SYMPOSIUM OP'24

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OSSEs with SWOT and Gliders in the Southwest Atlantic with HYCOM+RODAS

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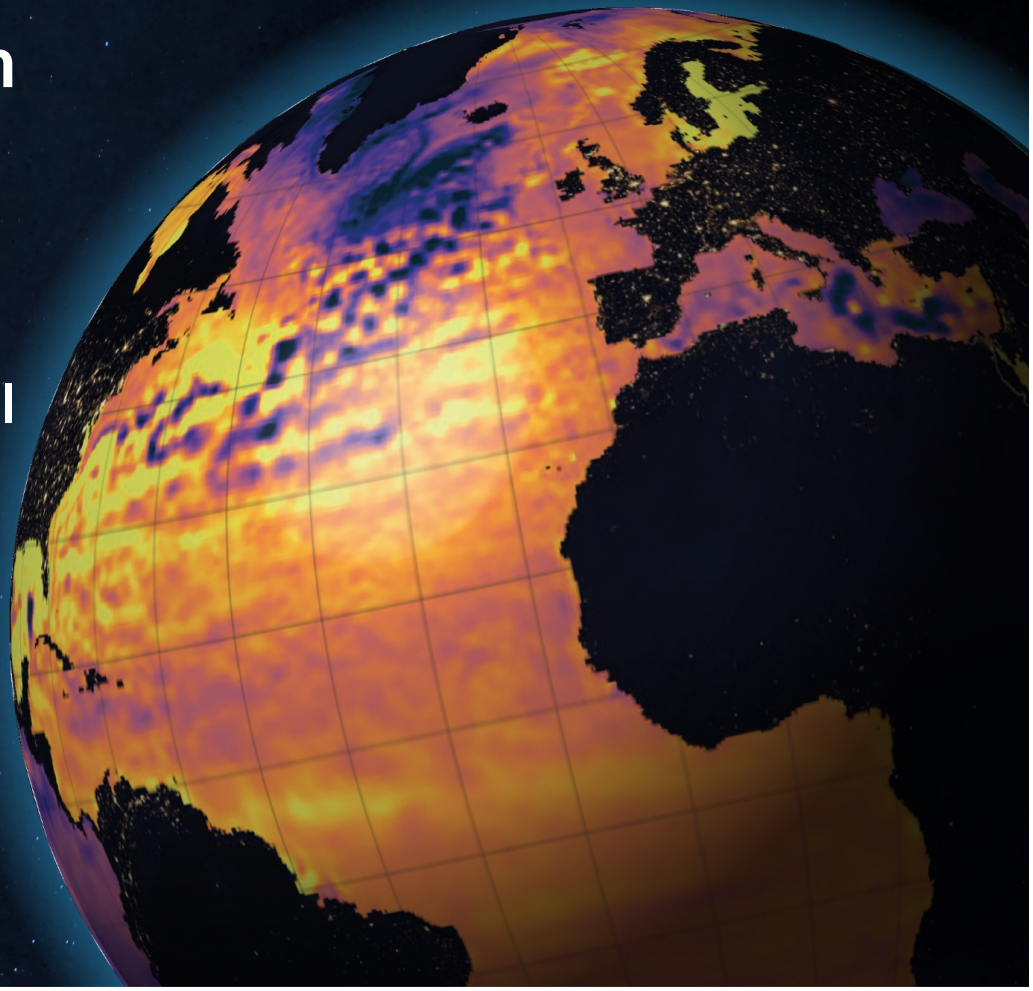
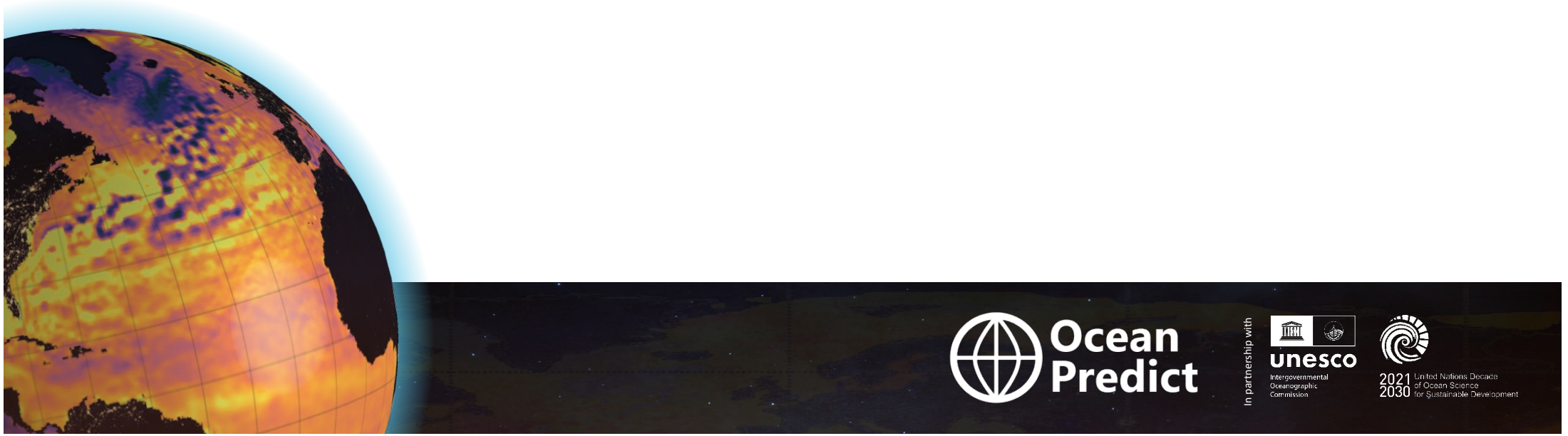
Oceanographic Modeling and Observation Network (REMO www.rederemo.org)



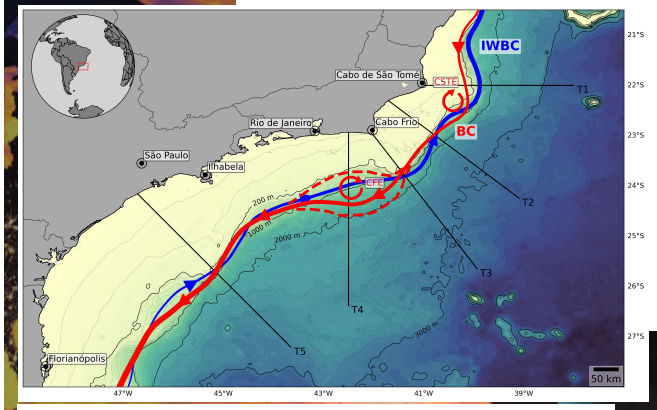
Outline

- Introduction
- OSSEs with SWOT
- OSSE with SWOT+Gliders
- Final Considerations

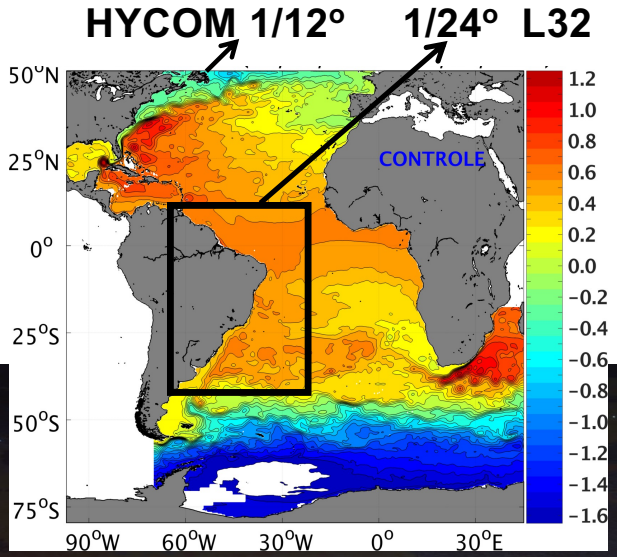


Introduction

- REMO is a research network established in 2007 dedicated to operational oceanography in Brazil. The Brazilian Hydrography Center (CHM) hosts our operational systems since 2010
- The current version of the operational system: **HYCOM+RODAS** (EnOI) with assimilation of OSTIA SST, along track SLA and Argo T/S profiles in 2 domains with focus on Metarea V
- Important features to be simulated and forecasted are the Brazil Current (BC) and the underlying Intermediate Western Boundary Current (IWBC)



