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REMO – Oceanographic Modeling and Observation Network

HYCOM 1/4º   1/12º   1/24º

- **System status, upgrades and achievements in 2023**

   - The REMO Ocean Data Assimilation System (**RODAS)** and **HYCOM** had no major upgrades this year in the **Brazilian Navy Hydrography Center (CHM)**

   - RODAS is based on EnOI and runs operationally with 126 ensenble members selected according to the assimilation day (Tanajura et al. 2020)

   - **HYCOM+RODAS** is still running in 2 different nested grid systems:
      - one with 1/4º – 1/12º – 1/24º L21
      - another (more recent) with 1/12º - 1/24º L32
      - the 1/24º grids have tidal forcing

   - RODAS assimilates SST from OSTIA, along track SLA and Argo and Deep Argo T/S profiles twice a week. In the other weekdays, 24 h forecasts are used as initial condition

   - Daily 5-day forecasts forced by 6 h GFS NCEP/NOAA in the large domain

   - For the 1/24º grid (Metarea V) the atmospheric forcing from **COSMO/CHM** with 10 km resolution was substituted by **ICON-LAM/CHM** (from DWD) with 6.5 km L50.
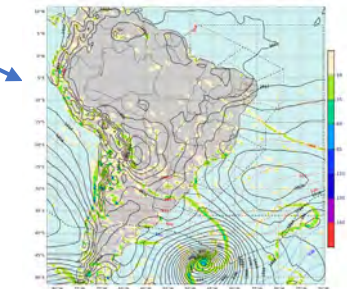

- **Next Steps:** - Perform EnKF experiments in a small grid. Tests were done perturbing the thicknesses of the model layers and observations

   - OSSEs with SWOT synthetic data (experiments were already done in UFBA) and with gliders crossing the Brazil Current
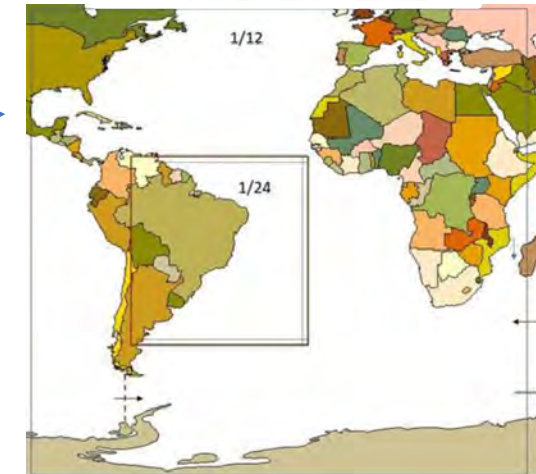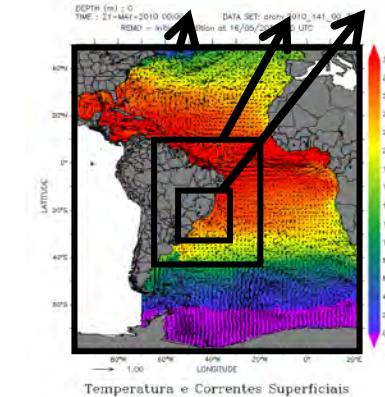
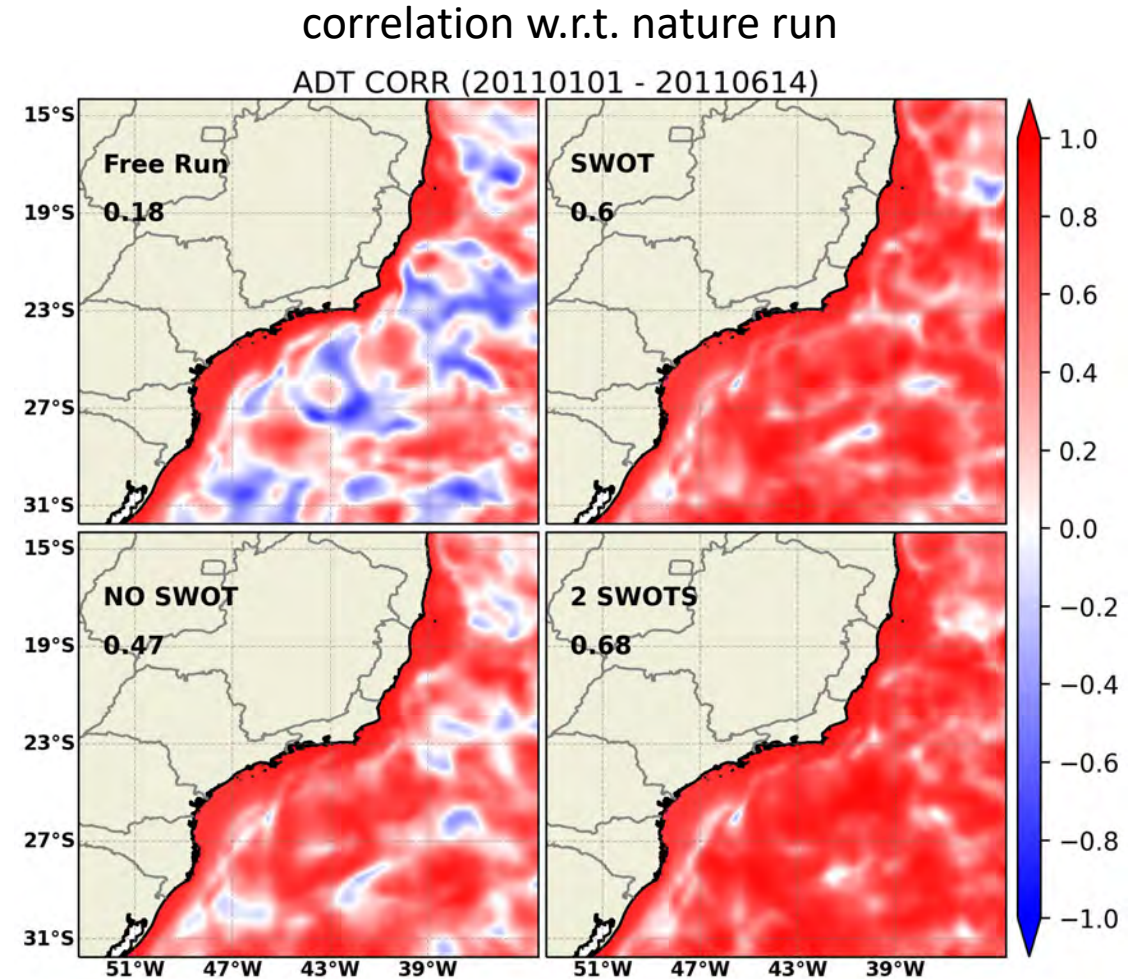**OceanPredict**
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- **HYCOM+RODAS (in UFBA)**

