Flash Talk Session Part 1
Theme 1 & 3

8 talks (theme1) & 5 talks (theme3)

Flash Talk Presenter Guidelines

Bell Signals

- **2:00**:
  30 seconds remaining. Please begin concluding your talk.
- **2:30 II:**
  End of presentation time. Please finish immediately.

On-Deck Speakers

- Please wait near the stage during the presentation prior to yours.
- Ensure a smooth transition by moving promptly when called.

Remote Presenters

- Slide advancement will be operated by the **LOC** (Local Organizing Committee).
- Please provide a clear verbal signal (e.g., *"Next slide, please"*) when ready to advance.

Theme 1:
Development of data assimilation and other techniques for effective use and impact assessment of ocean and interface observations

1.1 Annie Wong (remote)

SynObs & Ocean Observing Co-Design International Workshop 2026

EasyOneArgo data product:

A user-centric approach for delivering physical and biogeochemical ocean data from Argo profiling floats

Annie Wong, Jean Philippe Rannou, Thierry Carval, Laure Fontaine, Catherine Schmechtig, Henry Bittig

EasyOneArgo

To deliver the best Argo data in the simplest way

No data modes; no QC flags; no data manuals
Just good ocean data ready for immediate scientific use

EasyOneArgo – 4 datasets, 12 BGC parameters, plus P/T/S

A curated selection of good Argo vertical profiles in csv

EasyOneArgo product	Argo parameters	Vertical axis
EasyOneArgoTS	PRES, TEMP, PSAL	Original pressure
EasyOneArgoBGC	PRES, TEMP, PSAL, DOXY, NITRATE, PH_IN_SITU_TOTAL, CHLA, CHLA_FLUORESCENCE, BBP700, DOWN_IRRADIANCE 380, 412, 443, 490, 555, DOWNWELLING_PAR (12 BGC parameters)	Synthetic pressure
EasyOneArgoTSLite	**Same as EasyOneArgoTS**	**EasyOneArgo pressure grid**
EasyOneArgoBGCLite	**Same as EasyOneArgoBGC**	**EasyOneArgo pressure grid**

107 vertical levels from 2dbar to 6000dbar:
[2, 5@5-250, 10@250-350, 25@350-500, 50@500-1000, 100@1000-2000, 200@2000-6000]

Some BGC data are pre-filtered before vertical interpolation.

EasyOneArgo – How to get it?

The EasyOneArgo data product is freely and publicly available through **monthly** FAIR-compliant releases at SEANOE.

To download the data product:

DOI 10.17882/107233

To download the data product specification:

DOI 10.13155/107206

To download the Matlab code of EasyOneArgo creation tool:

Github.com/OneArgo/EasyOneArgo

Please email comments to:

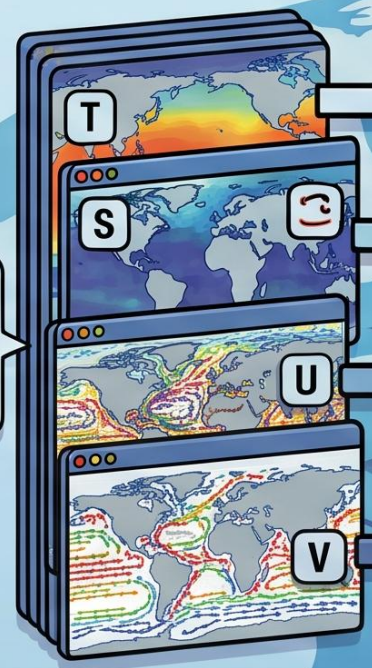
Annie Wong (apsw.uw@gmail.com) or Thierry Carval (Thierry.Carval@ifremer.fr)

1.2 Hakase Hayashida

py-off-bgc: PRACTICAL OFFLINE DRIVING OF OCEAN BGC MODELS

Hakase Hayashida (JAMSTEC) et al.

1. OCEAN PHYSICAL REANALYSIS
(The Driving Forcing)



BRAN2020,
JCOPE2M,
LORA-WNP

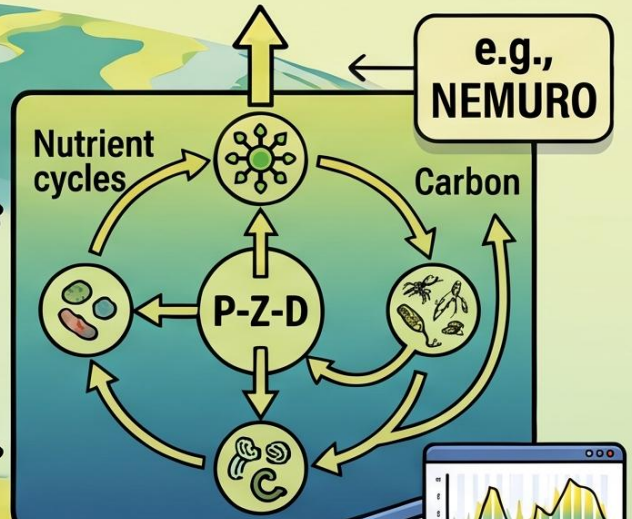
Select any **Physics Product** to drive the same BGC setup!

py-off-bgc:
OFFLINE DRIVING ENGINE

Reads, Standardizes, and Regrids Reanalysis Data Products (Offline Forcing)

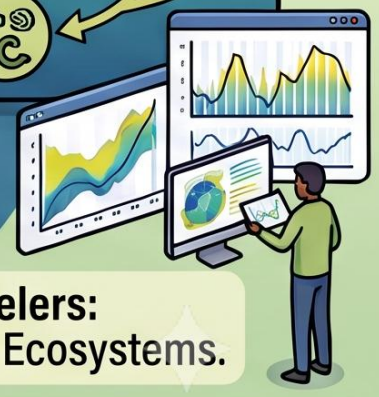
Processed Driving Forcing (3D Standardized Fields)

2. OCEAN BGC MODEL
(Driven Offline)





Physical Modelers:
Focus on Hydrodynamics.



