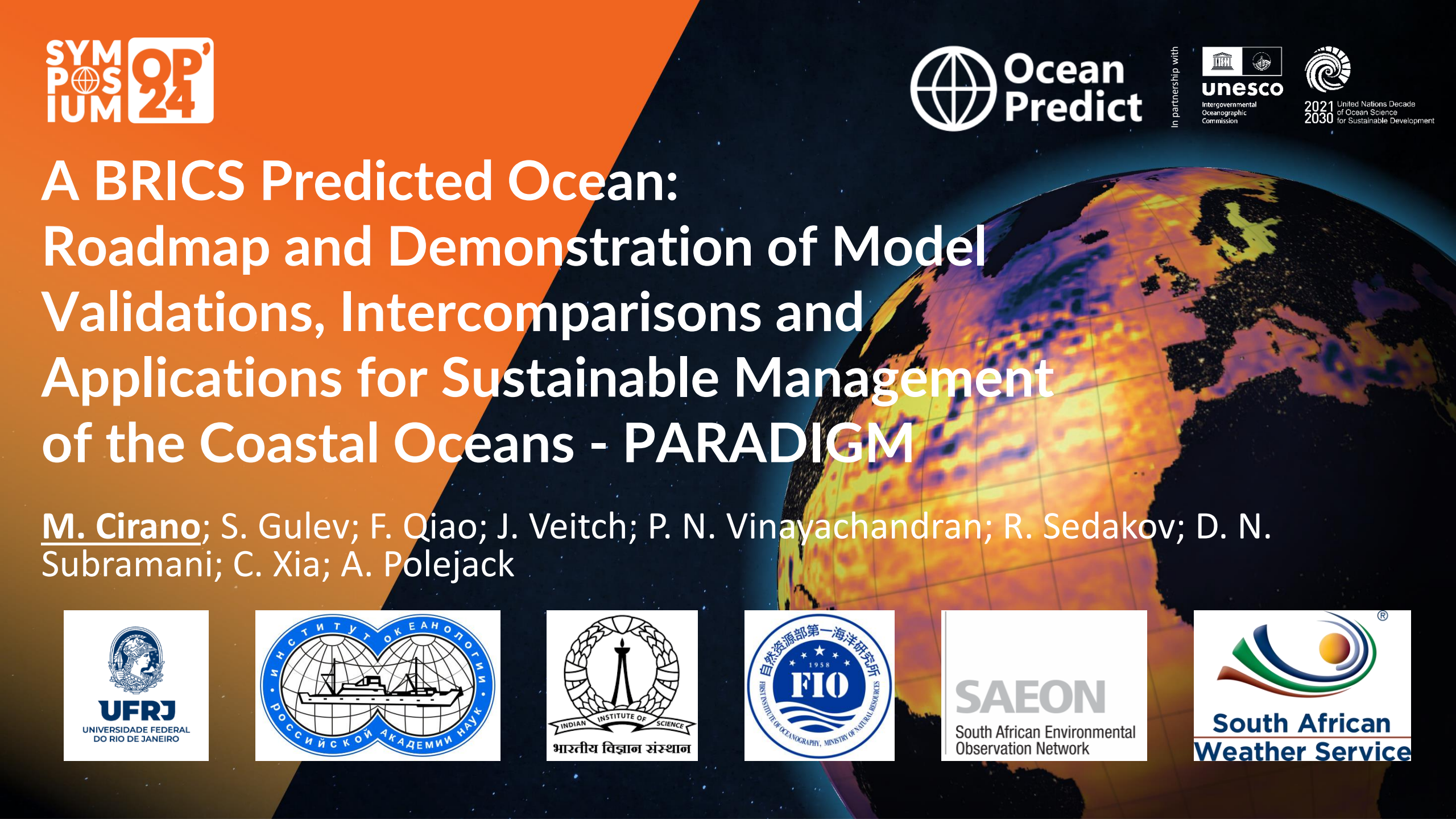
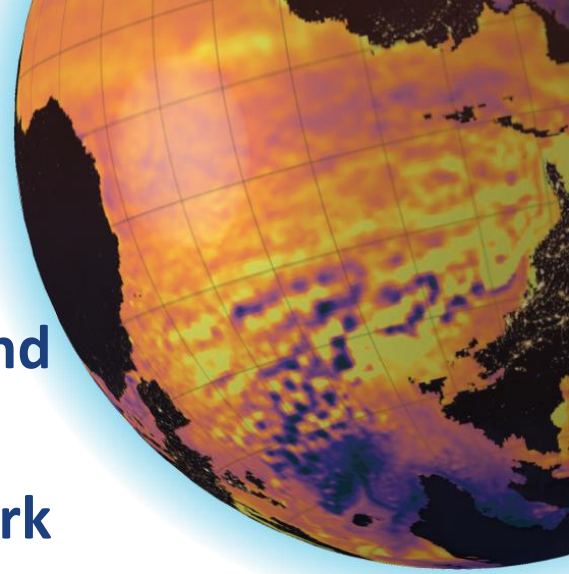


A BRICS Predicted Ocean: Roadmap and Demonstration of Model Validations, Intercomparisons and Applications for Sustainable Management of the Coastal Oceans - PARADIGM