  - OSSEs with 1 SWOT and 2 SWOTs for 2 yrs with respect to a run assimilating SST, SLA along-track and T/S profiles

  - Nature run from ROMS

  - SWOT synthetic data generated Gaultier et al. (2021) code
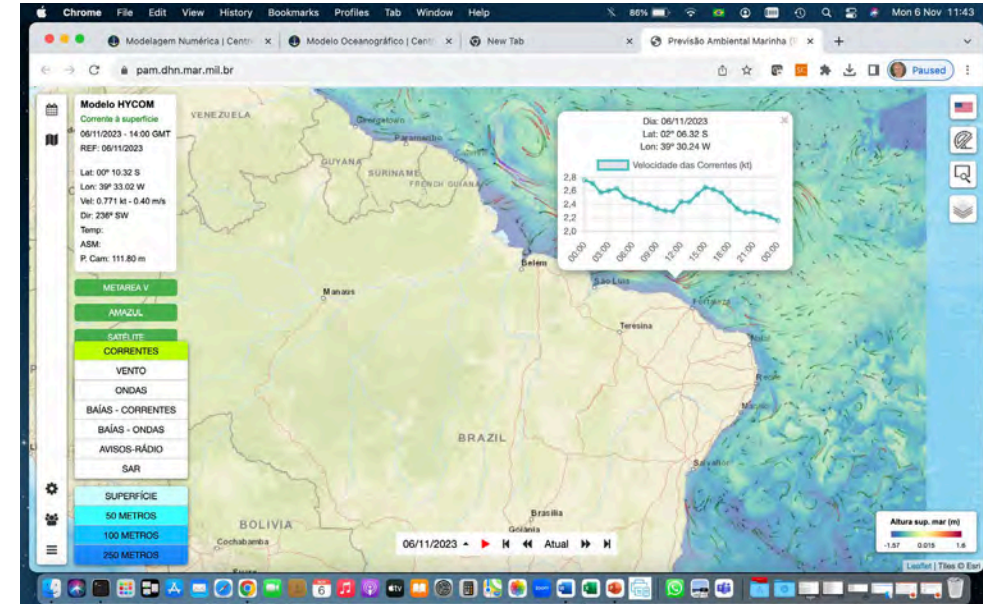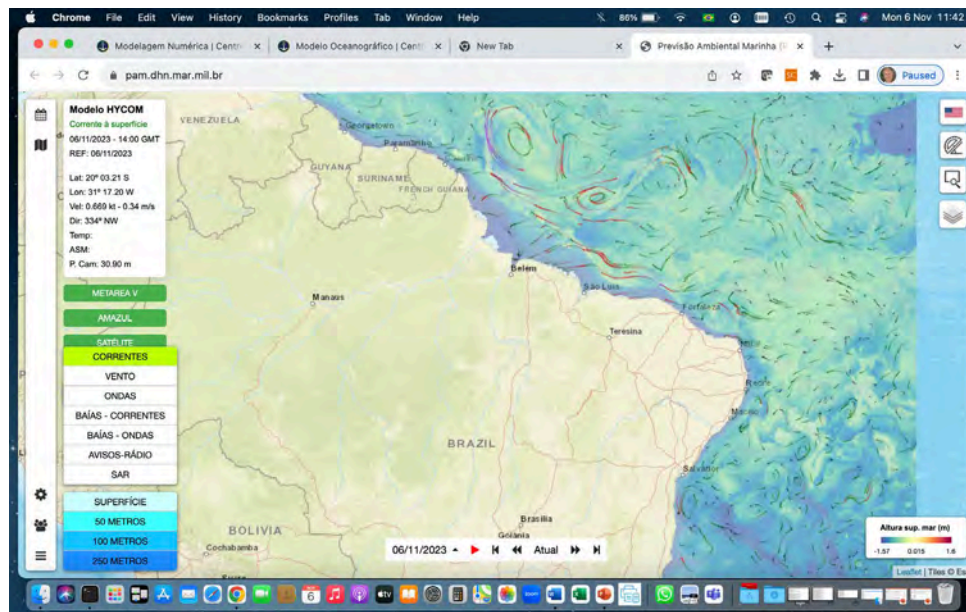
  - **Next Steps:**