BGC Modelers:
Focus on Marine Ecosystems.

MODULAR COLLABORATION: Physical and BGC teams work independently on their specific expertise, reducing dependency and conflict while maximizing scientific flexibility and practical usability.

1.3 Hyun-Chul Lee (remote)

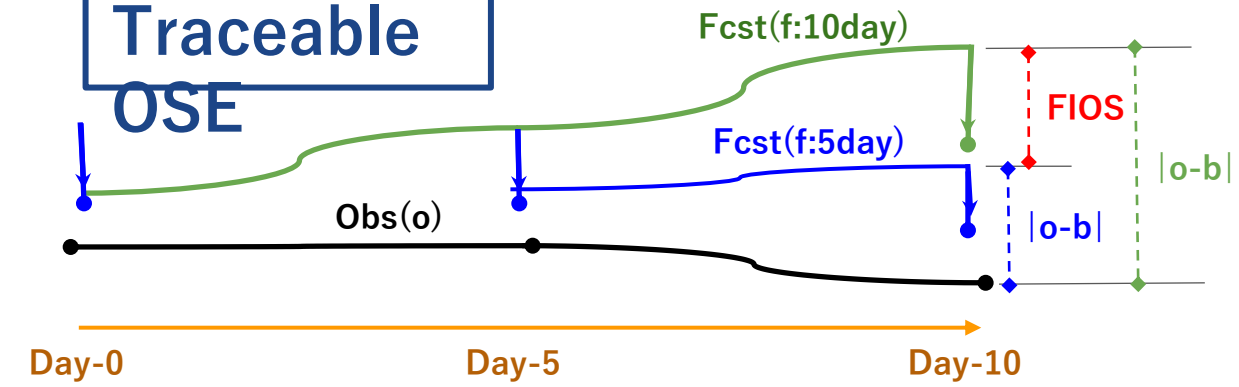
An Estimation of Impacts of Ocean Observing Systems on Forecast and Analysis in Tropical Pacific Ocean

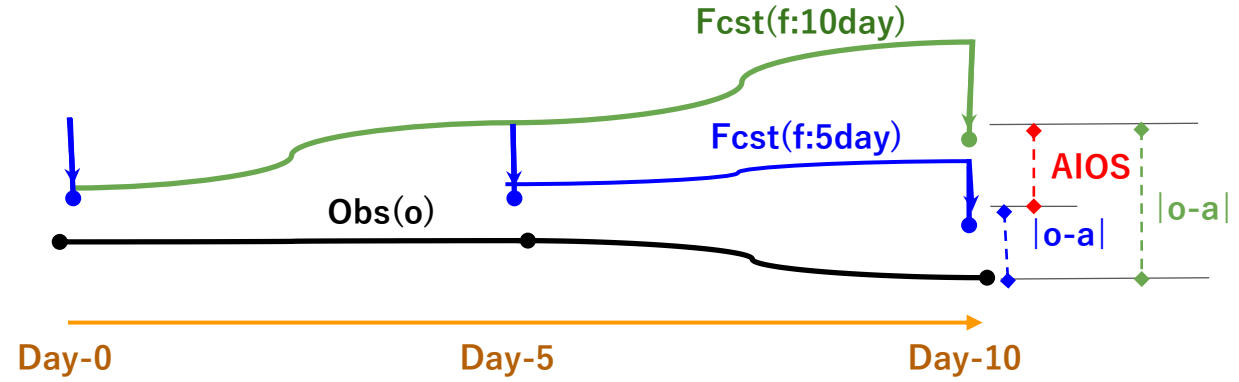
Hyun-Chul Lee*, Arun Kumar*, JieShun Zhu, Caihong Wen****