M. Cirano; S. Gulev; F. Qiao; J. Veitch; P. N. Vinayachandran; R. Sedakov; D. N. Subramani; C. Xia; A. Polejack

Background information

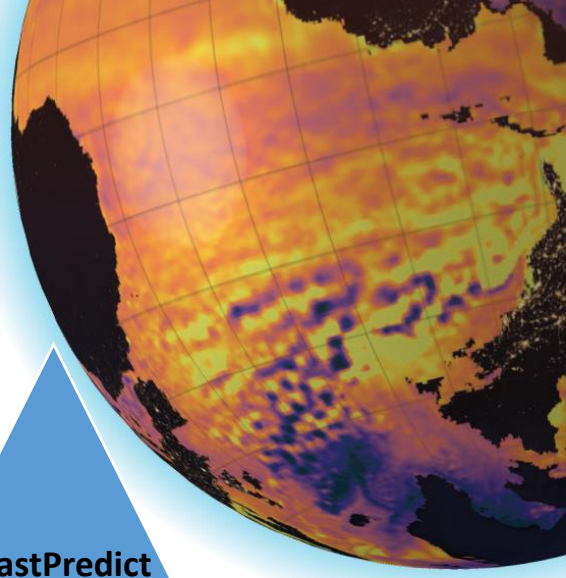


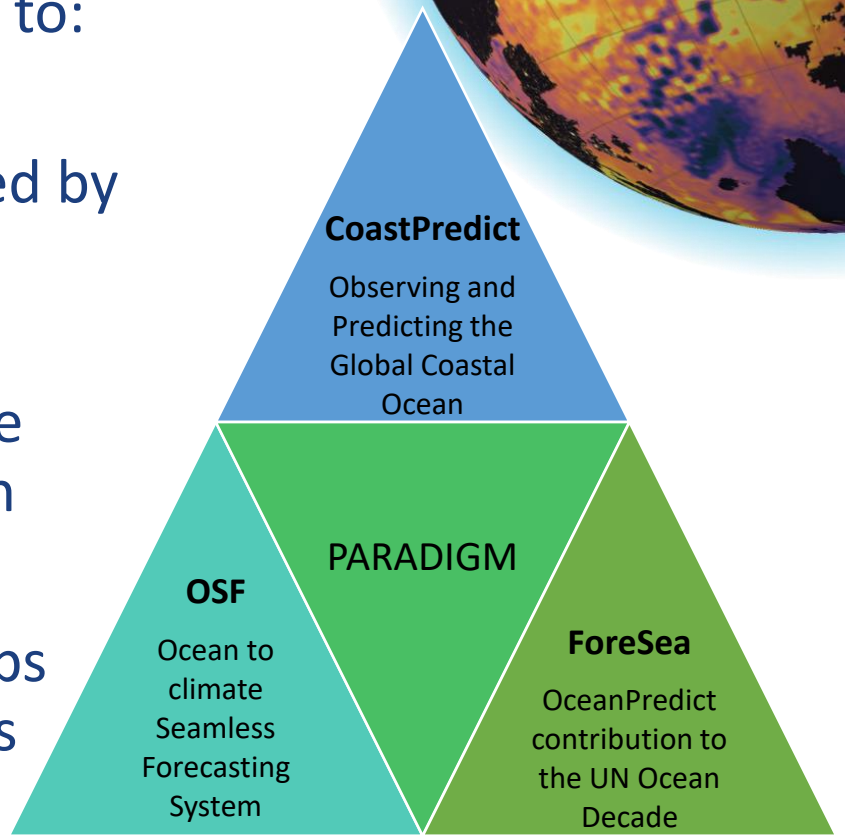
- In 2016/2018 a BRICS Working group in **Ocean and Polar Science and Technology – OPST** was created
- PARADIGM was submitted to the **5th Call 2021 - BRICS STI Framework Programme Coordinated call for BRICS multilateral projects**
  - More than **383 projects** submitted a **pre-proposal** to this call, where 322 projects were invited to submitted a **full proposal**
  - Only **33 projects** were approved (~9% approval rate)
  - In the **thematic area of OPST** (10 areas overall) only **two projects** were approved
  - PARADIGM was selected to represent the **thematic area of OPST** as a story of success – published in **BRICS STI Framework Programme Bulletin 2024** – Cirano *et al.* (2024)

Aims of PARADIGM

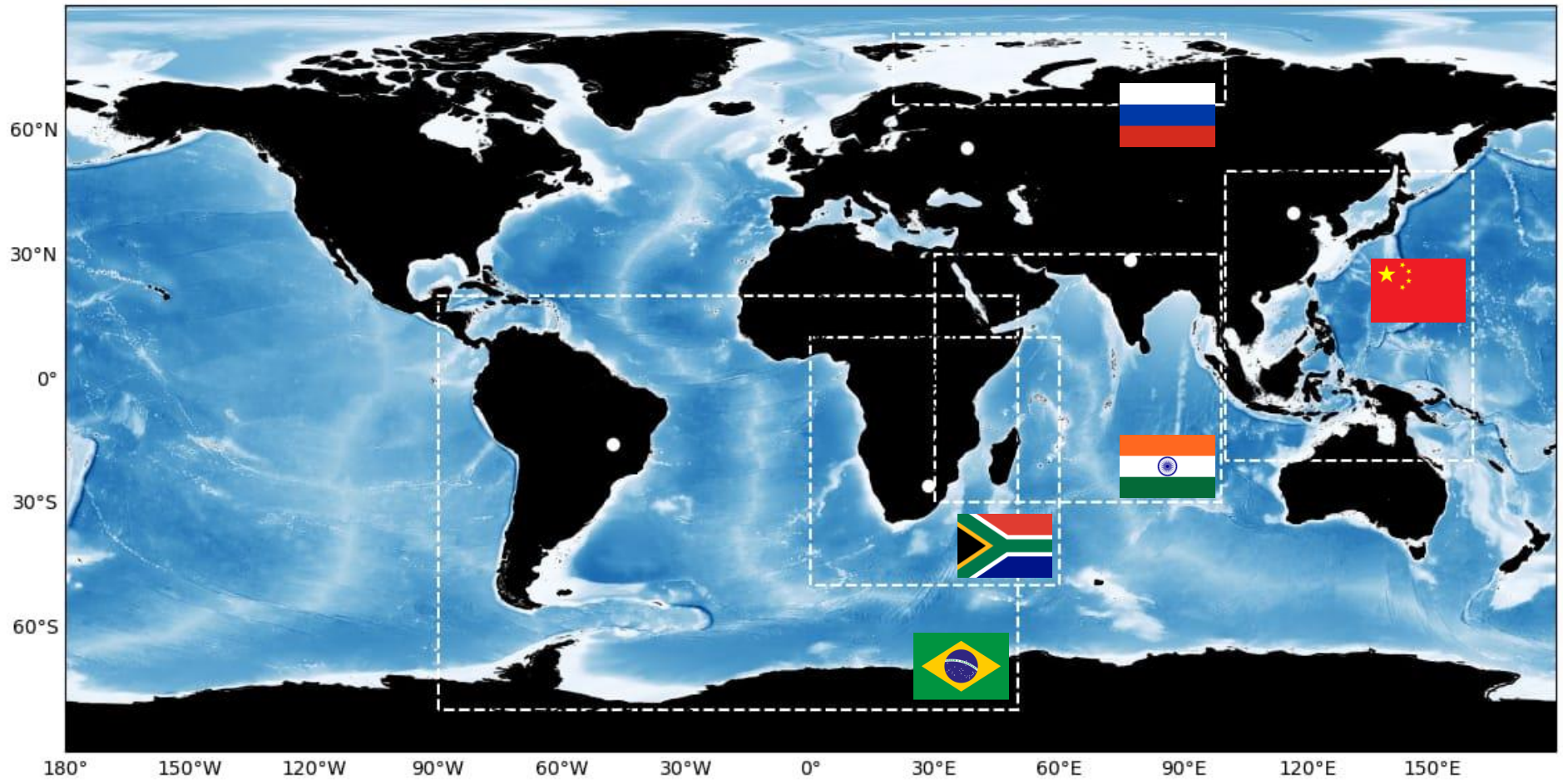
By joining scientists from **3 UN endorsed programs**, we aim to:

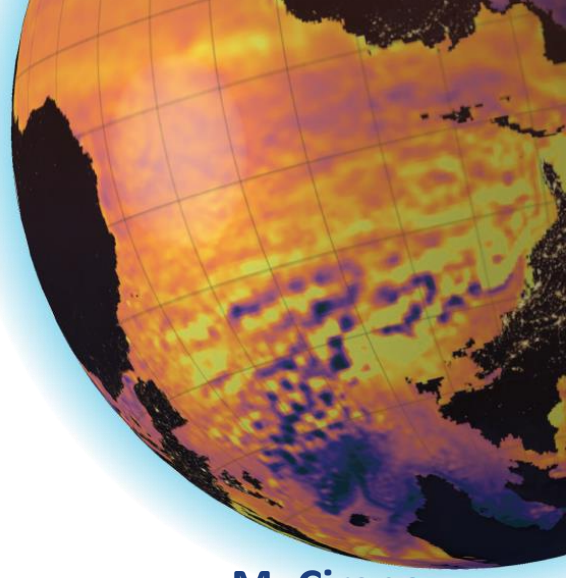
- To **validate, intercompare** and **assess** the performance of **Ocean Forecasting and Analysis Systems (OFAS)** generated by multiple agencies worldwide, for BRICS countries, using regional observations
- Implement **high-resolution OFAS** configurations in the five model regions for **improving regional** multipurpose ocean hindcasting and forecasting
- Provide **capacity building** by organizing training/workshops focusing on **Operational Oceanography** in BRICS countries