  - OSSEs with SWOT synthetic data and gliders and with gliders crossing the Brazil Current with the CHM operational system

  - Perform EnKF experiments in a small grid. Tests were done perturbing the thicknesses of the model layers and observations

correlation w.r.t. nature run

ADT CORR (20110101 - 20110614)

Free Run 0.18 | SWOT 0.6
NO SWOT 0.47 | 2 SWOTS 0.68

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▪ **Dissemination**

- HYCOM+RODAS forecasts (only figures) are disseminated at https://pam.dhn.mar.mil.br and at https://www.marinha.mil.br/chm/dados-do-smm-modelagem-numerica-tela-de-chamada

- The main users today are the Oil State Co. **Petrobras** and the **Brazilian Navy**


▪ **Next Steps along with OceanPrediction DCC**

- HYCOM+RODAS 1/12° 5-d forecasts (.nc files) will be publicly available in 2024 in the REMO site (www.rederemo.org) and/or in the DCC portal

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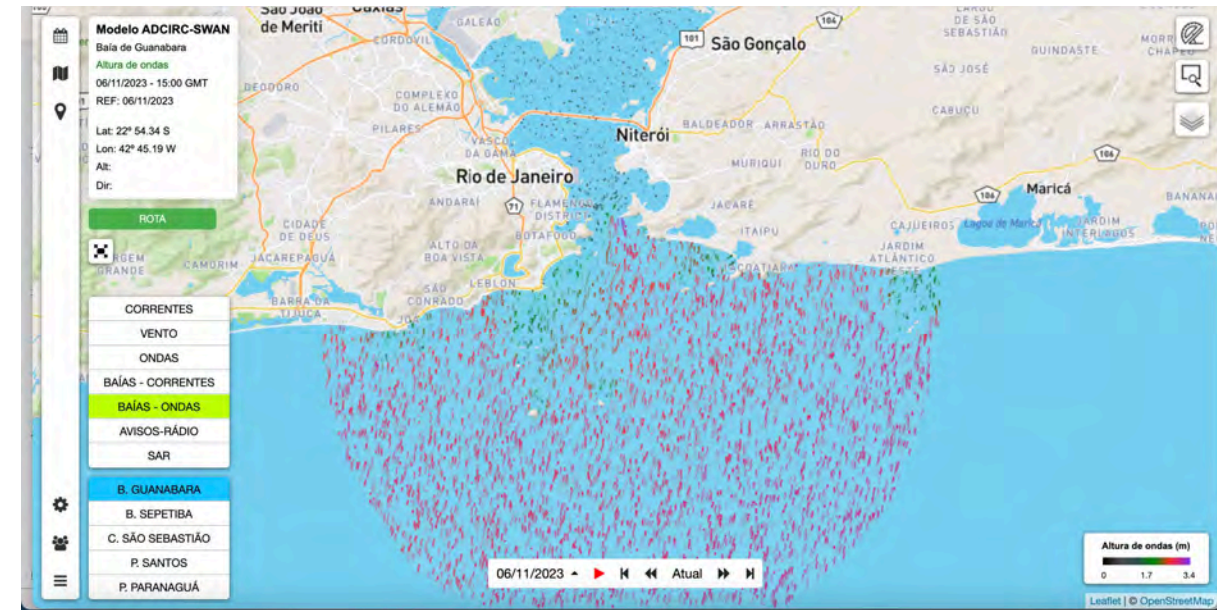**REMO – Oceanographic Modeling and Observation Network**

- **ADCIRC – SWAM (00Z)**

  - Finite element model and wave model for 2D circulation nested in HYCOM+NCODA $1/24^o$ and WW3

  - Horizontal resolution ranging from 150 m to 4 km.