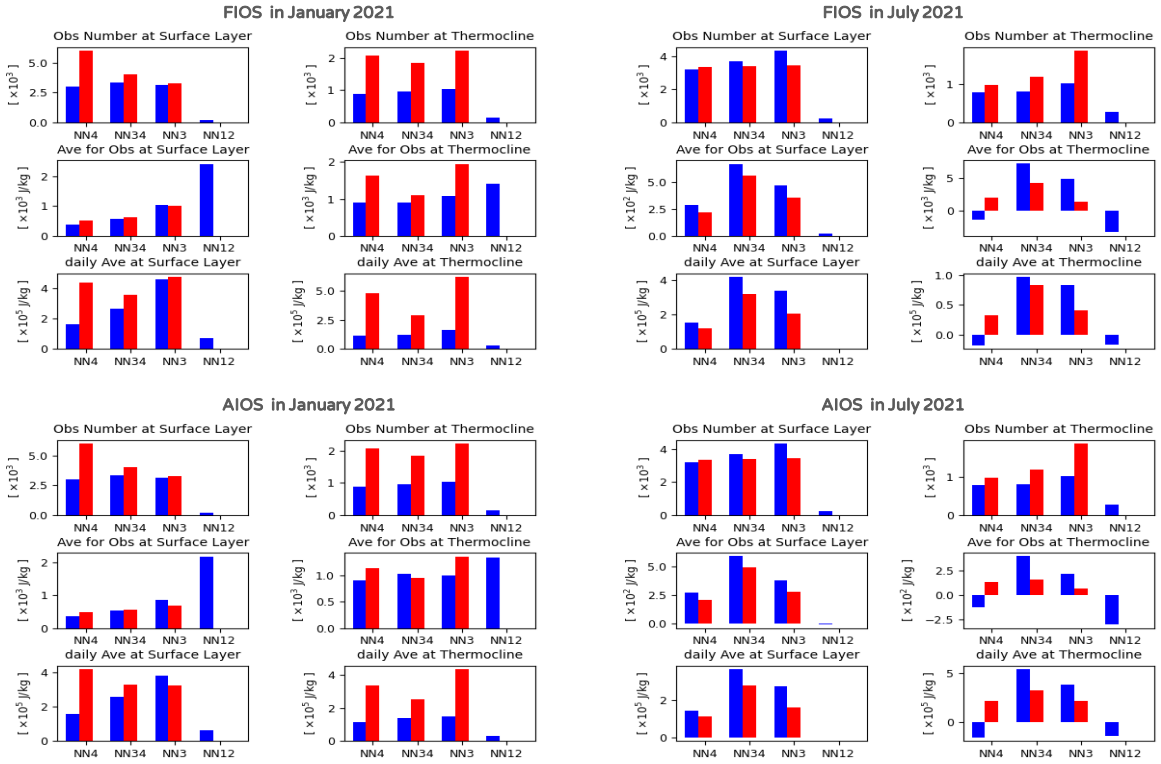
*Entarian at NOAA/NWS/NCEP/EPD, **NOAA/NWS/NCEP/EPD (formerly NOAA/NWS/NCEP/CPC, USA)

- An alternate and a simpler approach for the estimation of observing system impacts on forecast and analysis is proposed.
- The estimate of the observing system influence is based on the difference between two parallel ocean data assimilation runs that differ in forecast-assimilation cycling.
- This approach is relatively straightforward to implement and possible influence of observational data, without incurring further computational cost, can be done for various observing systems and geographically relevant regions simply by maintaining two ocean assimilation systems

Traceable OSE







- Results show that the impacts of each observing system in the regions can be estimated and monitored by the maintaining two parallel runs.
- The proposed methodology is computationally cost effective compared to the traditional data denial experiments for estimating the impacts of many observing systems simultaneously.

1.4 Matthew Goldberg

The University of Texas at Austin
Oden Institute for Computational Engineering and Sciences

GORDON AND BETTY MOORE FOUNDATION

SMART CABLES

Evaluating the potential of SMART subsea cable pressure sensors to constrain Subpolar North Atlantic circulation variability through Observing System Simulation Experiments

Matthew Goldberg[1] Helen Pillar[1] An T. Nguyen[1] Bruce M. Howe[2] Patrick Heimbach[1 3 4]

[1]The University of Texas at Austin Oden Institute [2]JTF SMART Cables at The University of Hawai'i at Manoa [3]The University of Texas at Austin Jackson School of Geosciences [4]The University of Texas at Austin Institute for Geophysics

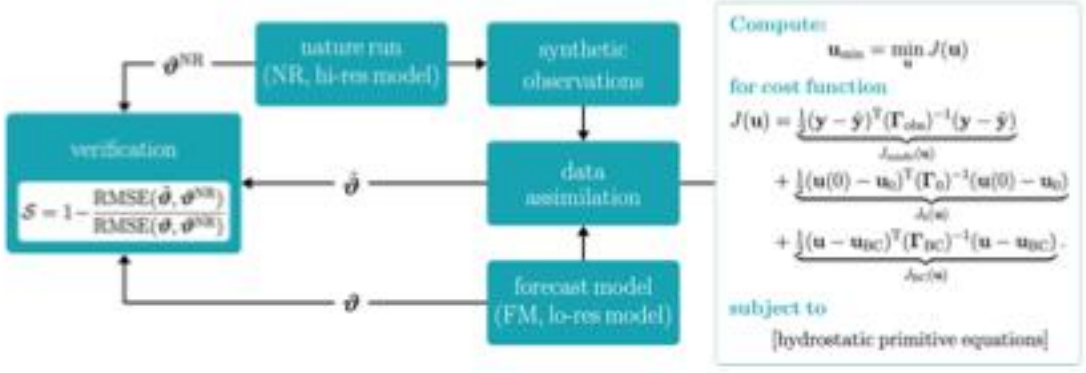
Synobs and Co-design Workshop, August 26, 2026, Mutsu, Japan