de Paula,T. PhD Thesis, UFRJ, 2024



Mignac et al. Oc. Sci, 2015
Tanajura et al, Oc Dyn 2020
Costa and Tanajura, Oc Model, 2022

https://pam.dhn.mar.mil.br/

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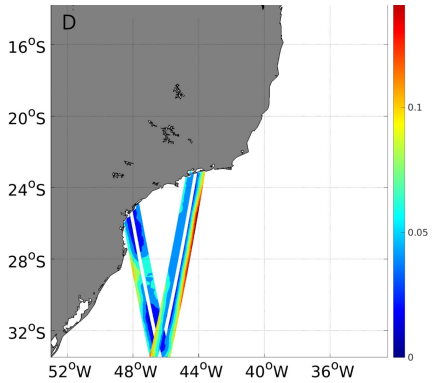
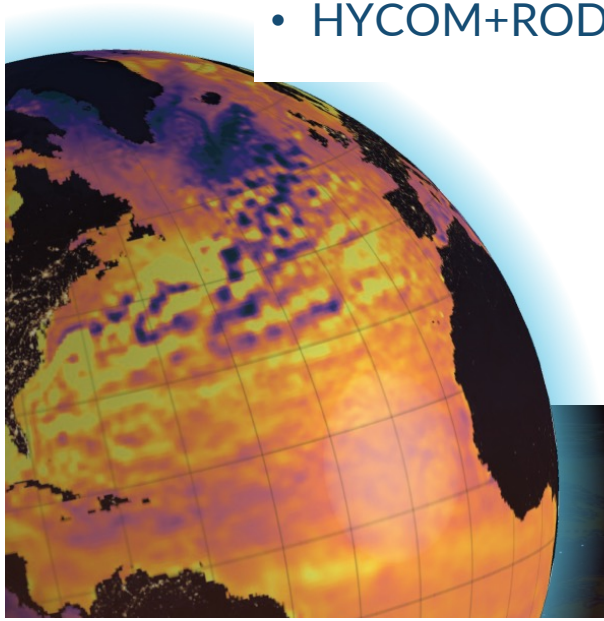
OSSEs with SWOT

- Nature run from a ROMS 1/24º L32 free run nested in HYCOM+NCODA forced with ERA-Interim from 2008 to 2012 off Brazil South and Southeast coast
- HYCOM 1/24º L32 free run nested in HYCOM 1/12º L32 free run forced with CFSR in 2011-2012
- SWOT synthetic data produced by L. Gaultier et al. (2017, 2021) code with 8 km resolution
- HYCOM+RODAS with assimilation each 3 d of SST + “Argo” T/S + Along-track SLA
- HYCOM+RODAS as before + 1 SWOT with Karin errors only
- HYCOM+RODAS as before + 2 SWOTs





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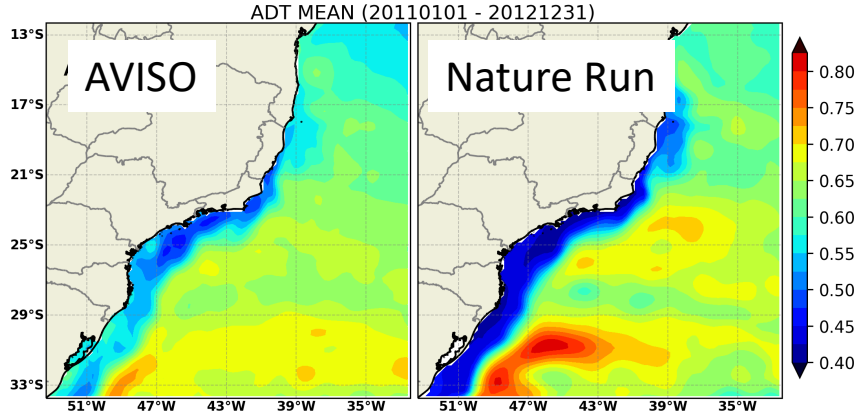
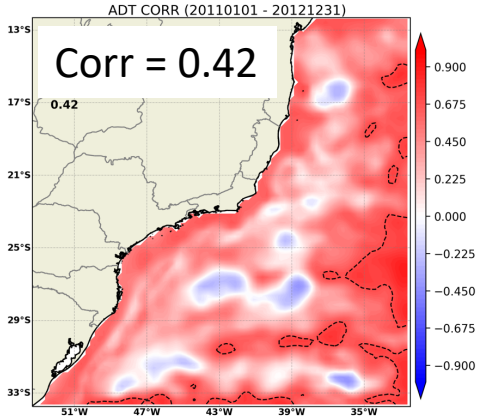
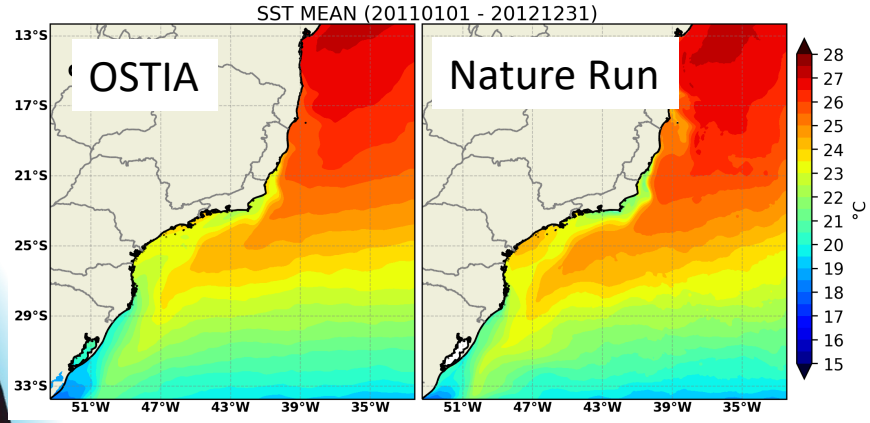
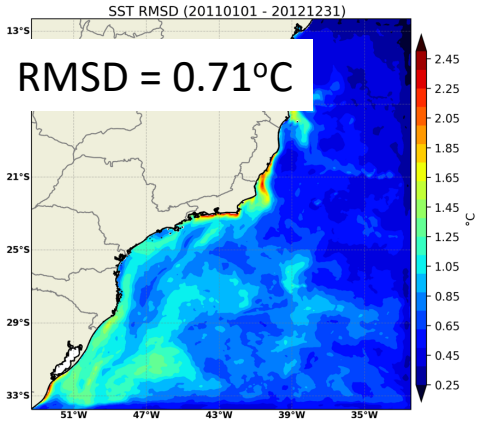
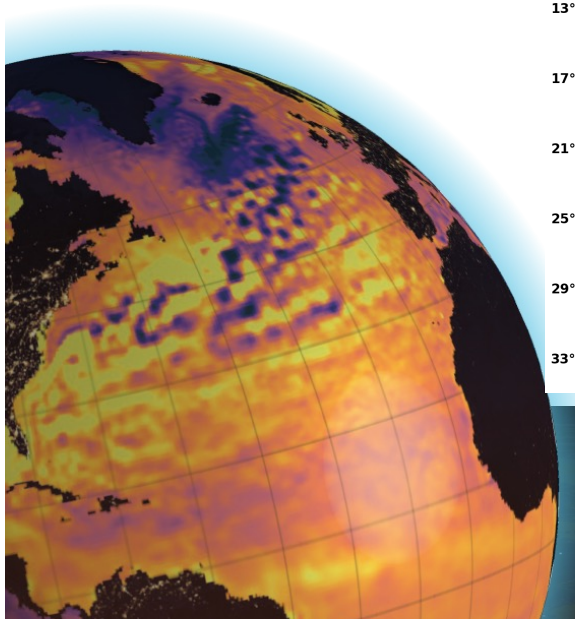
Nature Run (ROMS) - SSH vs. AVISO & SST vs OSTIA