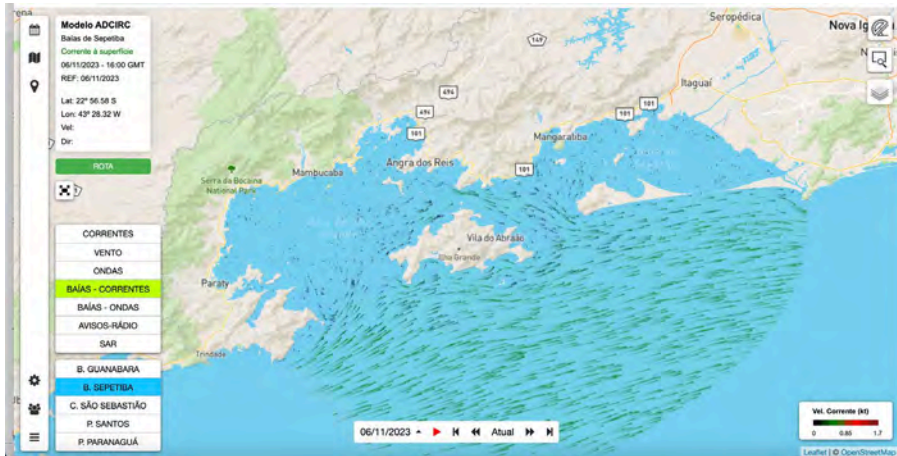Guabanbara Bay – Rio de Janeiro (22.8^oS)
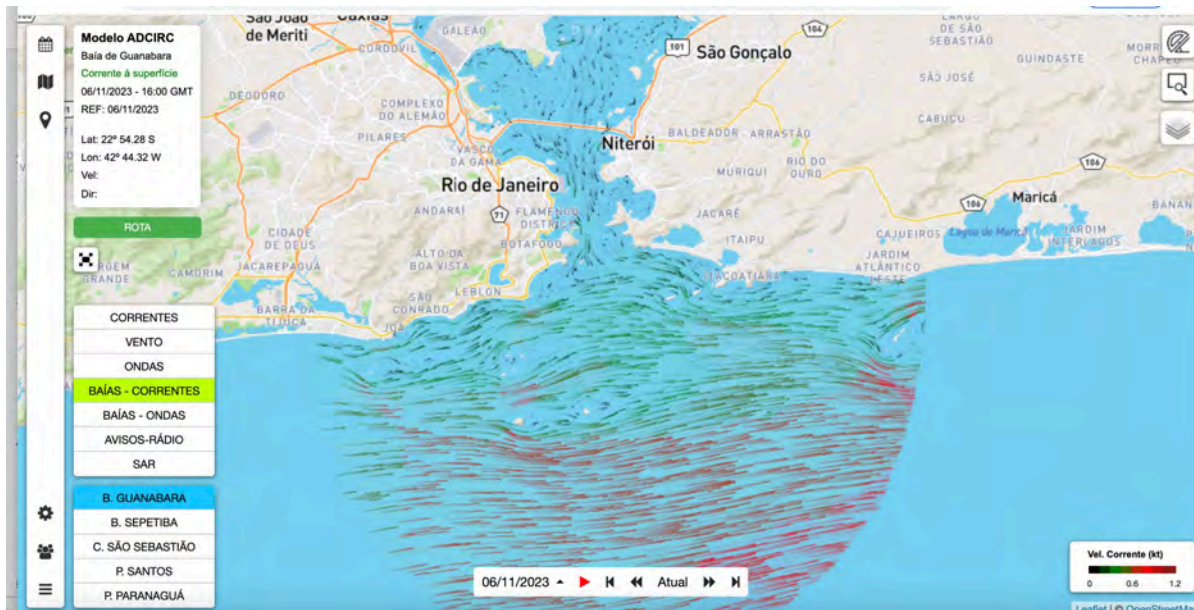
Currents