Evaluating Potential of SPNA SMART Cable OBP

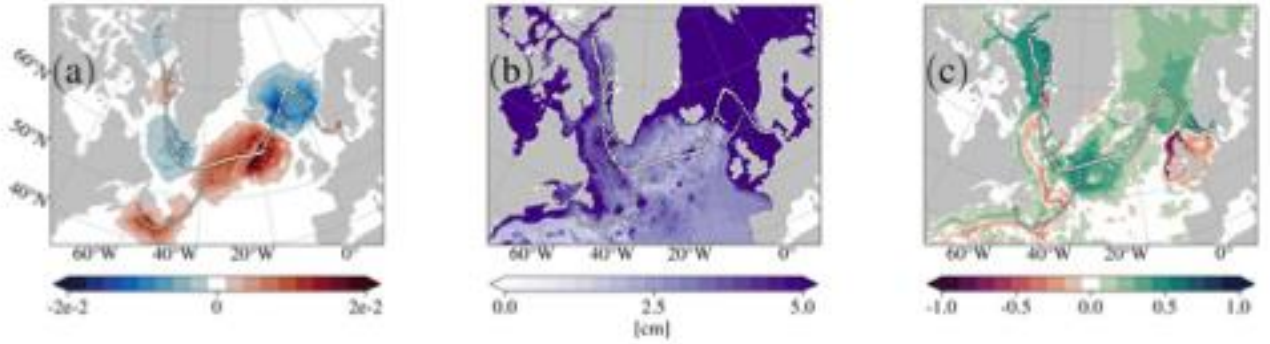


Science **M**onitoring **A**nd **R**eliable **T**elecommunications (**SMART**) Cables offer in situ high-frequency OBP monitoring

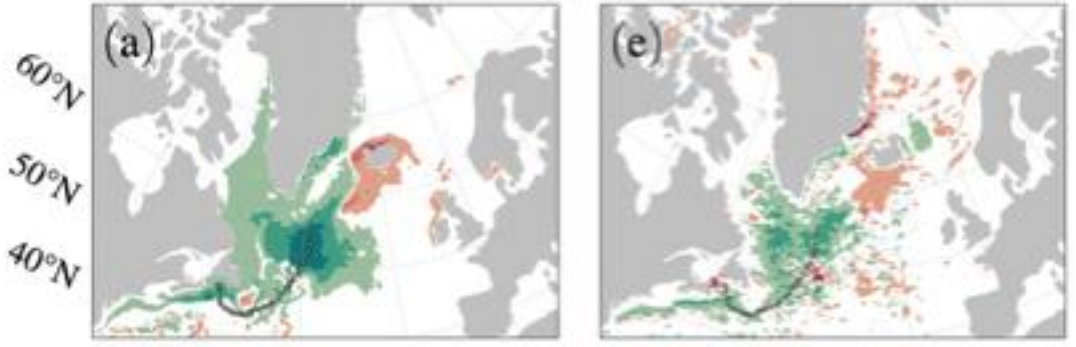
Goal: Pre-assess cable efficacy in constraining Subpolar North Atlantic (SPNA) circulation



Adjoint based (4D-Var) Data Assimilation schematic



Assimilating OBP along cable **reduces uncertainty in local and remote OBP**



Assimilation also reduces uncertainty in **unobserved quantities**

- **Barotropic velocity (above)**
- Advective FW transport across key gateways

1.5 Megan Scanderbeg

Accessing and Using OneArgo data

Megan Scanderbeg[1], Claire Gourcuff[2], Annie Wong[1], Catherine Schmechtig[3], Tanya Maurer[4], Thierry Carval[5], Raphaëlle Sauzède[3]

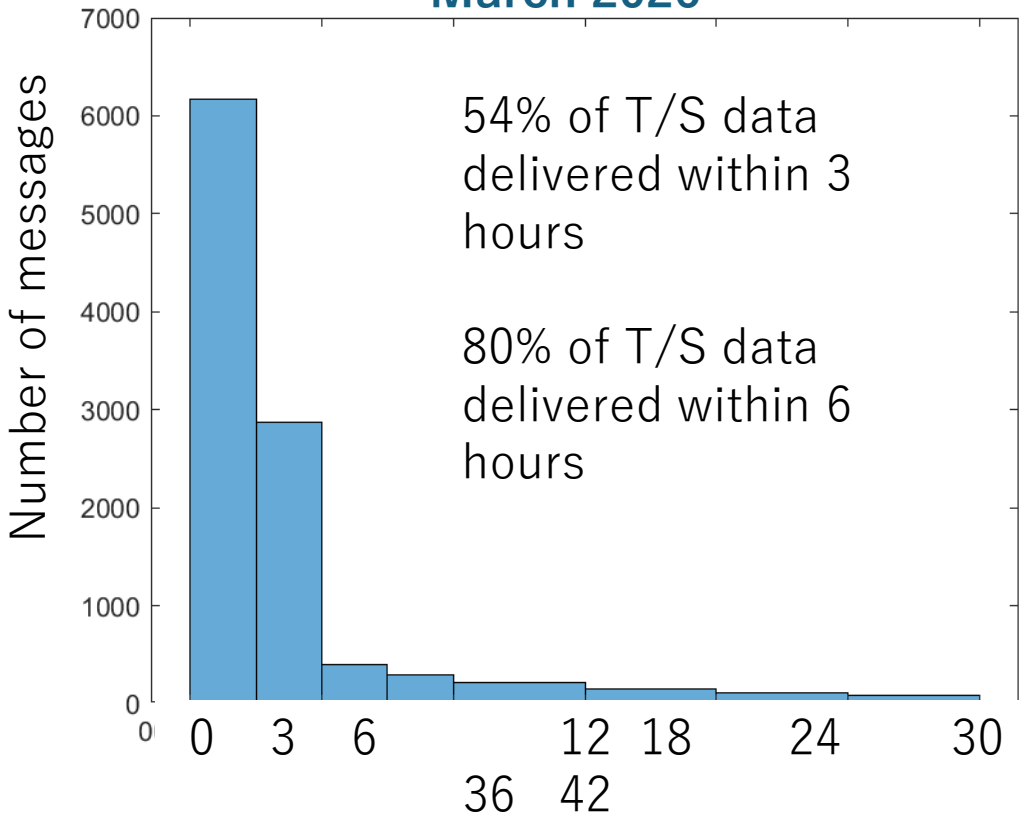
[1]Scripps Institution of Oceanography, [2] Euro-Argo ERIC, [3]CNRS, [4]Monterey Bay Aquarium Research Institute, [5]IFREMER

