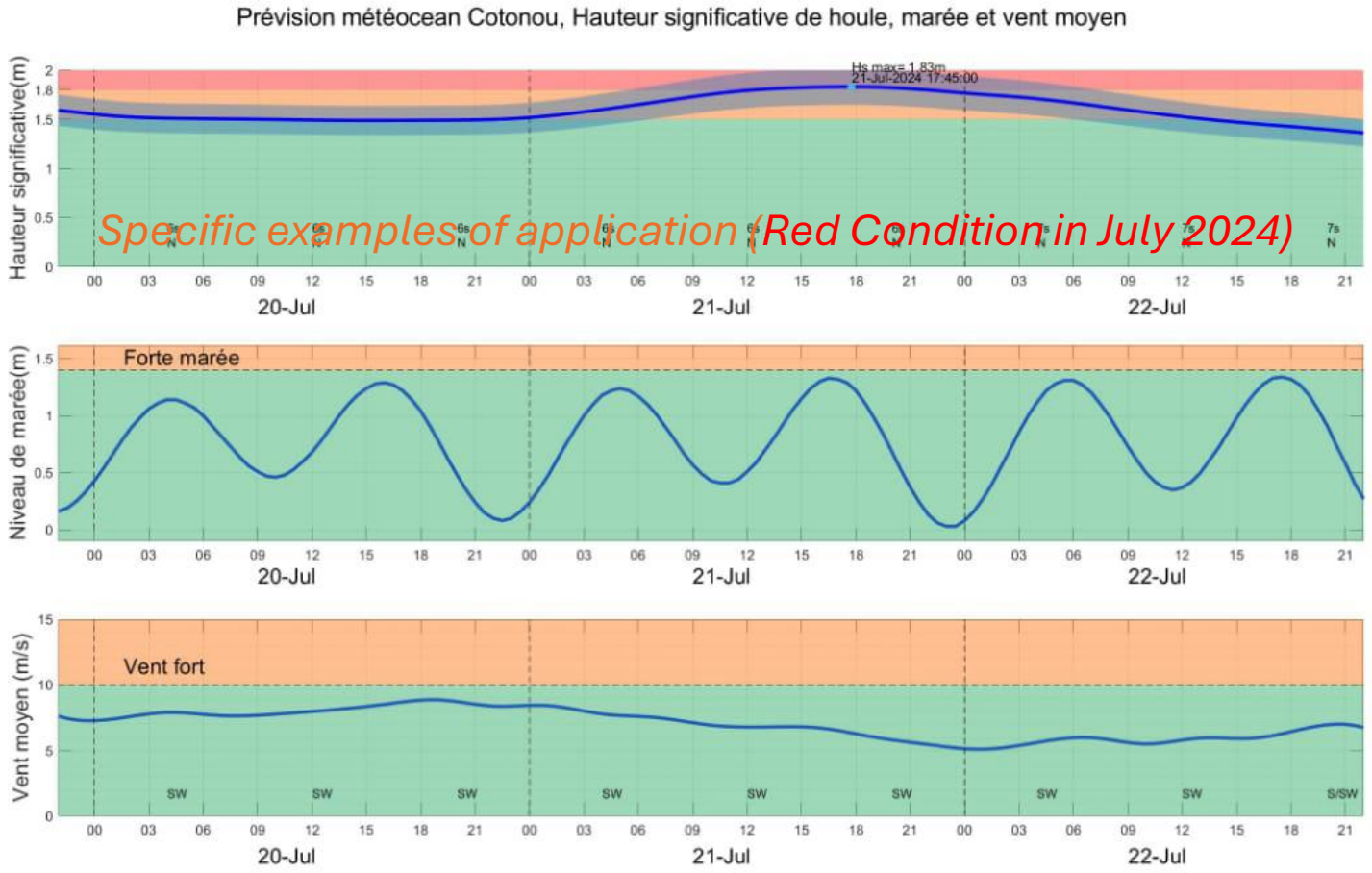
Specific examples of application (Red Condition in July 2024)



Specific examples of application (Red Condition in July 2024)

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Factors affecting

Factors Affecting TOMAWAC Simulation Time:

- **Internet Stability**: For retrieving forcing fields.
- **Data Availability**: Access to the forcing data site.
- **Power Outages**: Interruptions during the simulation.
- **Computational Power**: Limited capacity of the computer.

Factors affecting

- **Computational Power**: Limited capacity of the computer.

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Summary

Factors Affecting TOMAWAC Simulation Time:

- TOMAWAC-TELEMAC is a scientific software that models wave conditions, enabling the prediction of sea states along the Beninese coast. This capability helps combat maritime insecurity by providing essential information on wave heights and ocean conditions.

Apart from the IRHOB's own forecast, we also receive regional forecasts from the GMES and Africa project at the University of Accra's forecasting center in Ghana, which allows us to compare and be sure of our local forecast.

Both is always perfect

Perspectives

High-Power Computers and Their Uses

High-power computers are essential for tasks that require significant computational resources, such as:

1. Scientific Simulations: Models like TOMAWAC-TELEMAC for ocean wave predictions need powerful computers to handle complex calculations efficiently.
2. Data Analysis: Large datasets from various fields (e.g., climate modeling,) require fast processing to extract meaningful insights.
3. Cryptography and Security: High-performance computing is used in cryptographic applications, such as exponentiation in encryption algorithms.
4. Machine Learning and AI: Training complex models requires substantial computational power to process large amounts of data quickly.

- These computers enable faster processing of complex tasks, which is crucial for advancing research and technology in various fields.
- Needs of permanent website