Waves height and direction

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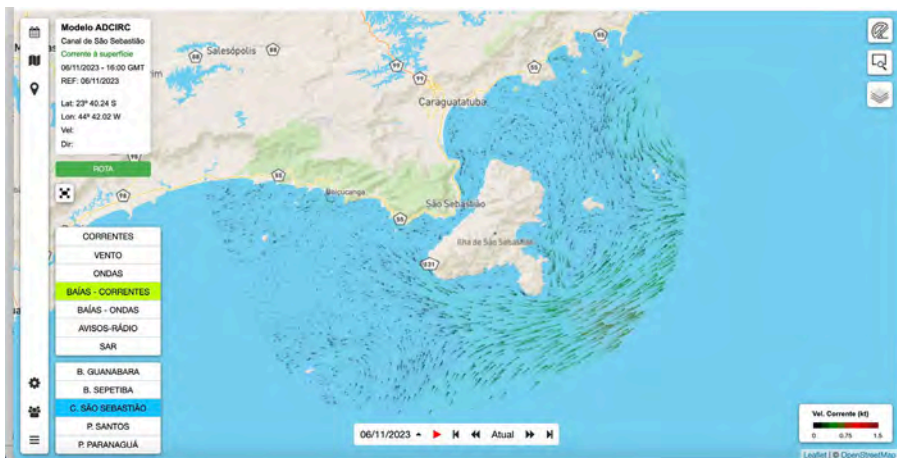- **ADCIRC–SWAM** is also employed in 4 other coastal regions. a new one will be implemented in NE Brazil in 2024
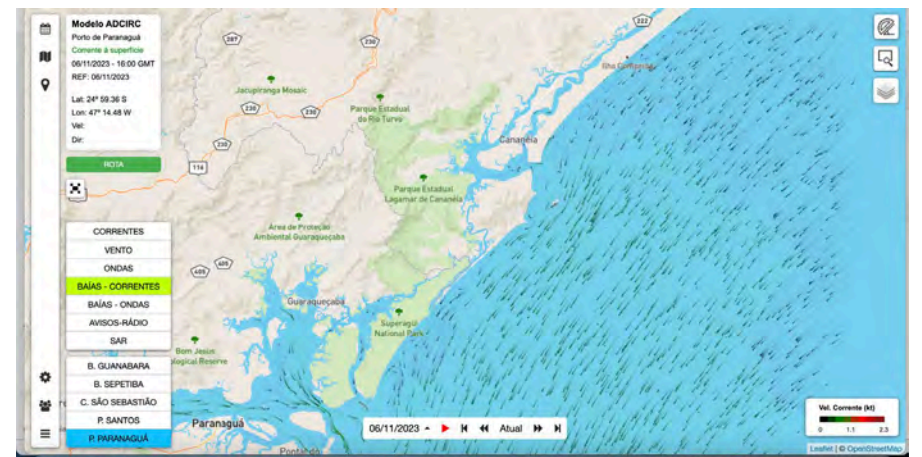
Sepetiba Bay (23°S)

Santos Port (24°S)

São Sebastião Cape and Canal (23.8°S)

Paranaguá Port (25.5°S)

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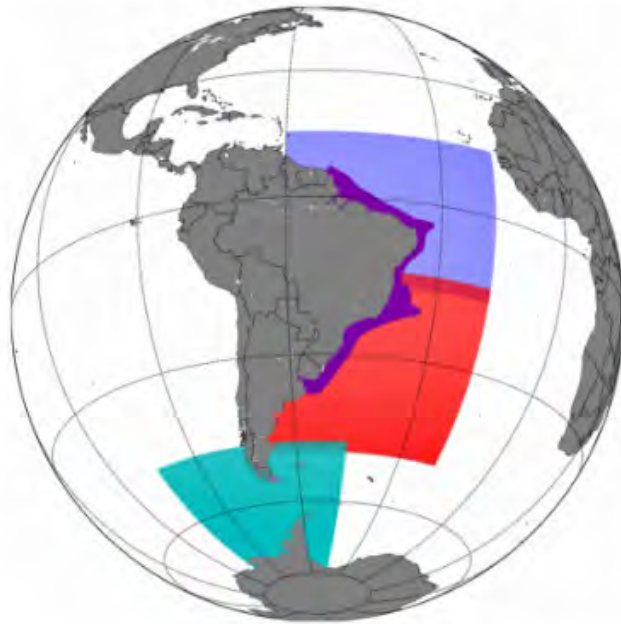
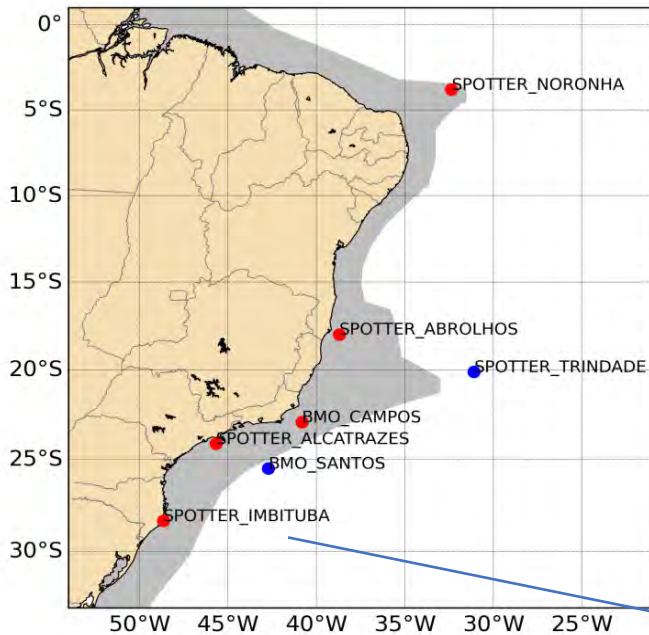**REMO – Oceanographic Modeling and Observation Network**