1) Argo on the GTS

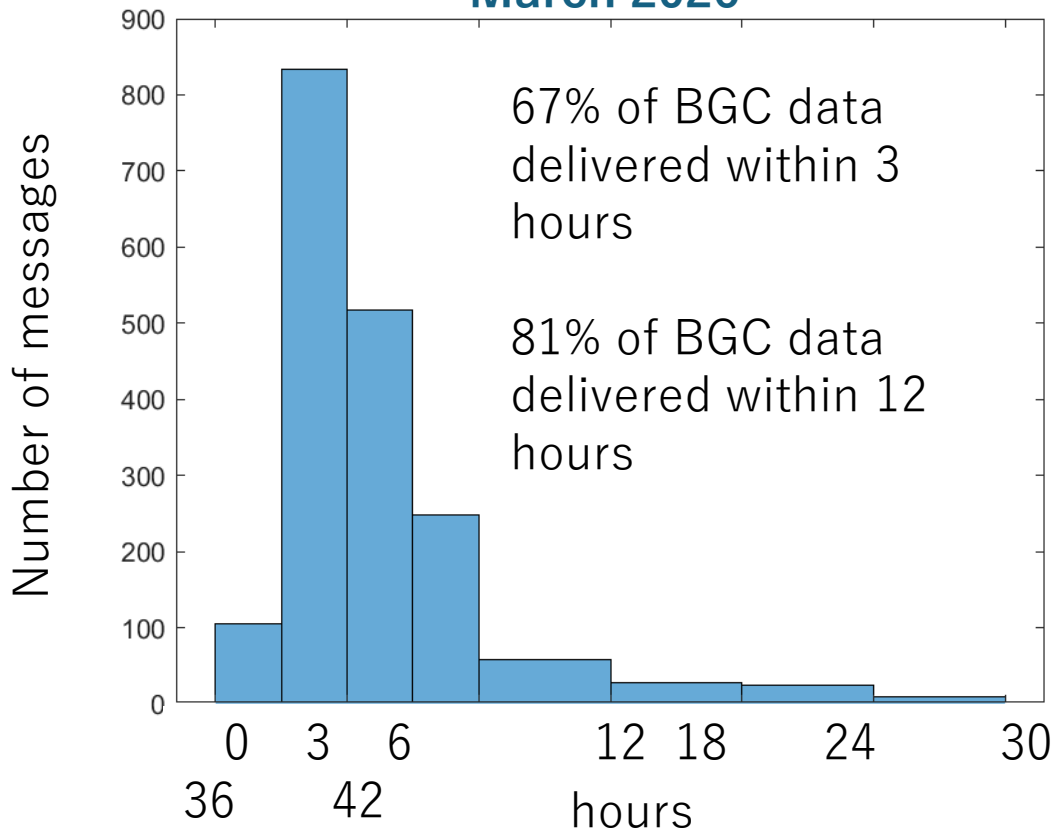
*Only ADJUSTED data to be sent for BGC parameters

RT HOUR

Timeliness for Argo T/S BUFR messages to appear on the GTS for March 2026



Timeliness for BGC Argo BUFR messages to appear on the GTS for March 2026



2) Argo netCDF files from the GDACs

RT DM

- HTTP & FTP access:
  - ftp://ftp.ifremer.fr/ifremer/argo
  - https://data-argo.ifremer.fr
  - https://nrlgodae1.nrlmry.navy.mil/pub/outgoing/argo

HOUR

- S3 data services: https://registry.opendata.aws/argo-gdac-marinedata
- Rsync:
  - https://www.argodatamgt.org/DataAccess.html#ifremer-rsync
  - https://www.argodatamgt.org/DataAccess.html#aws-s3-sync