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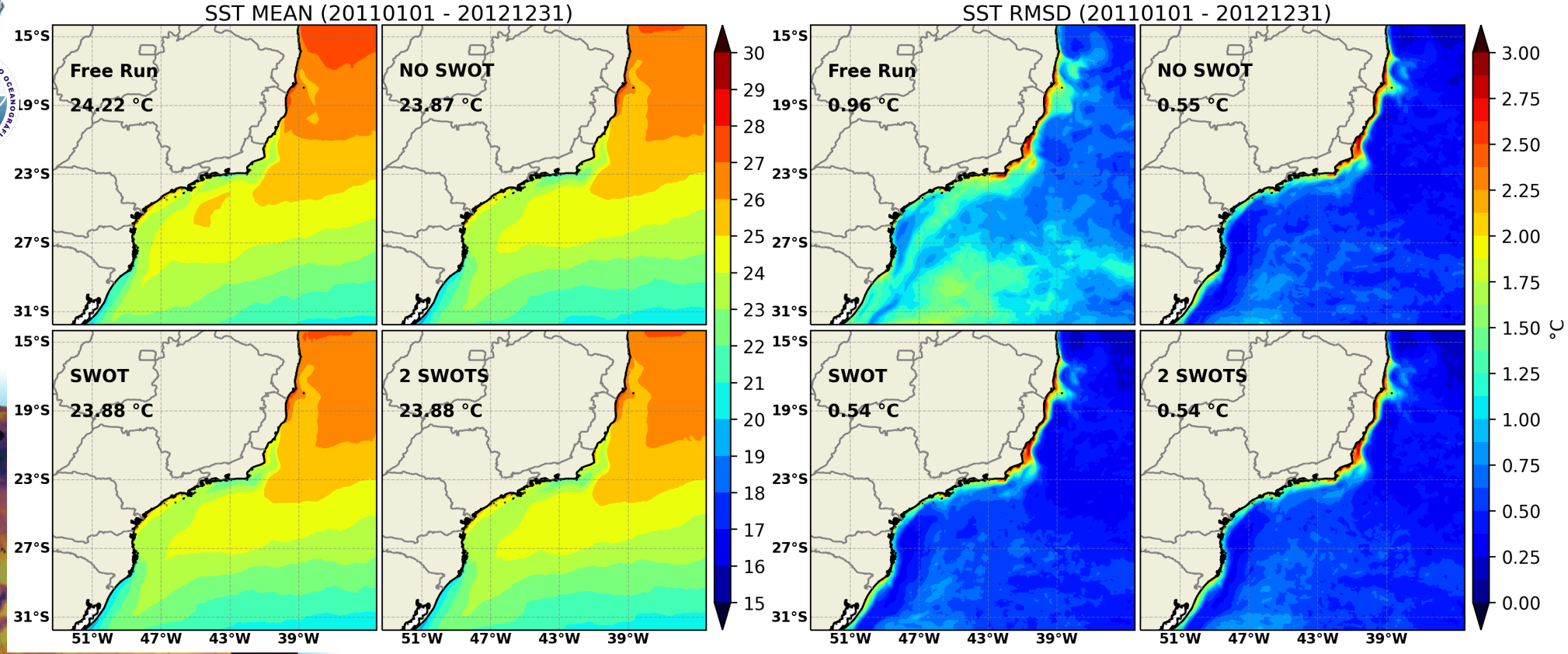
OSSEs with SWOT – SST (ºC)



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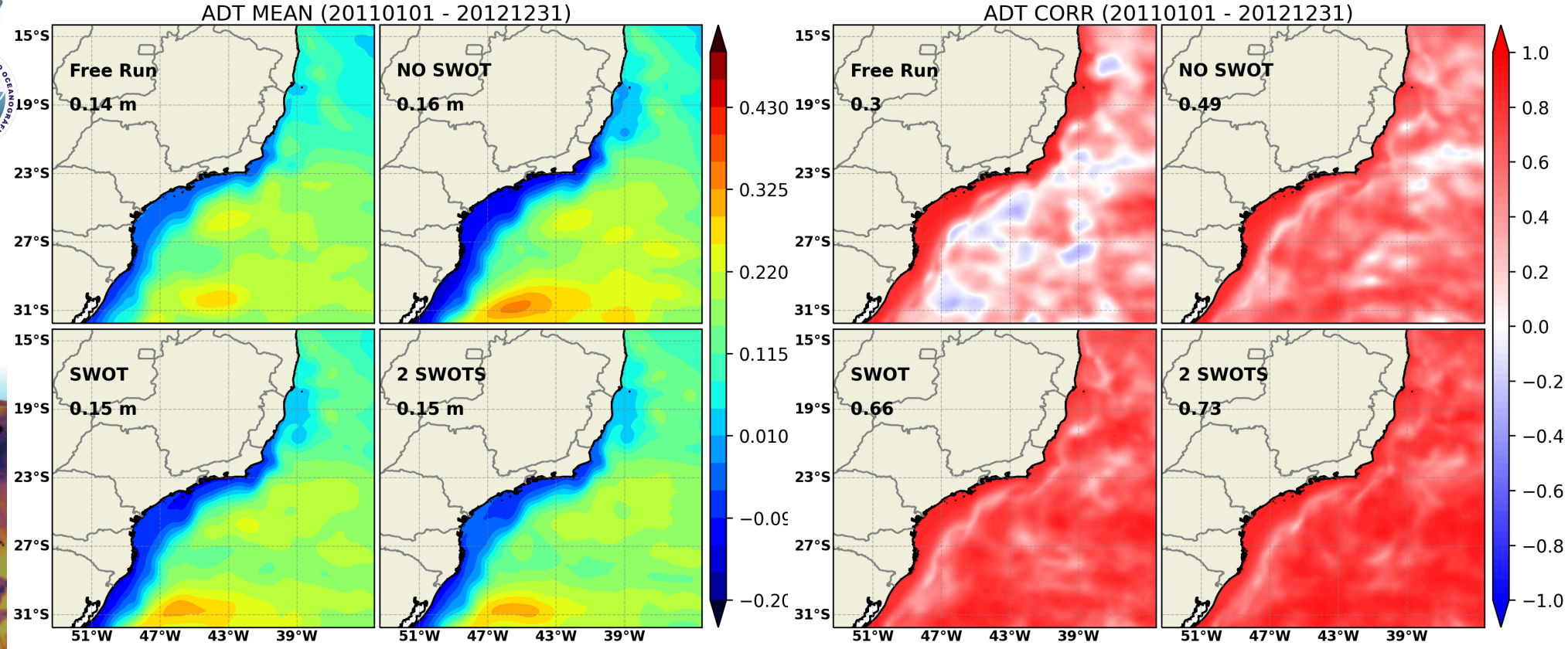
OSSEs with SWOT – SSH (m)