- **Wave Watch 3 Forecasts**
  - Two runs per day (00Z and 12Z) forced by GFS/NCEP/NOAA
  - Global: $1/3^o$; Antarctica: 0.1^o ; METAREA V South: 0.1^o ; METAREA V North: 0.15^o; COASTAL
  - WW3 Ensemble based on GFS/NCEP/NOAA ensemble forecasts
  - Antarctic grid was recently changed to 5 min x 10 min to fix a CFL problem
  - In situ vs. satellite data was compared to ensure the quality of validation and WW3 calibration

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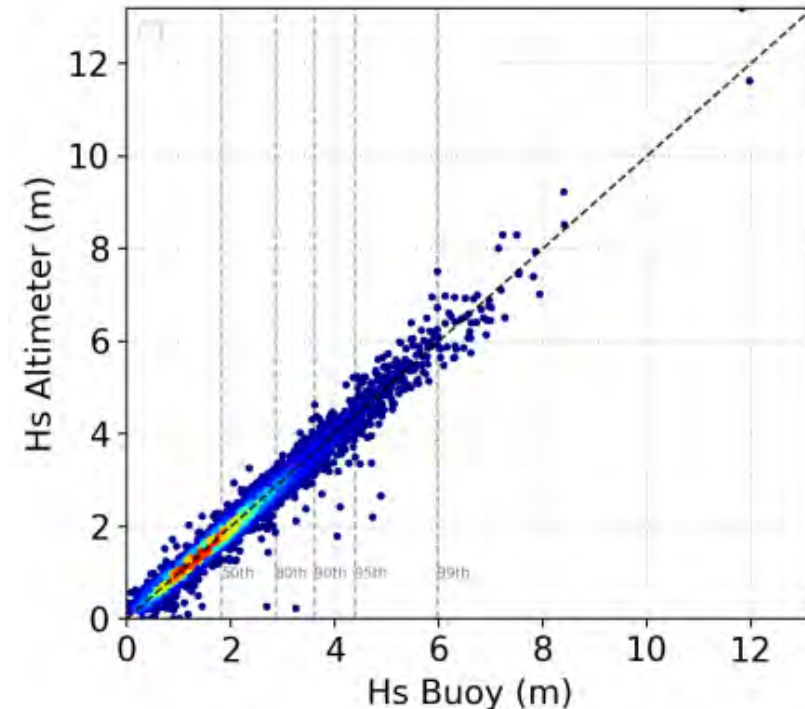
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- **Wave Watch 3 Forecasts**
  - Each CHM/REMO 5 d forecast was validated and compared with NOAA and DWD WAM ICON forecast
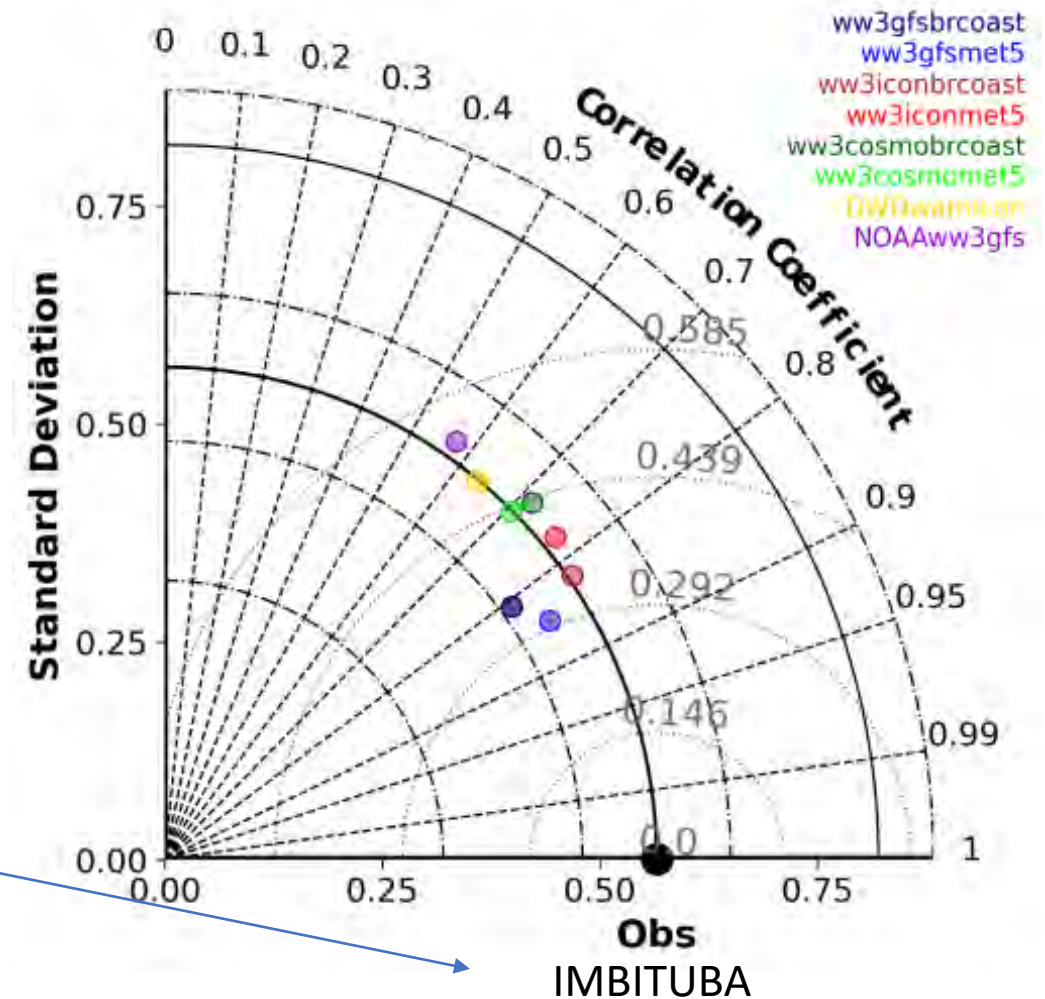