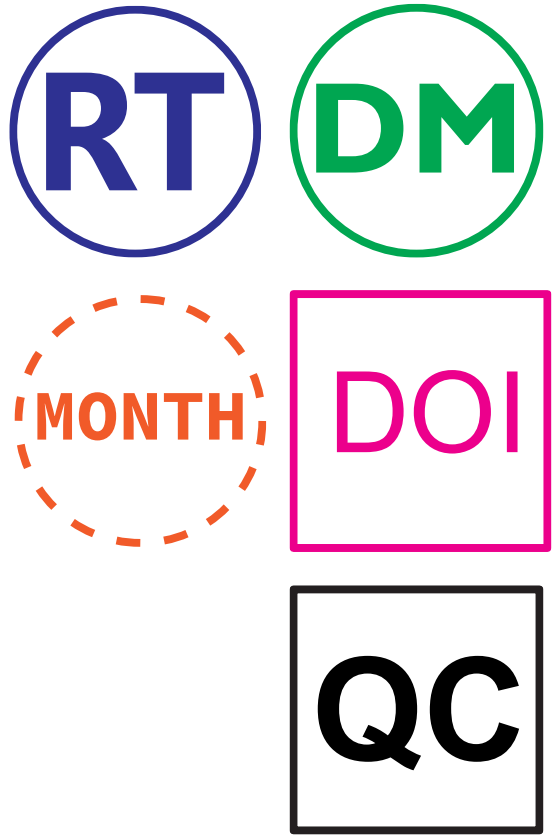
RT DM

- Monthly DOI tarball which follows FAIR principles: https://doi.org/10.17882/42182

MONTH

DOI

3) Community created products containing Argo data



https://argo.ucsd.edu/data/argo-data-products/

Grouped into six categories:

- Gridded fields
- Velocity products
- Profiles interpolated to same pressure levels
- Profiles with additional quality control measures
- Ocean bathymetry products
- BGC Argo products (also included in above categories, as appropriate, but collected in one place here)

1.6 Minori Fukushima

SynObs2026

Fourier Neural Operator-based Sensitivity Analysis for Nonlinear Dynamical Systems

Minori FUKUSHIM[1]　Takeshi ENOMOTO[2]

1 Graduate School of Science, Kyoto University

2 Disaster Prevention Research Institute, Kyoto University

Why a Differentiable Surrogate?

Conventional adjoint sensitivity analysis

- Requires a tangent-linear and adjoint model consistent with the nonlinear forward model.
- Developing a separate adjoint model can be technically demanding.

↓

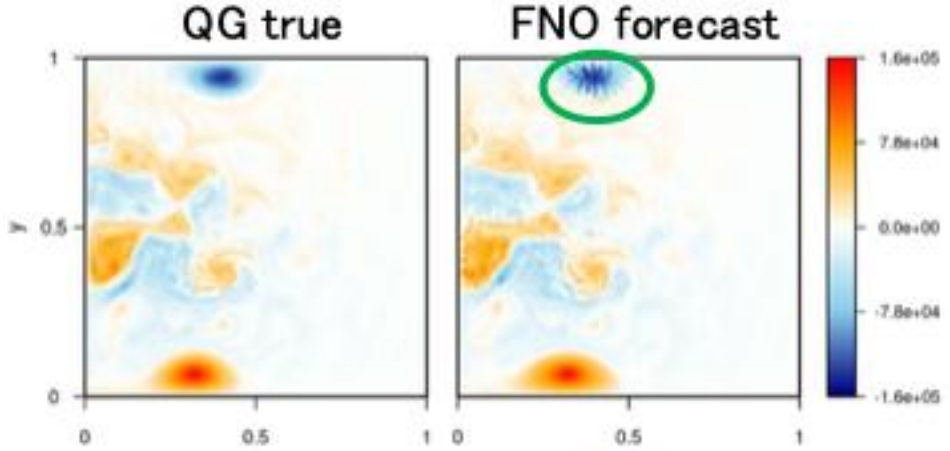
FNO surrogate

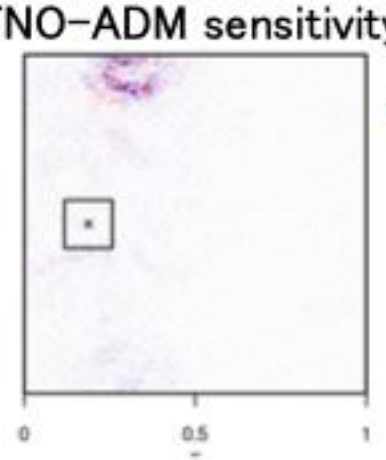
- Learns nonlinear forward evolution directly from data.
- Automatic differentiation provides initial sensitivities **without a separate adjoint model**.

Objective
Evaluate FNO-based sensitivity analysis in a 2-D QG system and examine how **local surrogate forecast errors affect the sensitivities**.

Results

Target: center

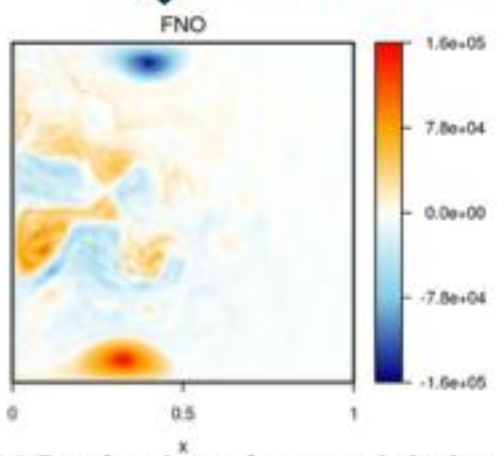


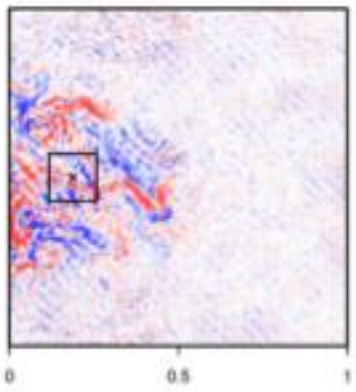


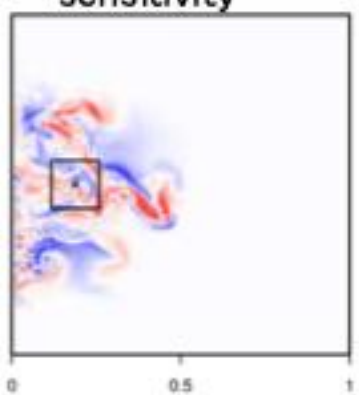
Sensitivity pulled toward local forecast error