Study Region





M. Cirano
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Shirshov Institute of Oceanology (IORAS)

P. N. Vinayachandran
Indian institute of Science

F. Qiao
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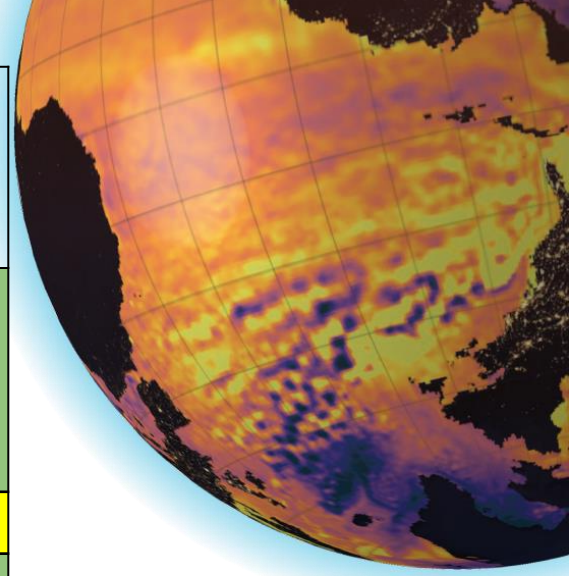
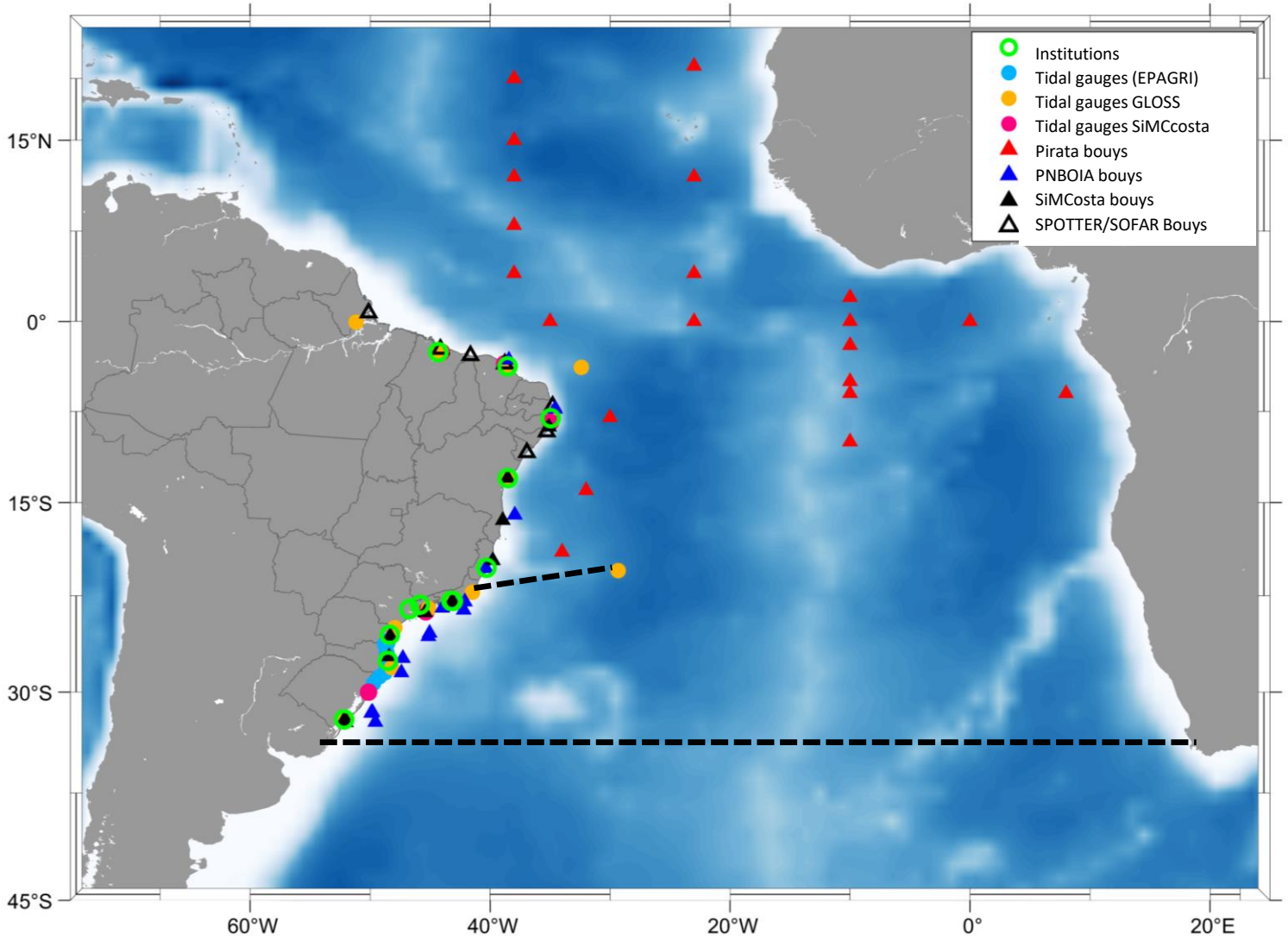
Center/Model	Name of the product	Vertical resolution (levels)	Horizontal resolution	Periodicity	Time availability
HYCOM/NCODA (USA)	GOFS3.1	41	1/12° (40ºN to 40ºS), and 1/24° (poleward of these latitudes)	3 hours	jan/1994 to dec/2015 + analysis until now
HYCOM/REMO (Brazil)	Atl12	32	1/12º	daily	jan/2006 to dec/2015
Mercator Ocean (French)	GLORYS12v1C	50	1/12º	daily	jan/1993 to feb/2024
First Institute of Oceanography (China)	FIOCOM	54	1/10º	daily	jan/2013 to dec/2022
CSIRO (Australia)	BRAN2020	51	1/10º	daily	jan/1993 to dec/2023
ECMWF (Europe)	ORAS5	75	1/4°	daily	jan/1993 to dec/2022
Met Office (UK)	GloSea5	75	1/4°	daily	jan/1993 to dec/2022
CMCC (Italy)	C-GLORSv5	75	1/4°	daily	jan/1993 to dec/2022
Mercator Ocean (French)	GLORYS2v4	75	1/4°	daily	jan to de/1993c/2022
JPL/Nasa (USA)	ECCO2	50	1/4°	3 days	jan/1992 to apr/2023
AOSC - U. Maryland (USA)	SODA3.3.2	50	1/4º	5 days	jan/1991 to dec/2019



Ocean Forecasting and Analysis Systems (OFAS)

Spatial distribution of institutions and observing platforms (shallow and deep waters buoys & tide gauges)