UFBA

REMO – Rede de Modelagem e Observação Oceanográfica

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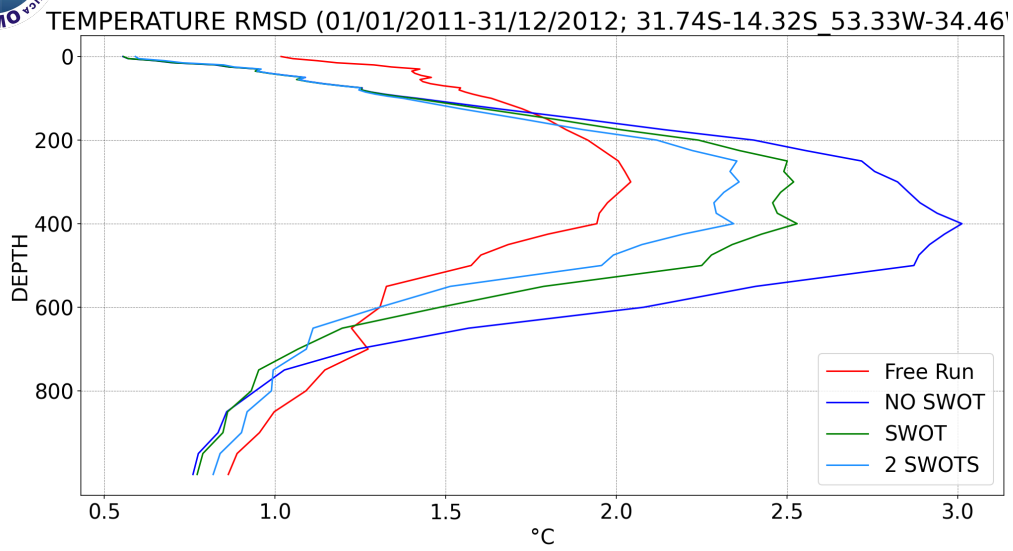
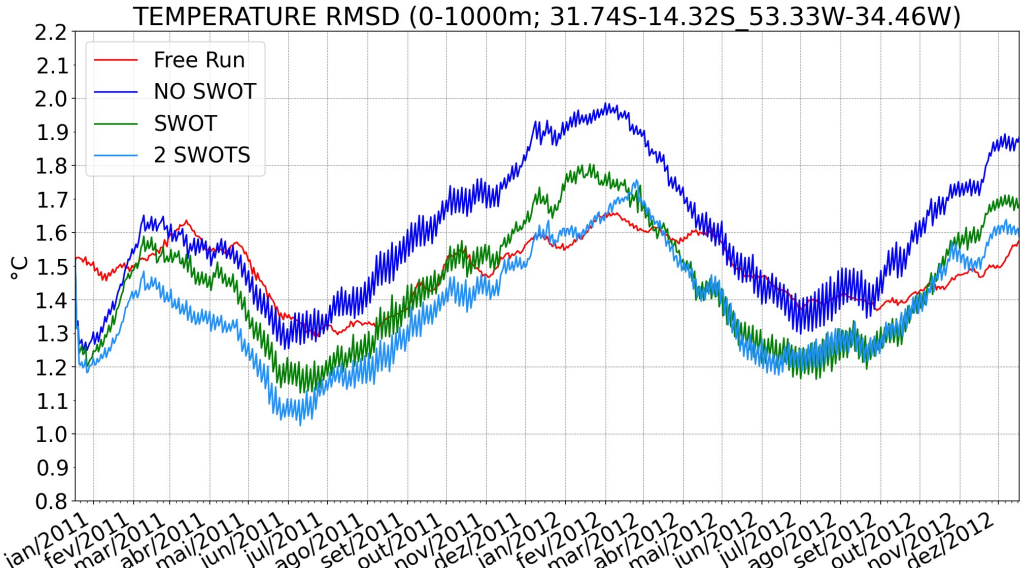
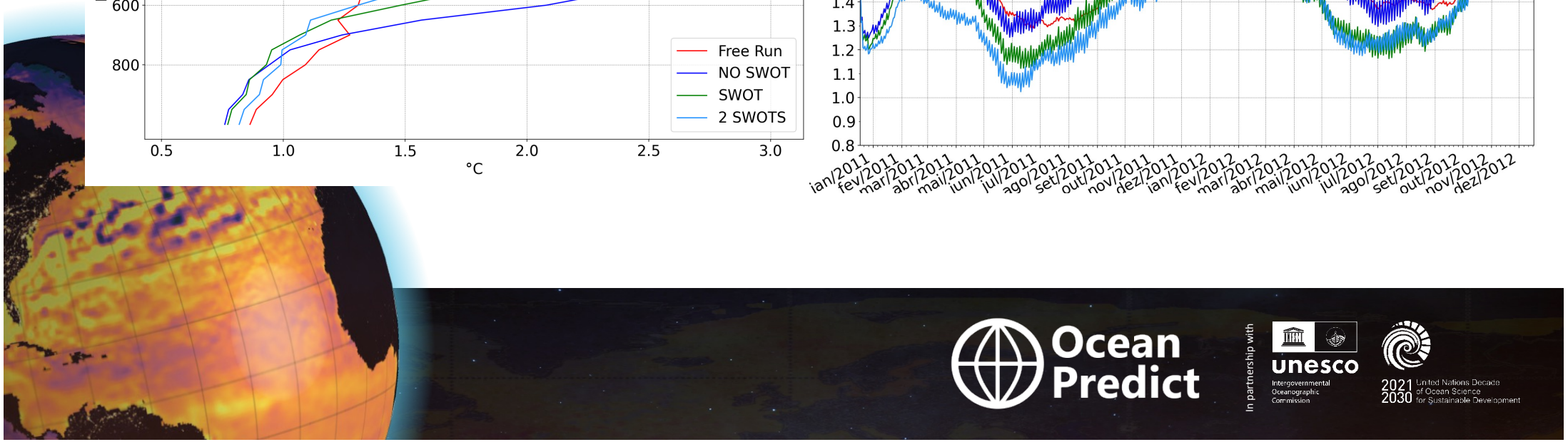
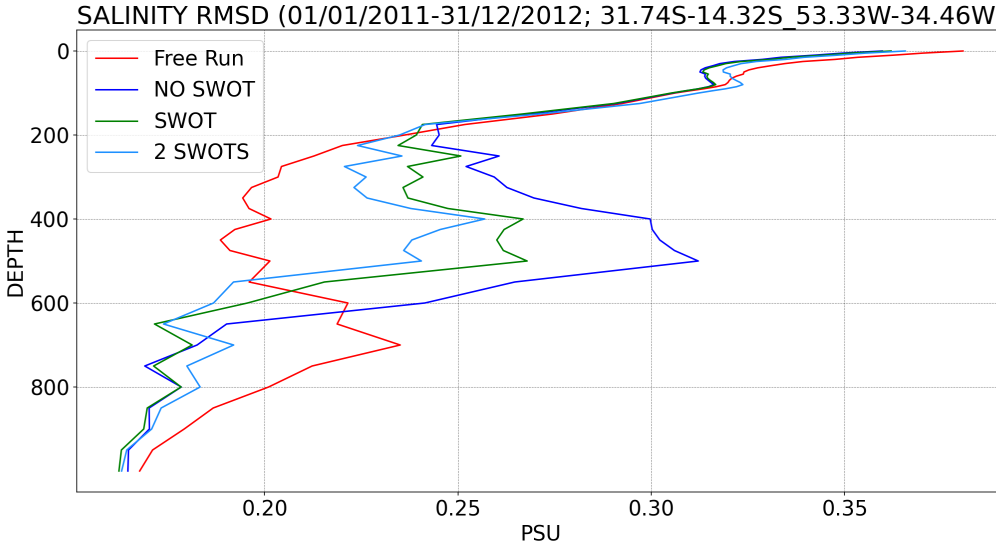
OSSEs with SWOT – T (ºC)