Improved upper-vortex prediction

After improvement







→ The improved FNO-derived sensitivity also produced a larger nonlinear response than the physical-adjoint sensitivity.

✓ With locally accurate forward dynamics, FNO automatic differentiation can provide initial sensitivities without a separate adjoint model.

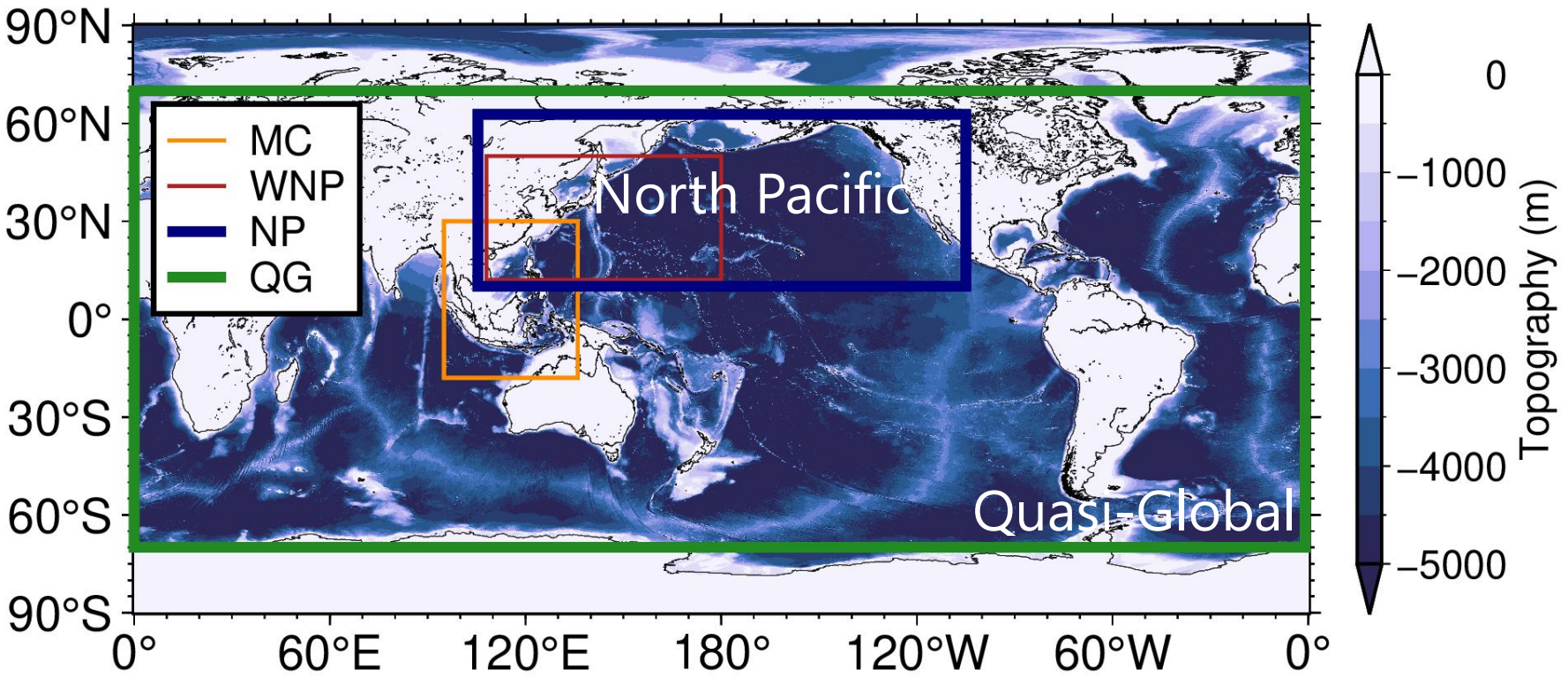
1.7 Shun Ohishi

LETKF-based Ocean Research Analysis version 2.0 for a quasi-global domain (LORA-QG)

Shun Ohishi[1], Takemasa Miyoshi[1], and Misako Kachi[2]