GOOS-BRASIL

Rede Nacional de Observação e Monitoramento Oceânico
ReNOMO

INPO INSTITUTO NACIONAL DE PESQUISAS OCEÂNICAS

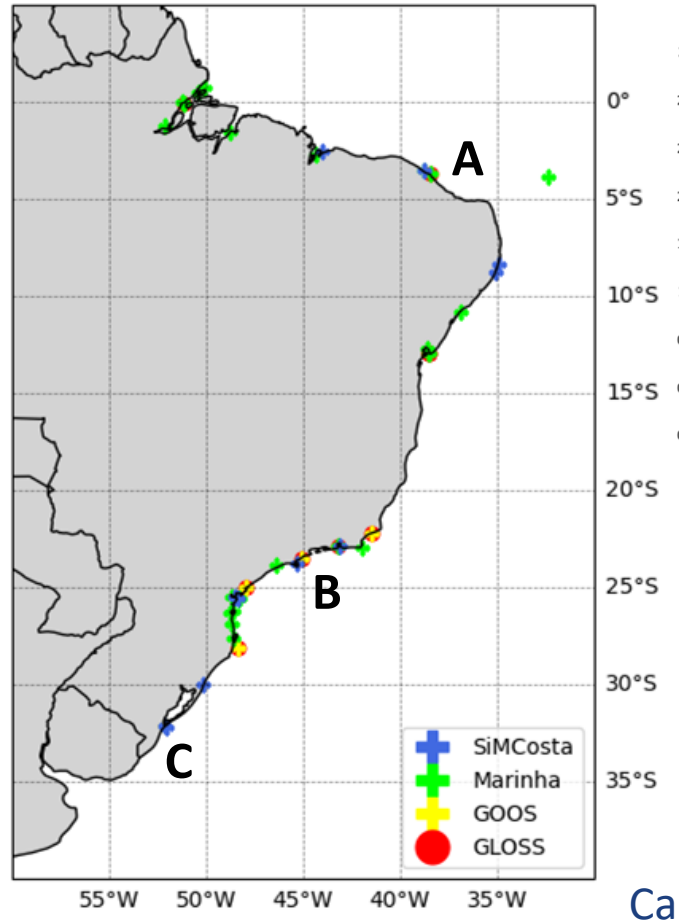
Additional presentations:

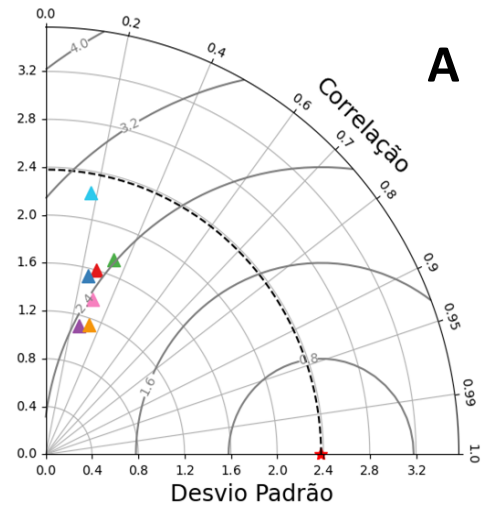
Session 6.2 – Barberini et al. (18/11)

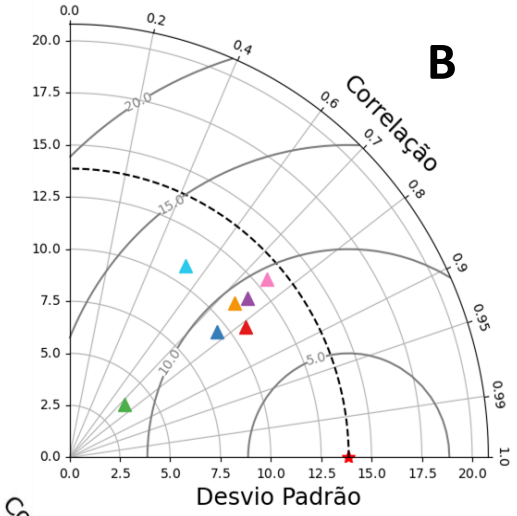
Session 2.2 – Barberini et al. (19/11)

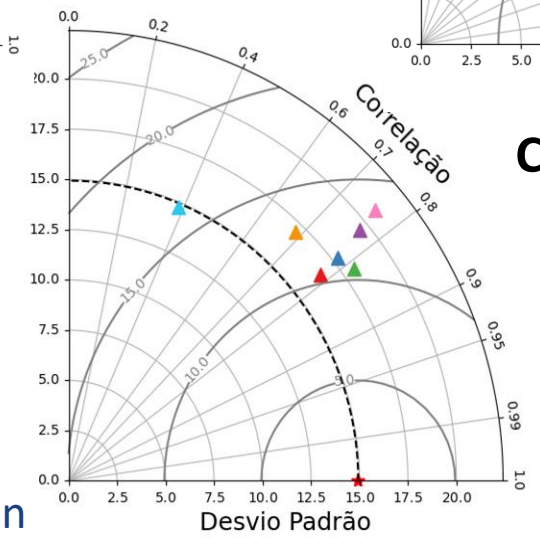
Session 4.1 – Ferreira et al. (20/11)

How well OFAS represent CTWs?