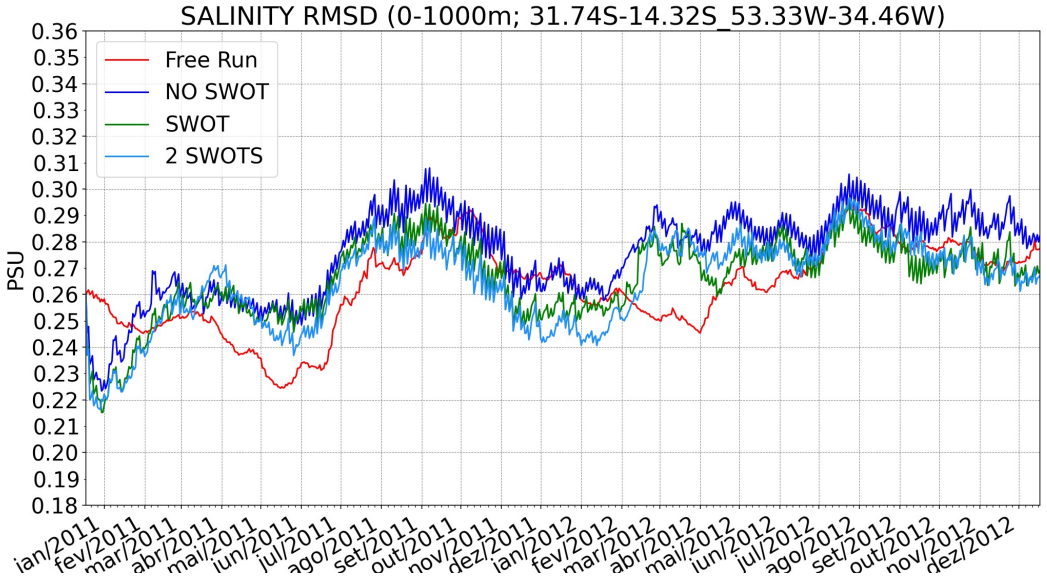


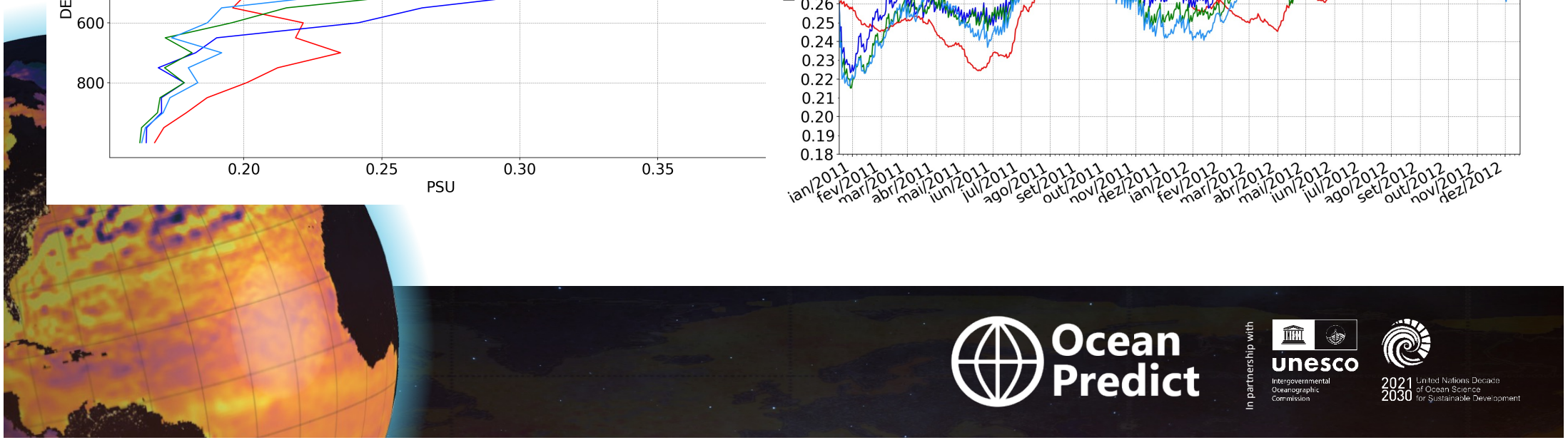




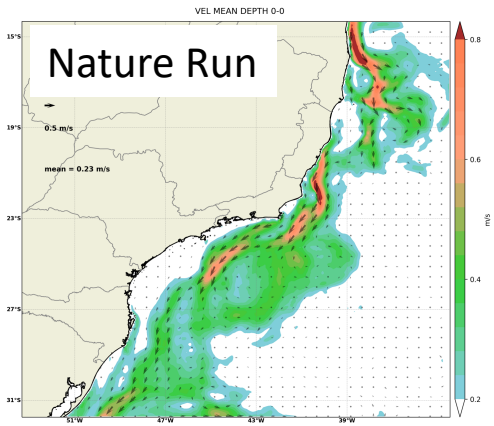
OSSEs with SWOT – S

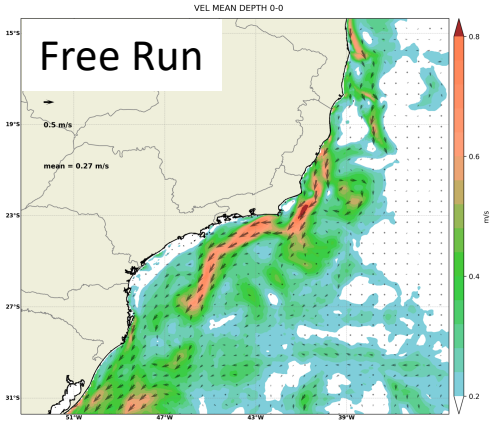


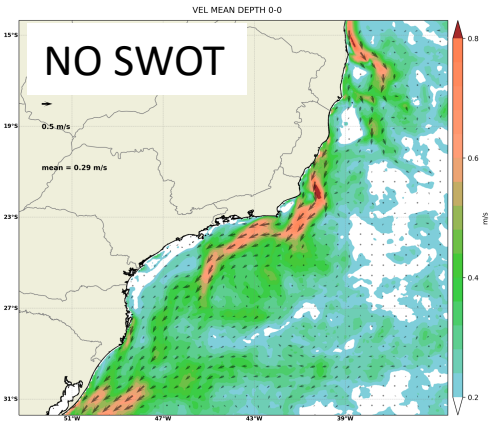


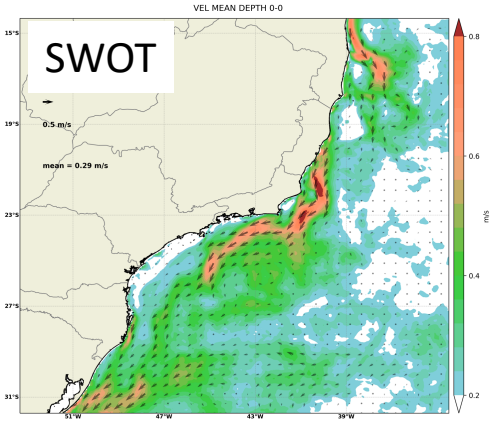


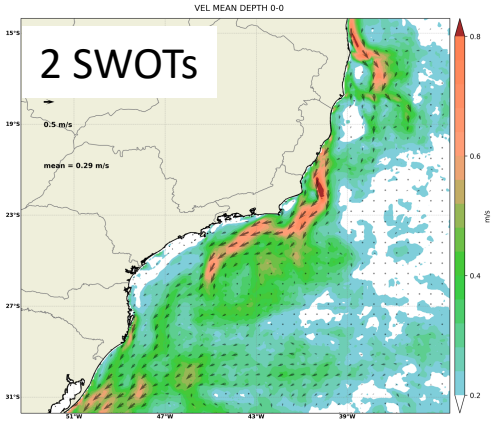
OSSEs SWOT– Currents (m/s) at SFC











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0.6
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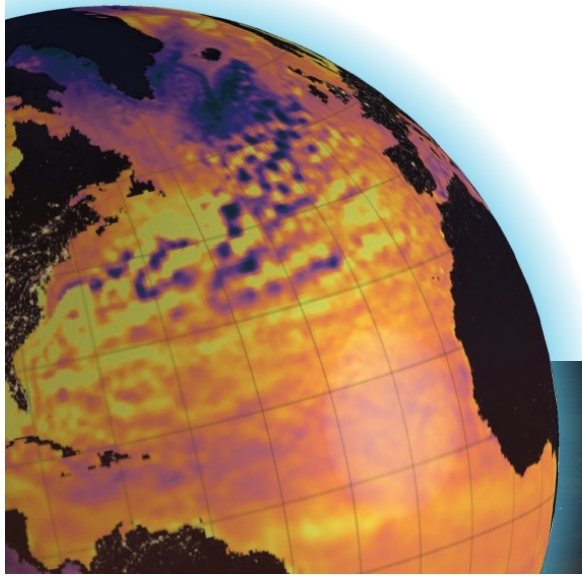