CHM/REMO wave forecasts:
- ww3gfs_brcoast
- ww3gfs_met5
- ww3icon_brcoast
- ww3icon_met5
- ww3cosmo_brcoast
- ww3cosmo_met5
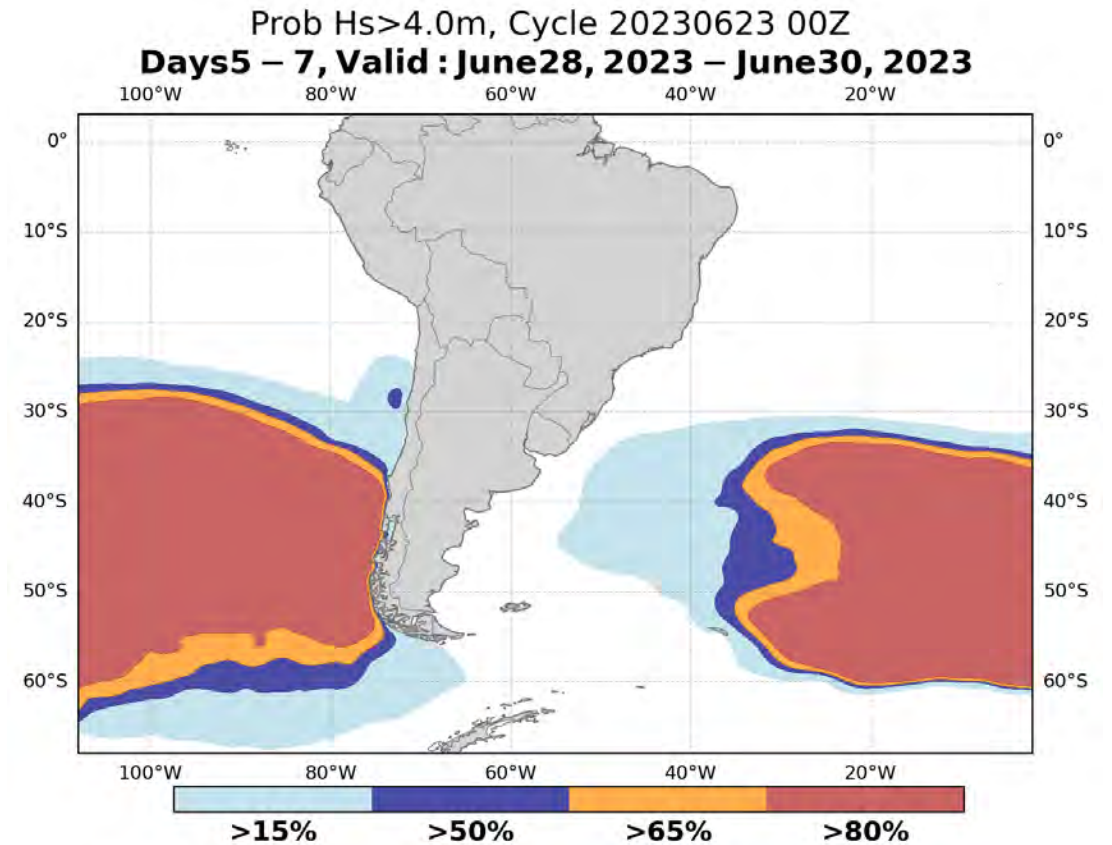
NOAA and DWD wave forecasts:
- DWDwamicon
- NOAAww3gfs