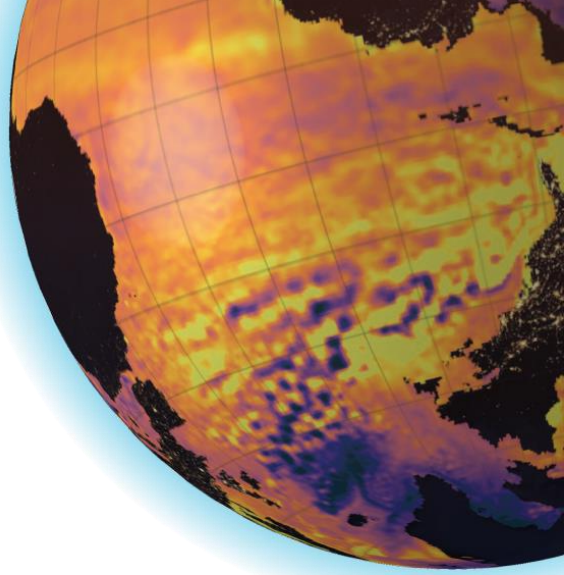




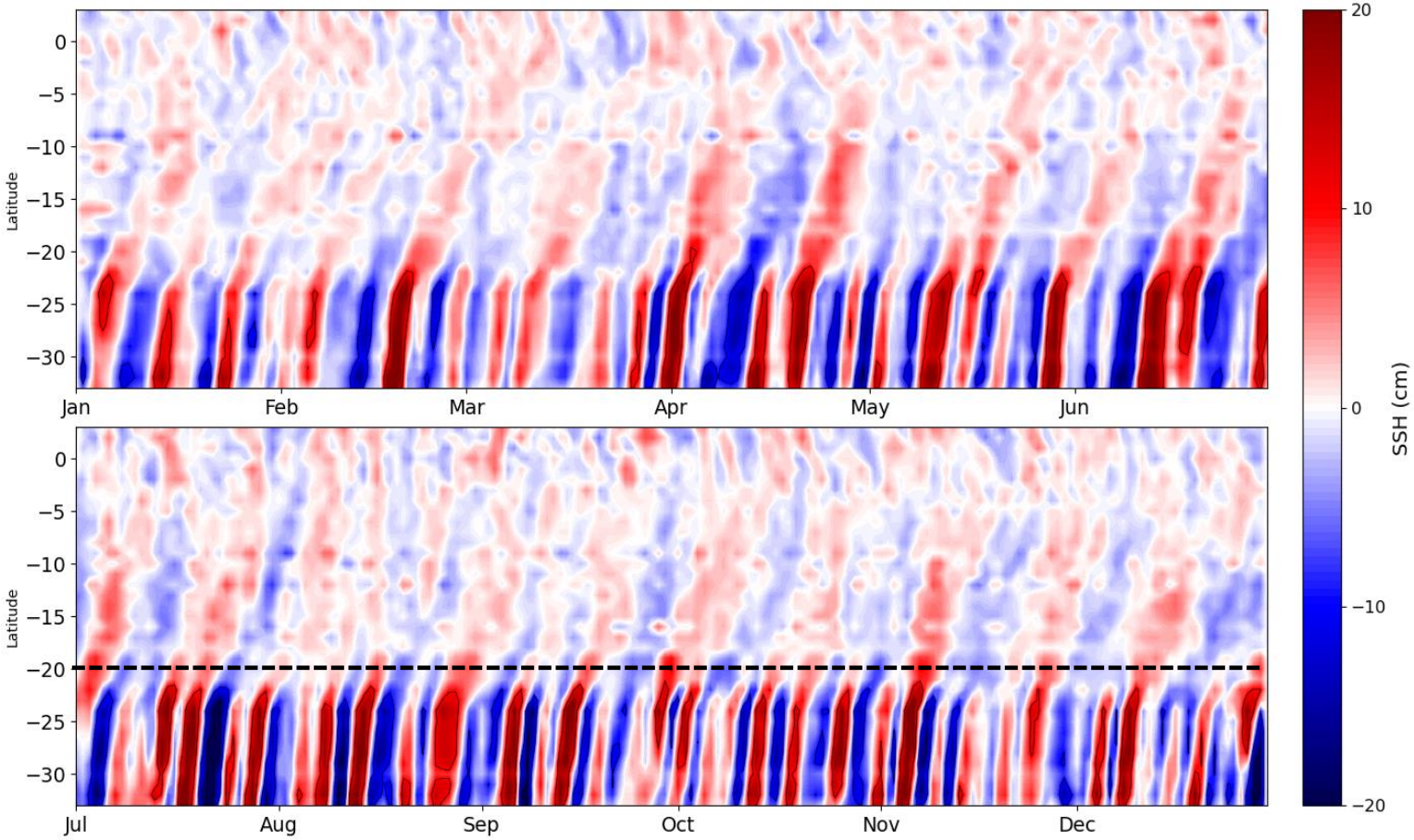
Cabral et al, in preparation

Skill (%)	A	B	C
BRAN	54	85	**88**
CGLO	51	77	86
FOAM	**60**	22	87
GLOR4	37	85	82
GLOR12	40	83	83
ORAS	48	**87**	79
GOFS	58	72	69

How well OFAS represent CTWs?



SSH (cm) for BRAN in 2022

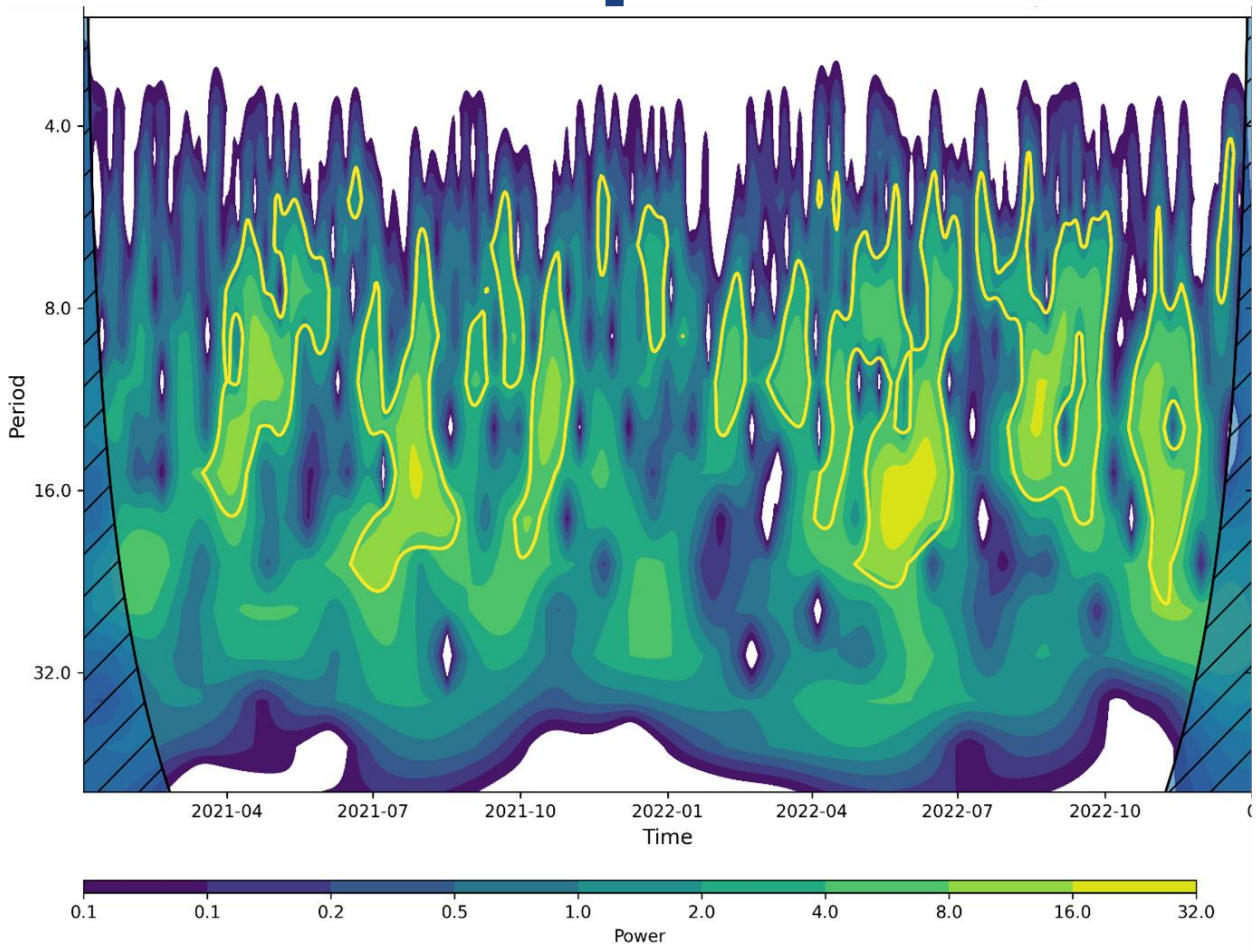


Only longer CTWs (> 15 days) propagate north of 20°S

Cabral et al, in preparation

How well OFAS represent CTWs?