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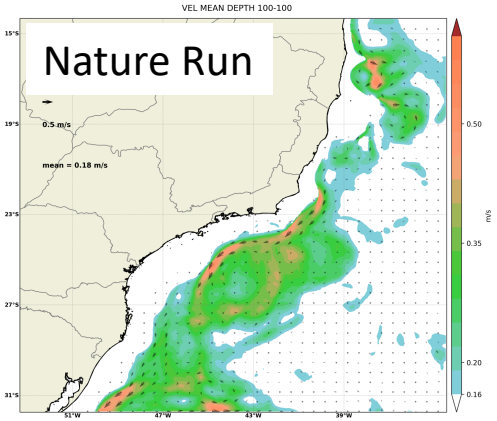
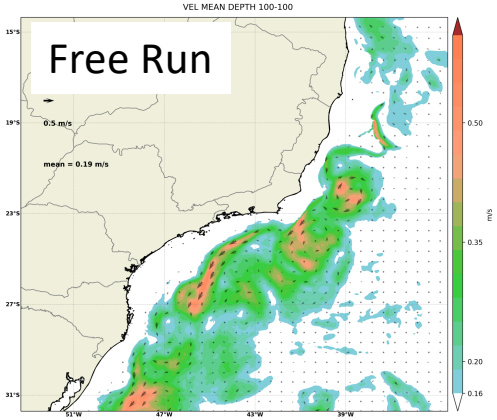
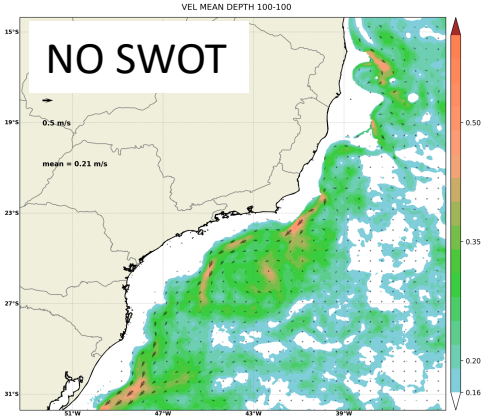
OSSEs SWOT– Currents (m/s) at 100 m



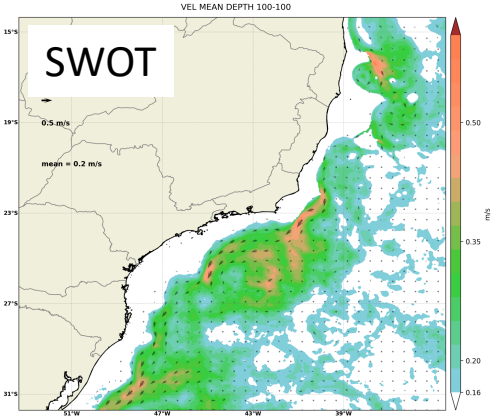


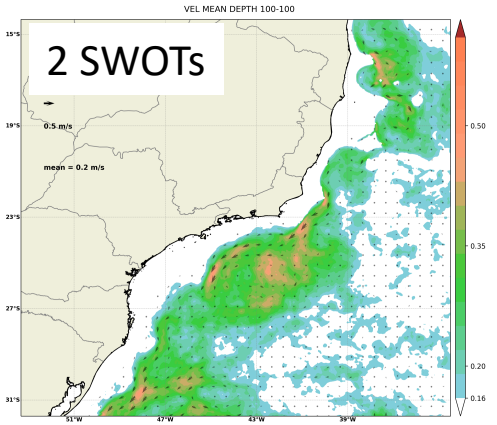


0.5

0.35

0.16





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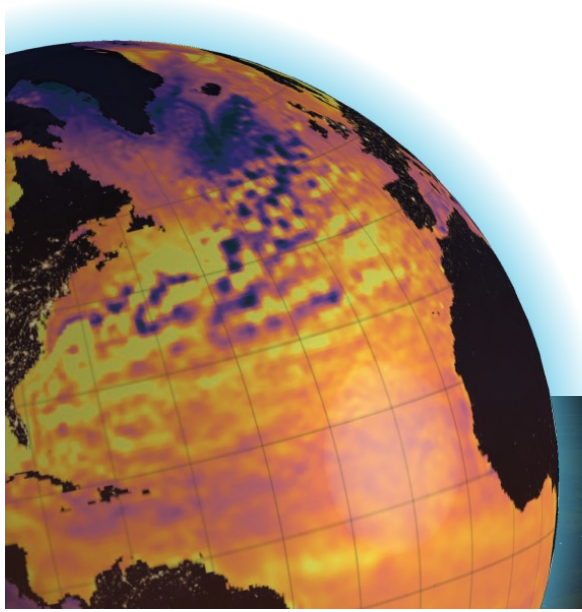

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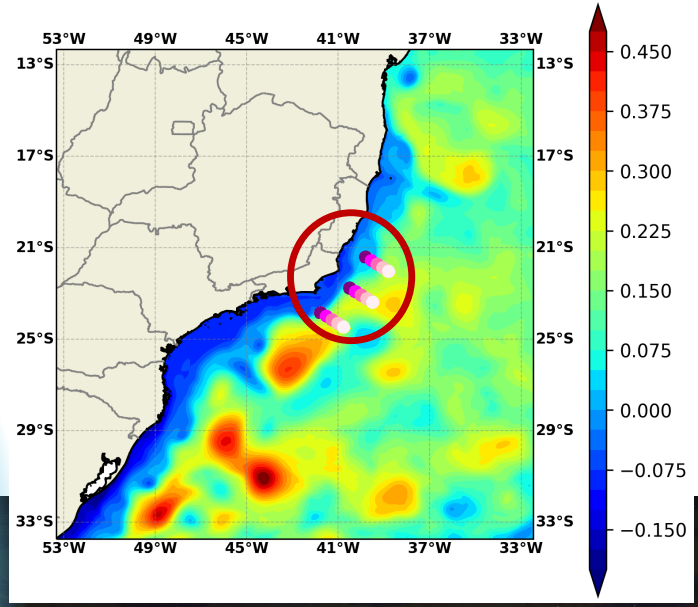
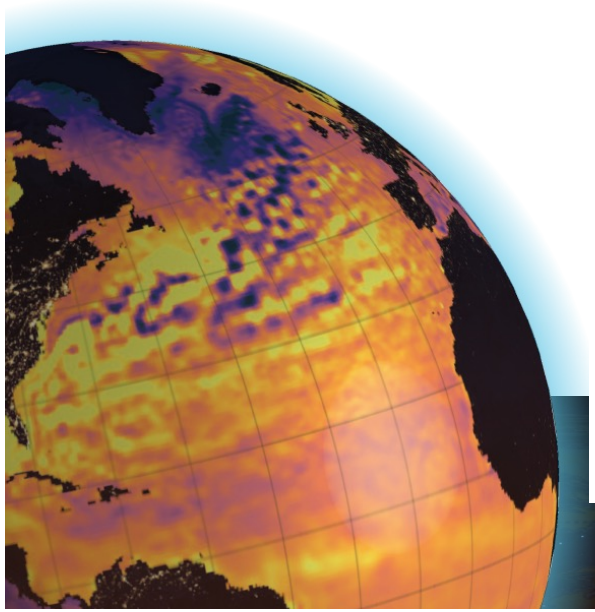
OSSE with 2 SWOTs + 3 Gliders