IMBITUBA

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- **Wave Watch 3 - Next steps**
  - Extend probabilistic forecasts with GFS ensemble for 5 d to 16 d window

  - Use of AI to correct biases

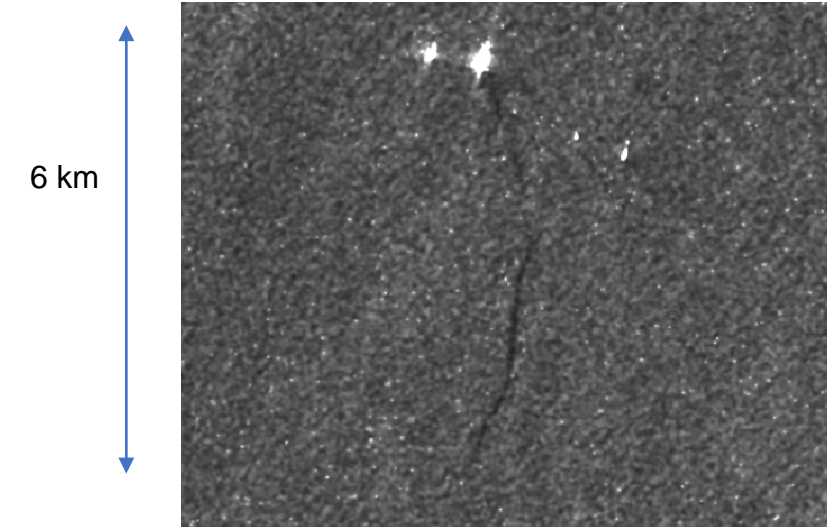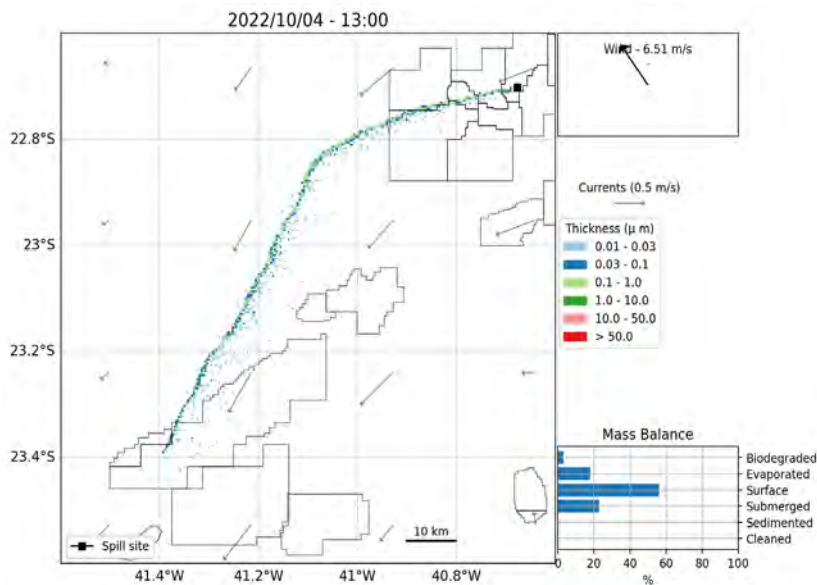 - Investigate and implement a new coastal grid

Prob Hs>4.0m, Cycle 20230623 00Z
Days5 − 7, Valid : June28, 2023 − June30, 2023

>15%   >50%   >65%   >80%

- **Coupled Model for Oil Spill Prediction (CMOP)**
  - Oil physical-chemical model under development by REMO
  - Planned to use 25 oil types, implemented until now 4 types
  - User friendly interfaces are under development to set up grid, forcing, model parameters and post-processing to produce figures

6 km

oil thickness along the trajectory

Multiple sources

a) without verical dispesion

b) with verical dispesion