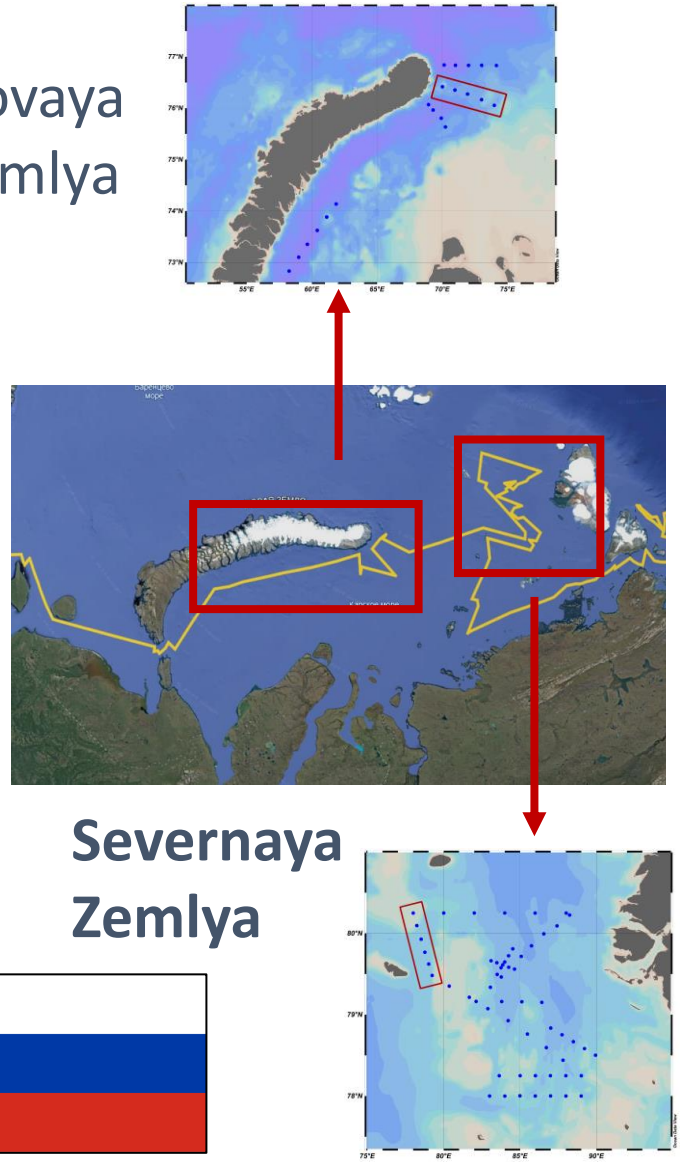
SSH (cm) for BRAN at the 50 m isobath and 20°S



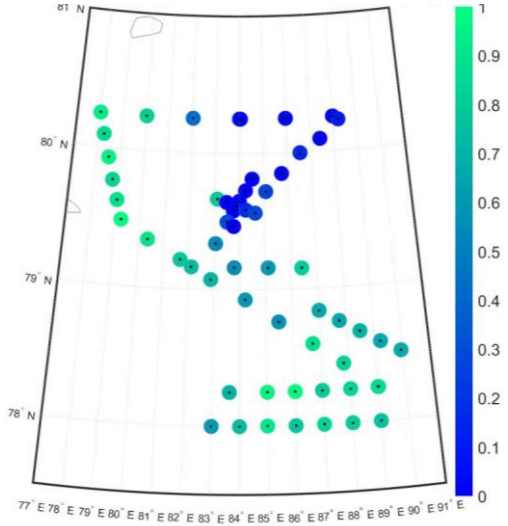
Cabral et al, in preparation

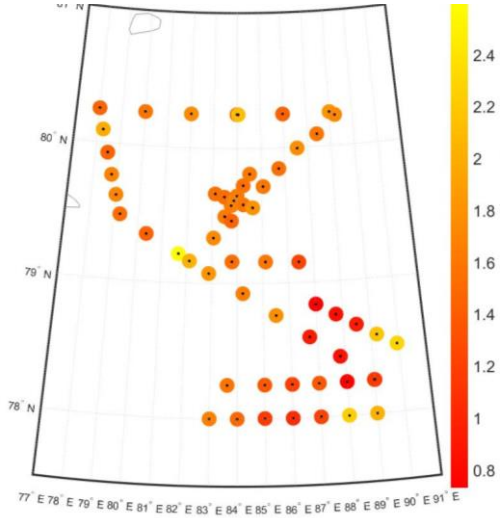
In situ data collection and OFAS (GOFS/HYCOM) validation at Arctic study region during IORAS Scientific Cruise in 2024