- HYCOM+RODAS with assimilation each 3 d of SST + “Argo” T/S + Along-track SLA + 2 SWOTs + 3 Gliders from 1 Jan 2011 to 15 April 2011
- HYCOM+RODAS with 3 Gliders off Rio de Janeiro coast around 22ºS
- Gliders synthetic data emulated data from 1 real glider trajectory and another 2 were included
- Range is very small and the goal was simply to develop RODAS to consider this observation type that should be in operation in 2025



- Glider max depth = 1000 m
- Each profile distance = 12 km
- Max eastern extension = 38ºW

- The main goal was to add the capability to RODAS to preprocess and assimilate glider data and to offer new possibilities to improve the BC and the IWBC short—range forecasts



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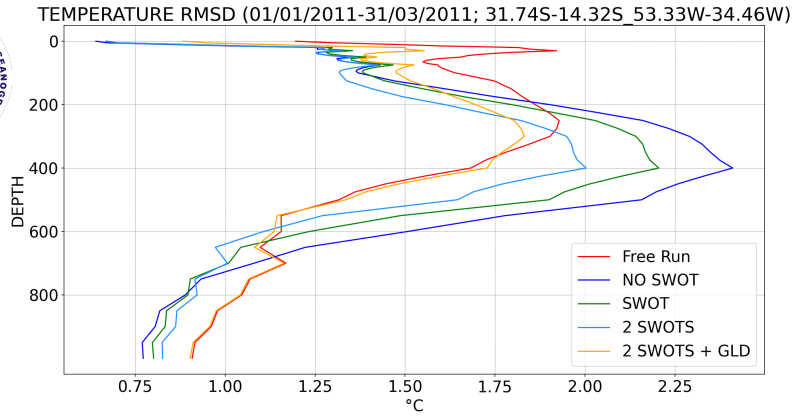
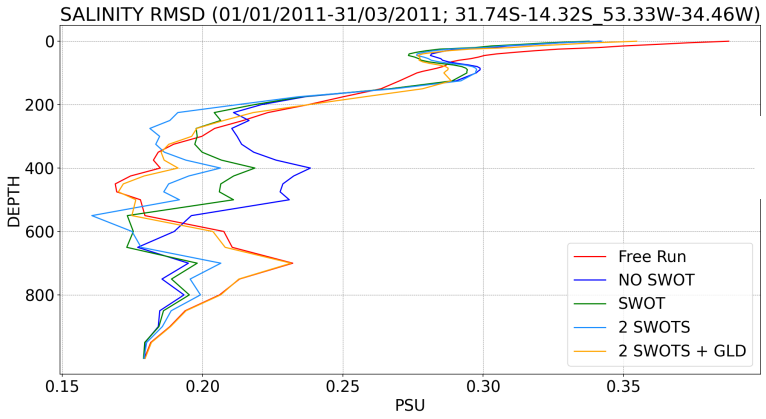
OSSE with 2 SWOTs + 3 Gliders

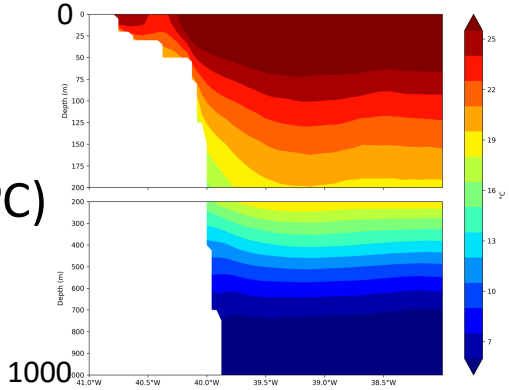


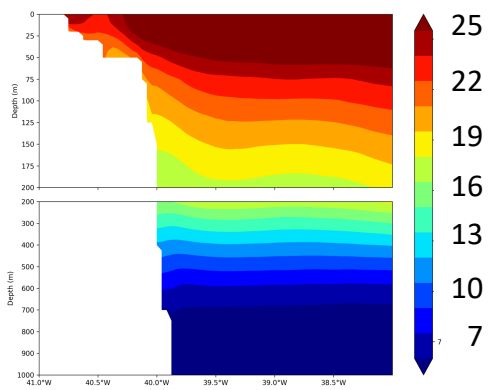


2 SWOTs

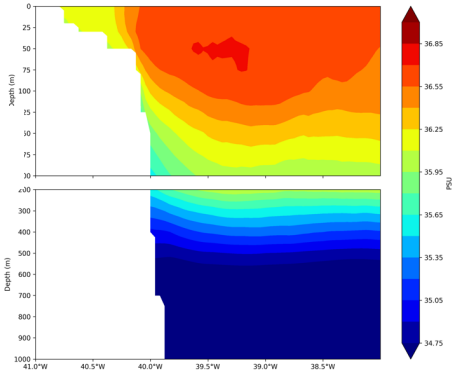
2 SWOTs+GLDs

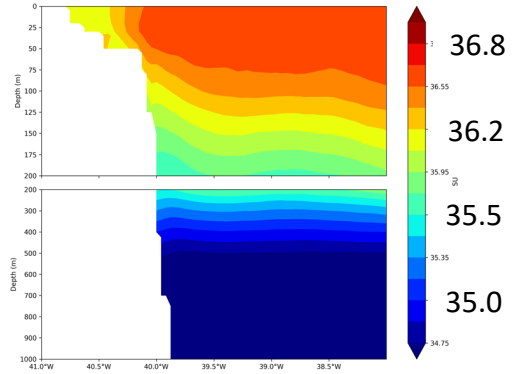
T (ºC)





S





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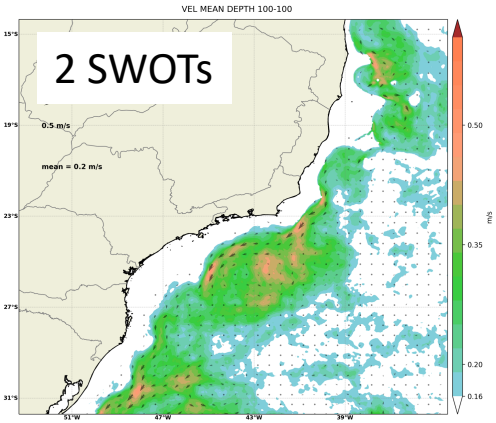
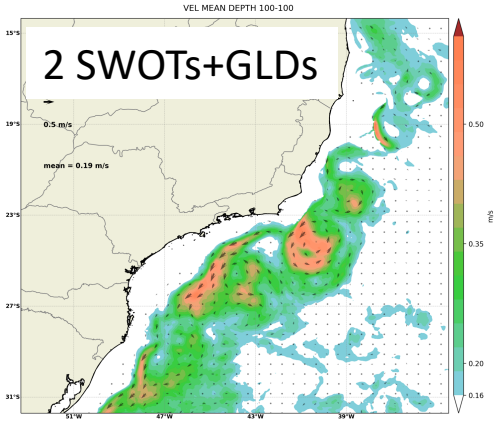
OSSE with 2 SWOTs + 3 Gliders