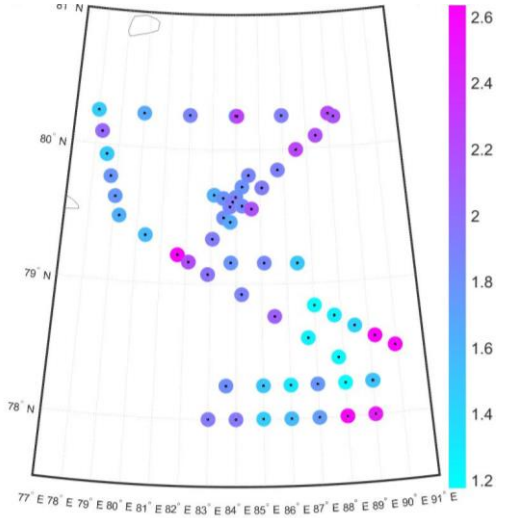
Novaya Zemlya



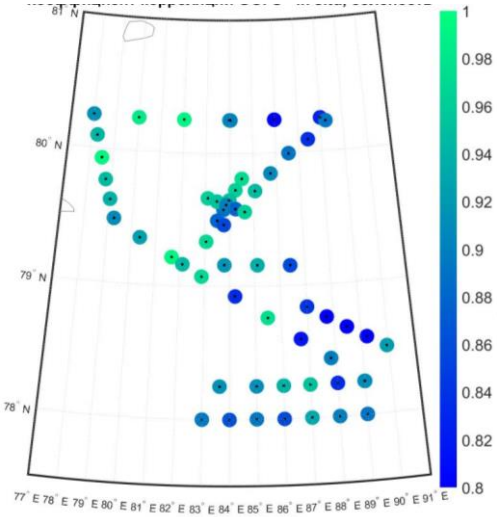
Severnaya Zemlya

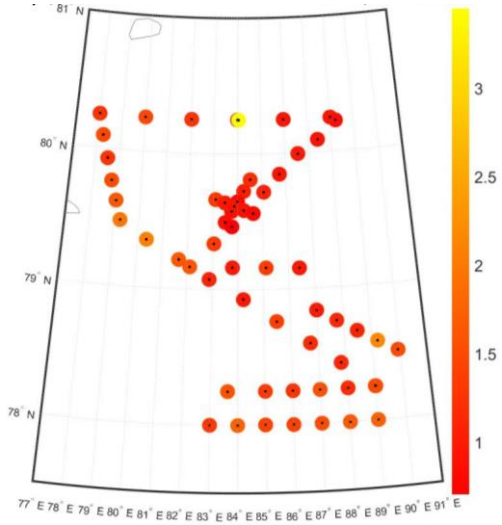


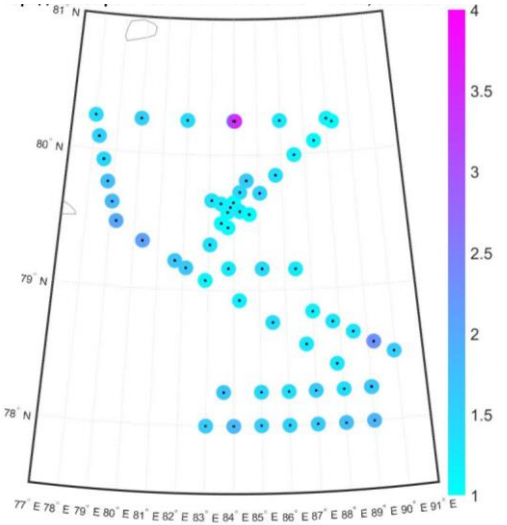




GOFS/HYCOM vs *in situ* **Salinity**, psu: Correlation, MAE, RMSE



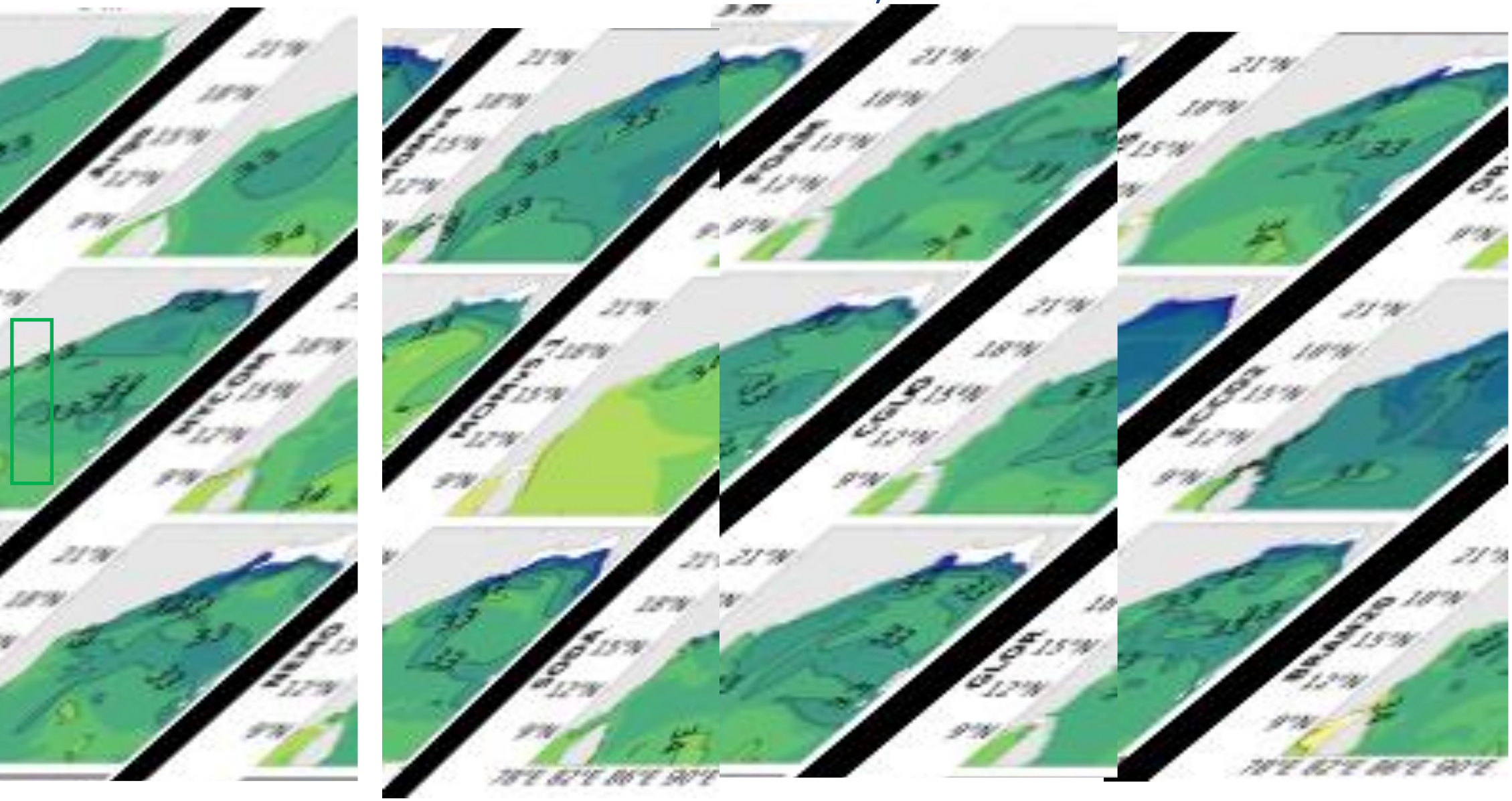




GOFS/HYCOM vs *in situ* **Temperature**, °C: Correlation, MAE, RMSE

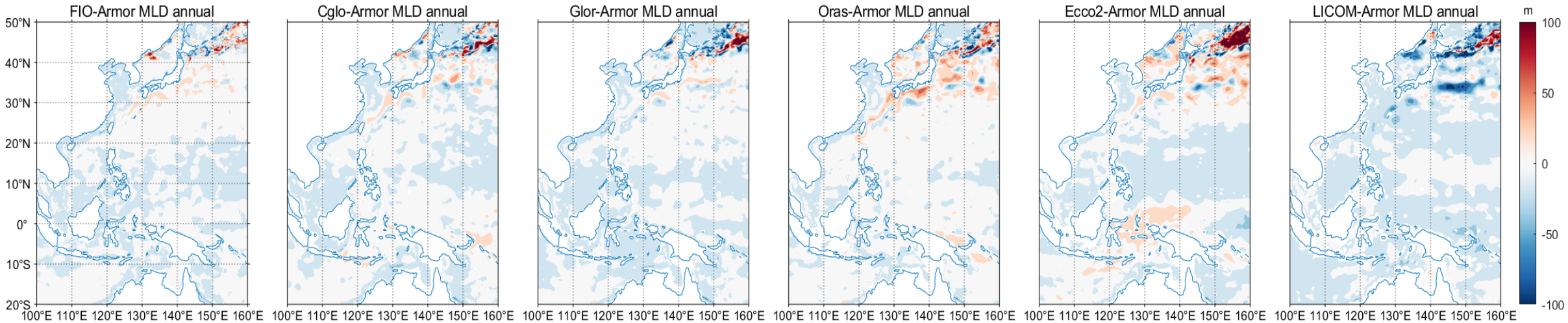
Bay of Bengal Salinity Intercomparison: Models and Reanalyses

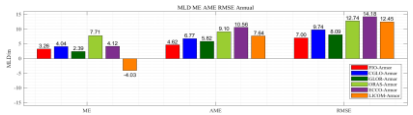
1-10 July 2016



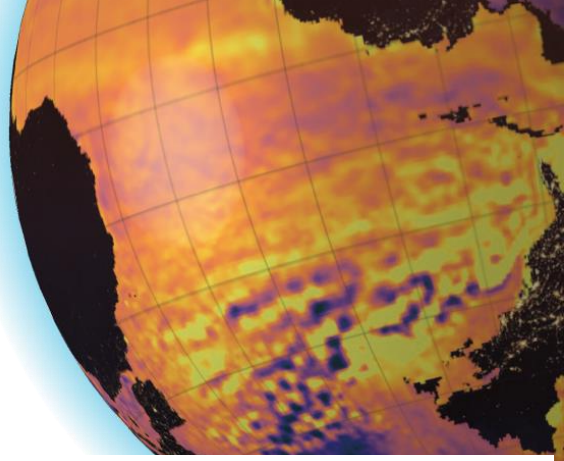
Nayak & Vinayachandran, in preparation

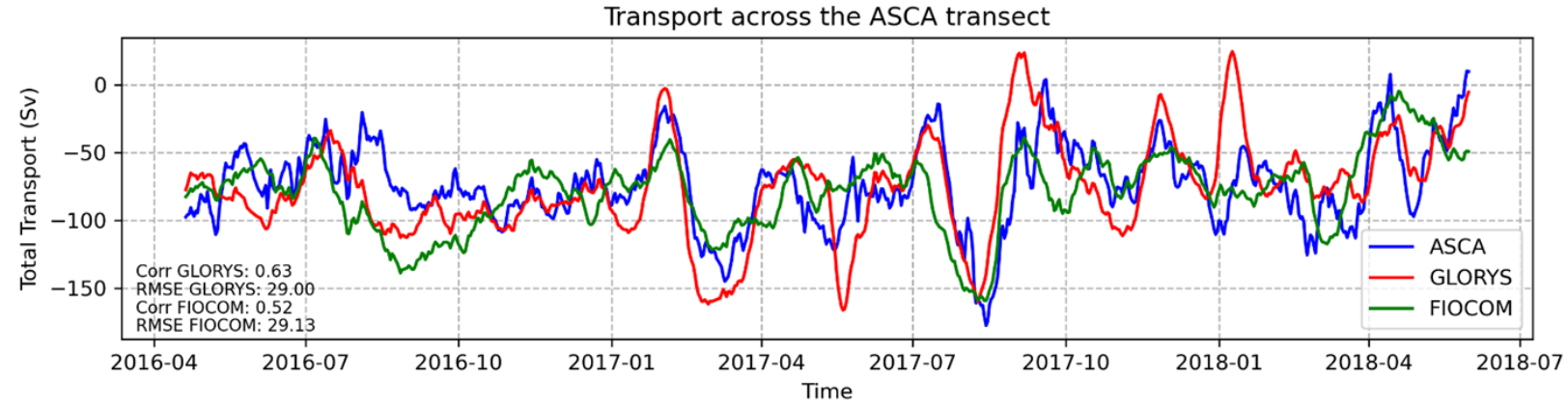
MLD comparison

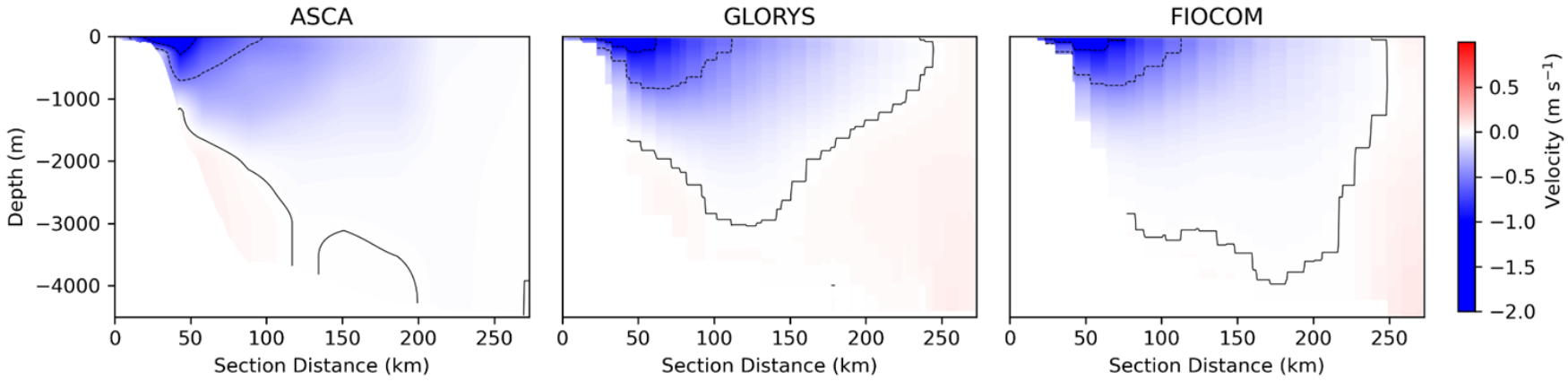


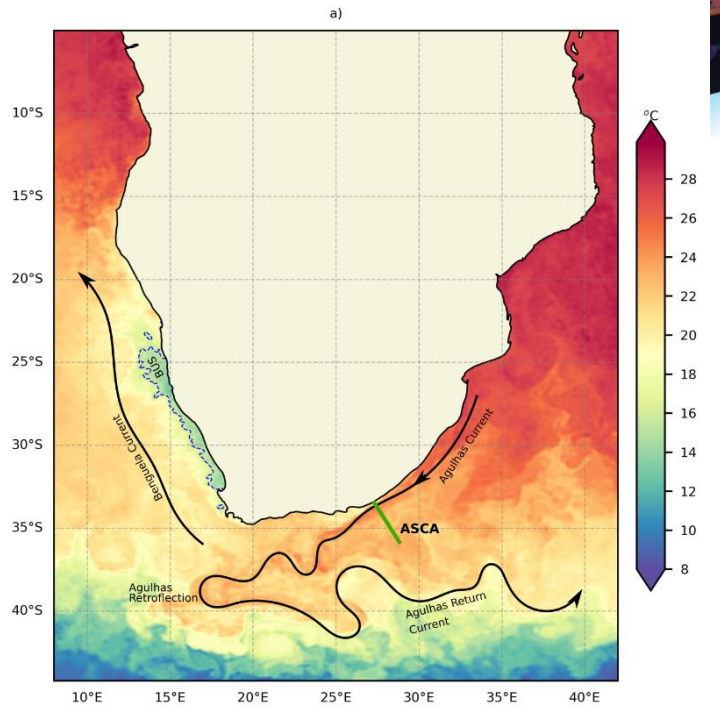


A comparison with the Agulhas System Climate Array (ASCA) mooring data: Transport and velocities

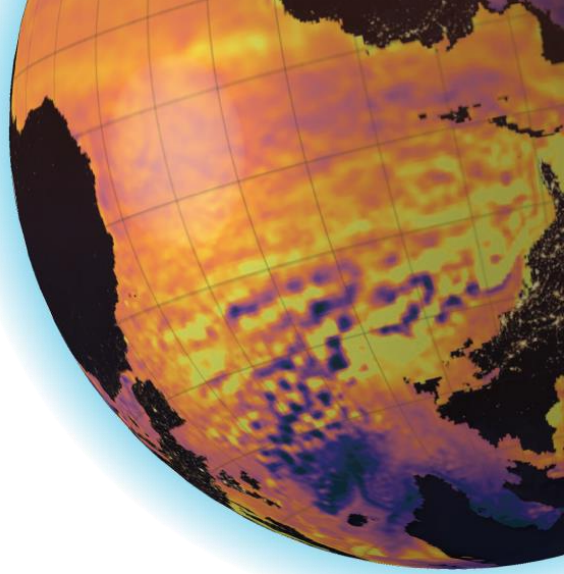








Conclusions and Future Steps



- The **assessment** and **intercomparison** of OFAS at BRICS countries using **regional observations** has been very useful to identify the **best systems** at each region
- This process is helping the implementation of **high-resolution OFAS** configurations in specific regions for each BRICS country, **improving** regional multipurpose ocean **hindcasting** and **forecasting**
- **China** hosted our **first BRICS Summer School** in Qingdao in July 2024 (40 applicants/17 selected) and **India** will host the **second BRICS Summer School** in Bangalore in July 2025
  - Both Summer Schools focus on **Operational Oceanography** in BRICS
- We truly believe that PARADIGM is a **seed** for a broader BRICS **Flagship Project**

Ocean Predict

In partnership with unesco Intergovernmental Oceanographic Commission

2021 2030 United Nations Decade of Ocean Science for Sustainable Development

中华人民共和国科学技术部
Ministry of Science and Technology of the People´s Republic of China

SYMPOSIUM OP'24

ADVANCING OCEAN PREDICTION
SCIENCE FOR SOCIAL BENEFITS

विज्ञान एवं प्रौद्योगिकी विभाग
DEPARTMENT OF SCIENCE & TECHNOLOGY
सत्यमेव जयते

CNPq
Conselho Nacional de Desenvolvimento Científico e Tecnológico

Thank you!

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EU COMPONENT TO GLOBAL OCEAN OBSERVATIONS

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