100 m





0.5

0.35

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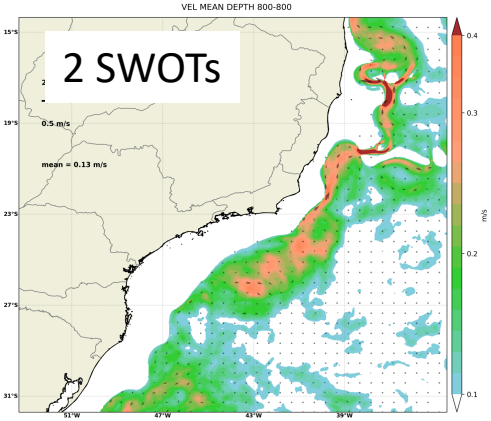
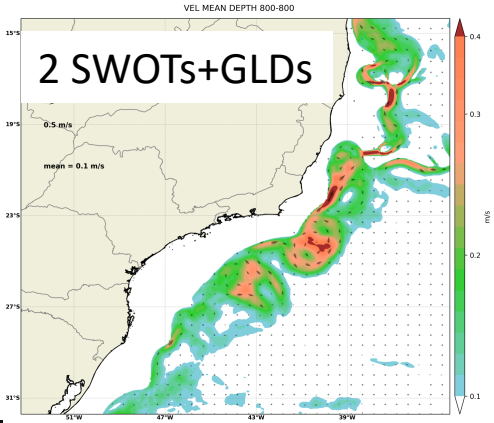
800 m





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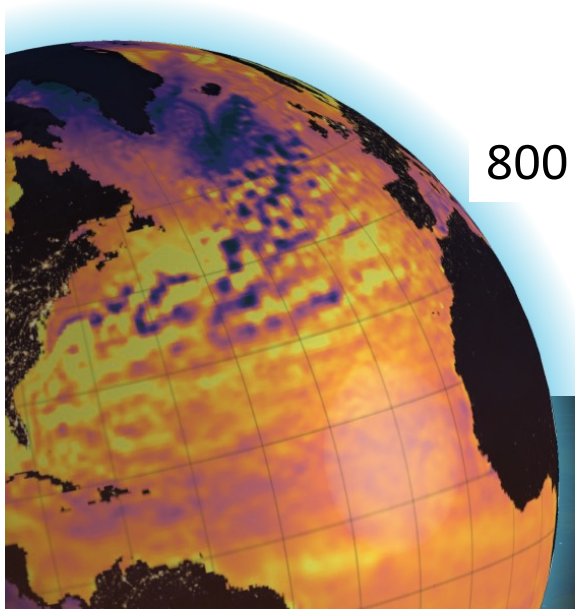
0.3

0.2

0.1



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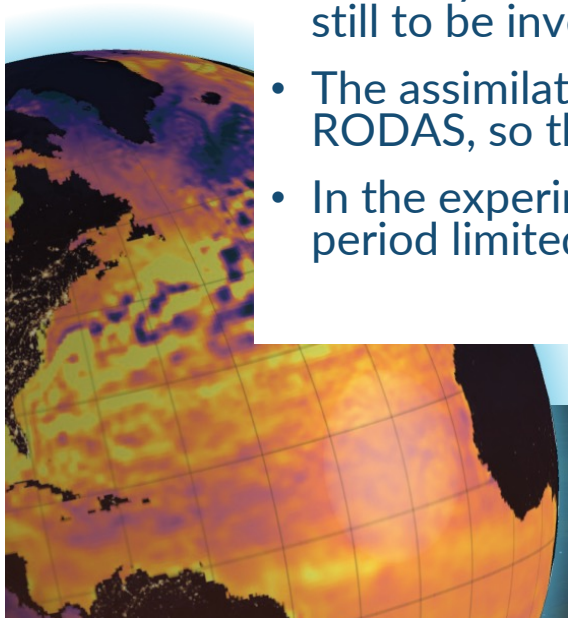
Final Considerations

- Assimilation of SST was effective in all experiments, improving SST RMS from 0.99°C to 0.54°C
- The inclusion of 1 SWOT improved SSH correlation from 0.59 in the NO SWOT Run to 0.66 and achieving 0.73 with 2 SWOTs with respect to the Nature Run
- T/S profiles were degraded with SST, SLA and the few T/S data available for assimilation (NO SWOT), but SWOT and 2 SWOTs could reduce the degradation
- Positive impacts of SWOT in the upper mean circulation were observed in few locations, but they were not a substantial. Maybe, there a signal in TKE and vertical fluxes, but it is still to be investigated. There is a need to populate the region with T/S profiles data.
- The assimilation of data from 3 gliders was successfully done, adding new capability to RODAS, so that it brings a potential to improve BC and IWBC simulation and forecasts
- In the experiments, the short range of the gliders trajectories and the short integration period limited the correction local circulation and impacts to the south and north.



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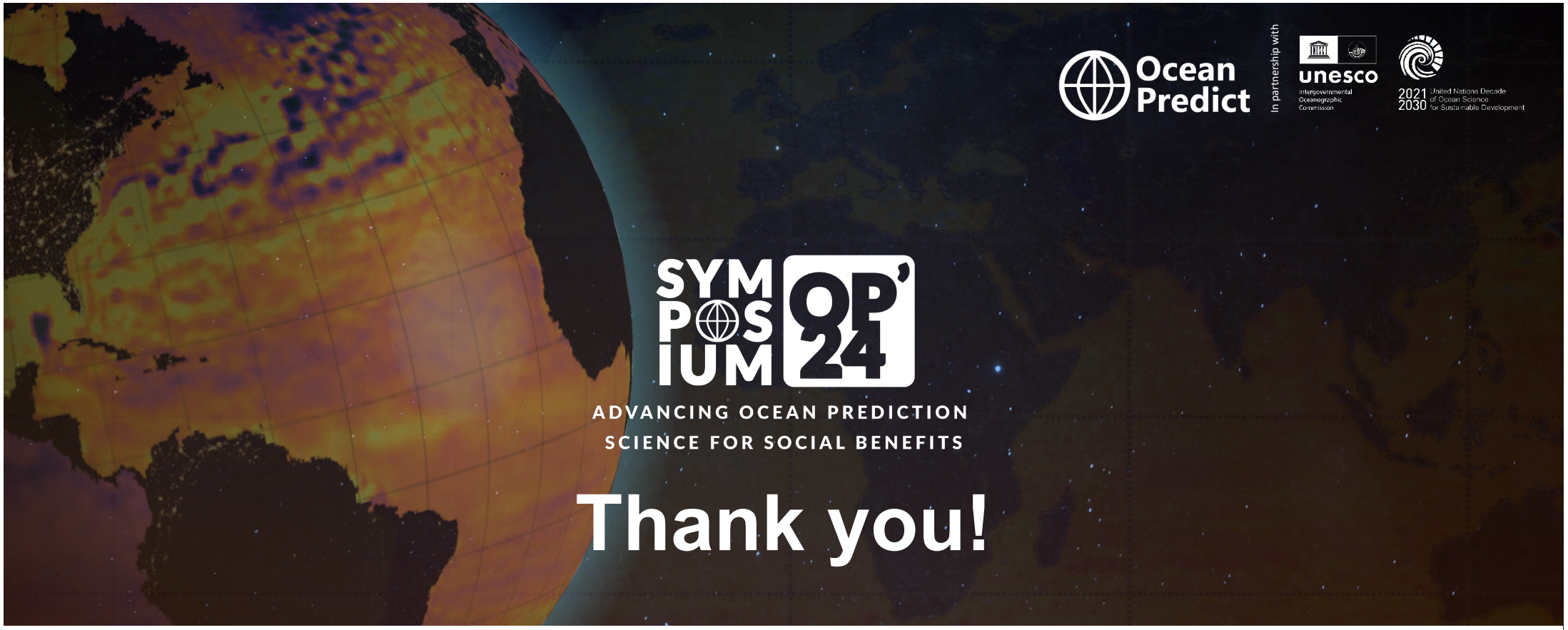

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