1: RIKEN, 2: JAXA

New LORA domains



- North Pacific (NP): dx=0.10° (eddy-resolving)
- Quasi-Global (QG): dx=0.25° (eddy-permitting)

with 75 vertical σ-layers

Validation

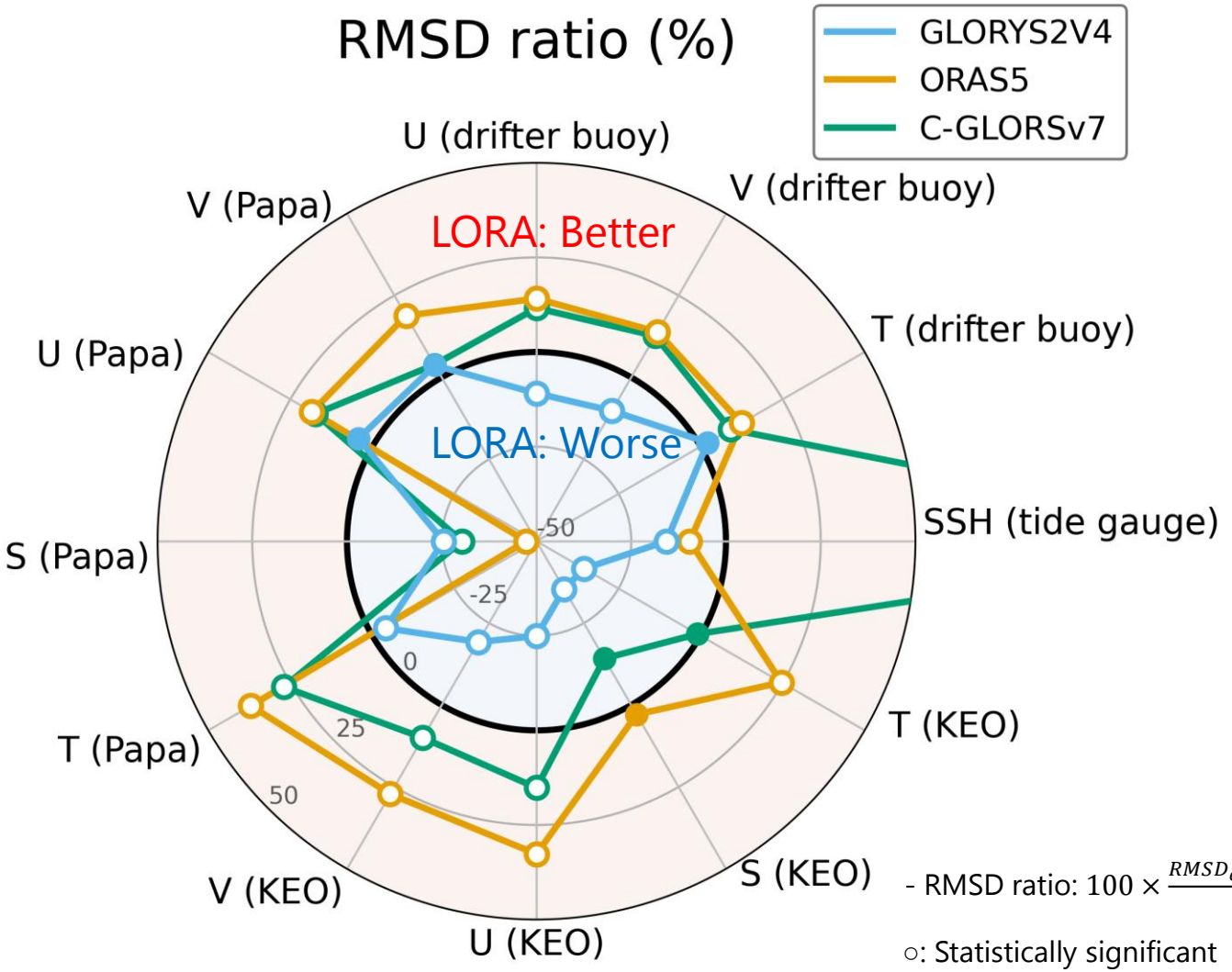
■ Existing eddy-permitting ocean (re)analysis dataset

	LORA-QG	GLORYS2V4	ORAS5	C-GLORSv7
Production center	RIKEN (Japan)	Mercator Ocean (France)	ECMWF (UK)	CMCC (Italy)
Reference	Ohishi et al. (in prep.)	Lellouche et al. (2013)	Zuo et al. (2019)	Storto et al (2016)
Model	sbPOM	NEMO3.1	NEMO3.4.1	NEMO3.4
Domain	Quasi-global	Global	Global	Global
Resolution	- dx=0.25° - 75 σ-layers	- dx=0.25° - 75 z-levels	- dx=0.25° - 75 z-levels	- dx=0.25° - 75 z-levels
Data assimilation	LETKF (128 members)	SEEK+3D-VAR bias correction	3D-VAR	3D-VAR
DA interval	1 day	7 days	5 days	7 days
Assimilated obs.	- Satellite SST - Satellite SSS - Satellite SSH - In-situ T - In-situ S	- Satellite SST (OI) - Satellite SSH - In-situ T - In-situ S	- Satellite SST (OI) - Satellite SSH - In-situ T - In-situ S	- Satellite SST (OI) - Satellite SSH - In-situ T - In-situ S
Output interval	1 day	1 day	1 day	1 day
Available period	Jun 2002–	Jan 1993–	Jan 1958–	Jan 1990–

Summary

We produced a new ensemble quasi-global eddy-permitting dataset since June 2002:

LETKF-based Ocean Research Analysis version 2.0 for a quasi-global domain (LORA-QG).



- RMSD ratio: $100 \times \frac{RMSD_{analysis} - RMSD_{LORA}}{RMSD_{LORA}}$ [%]

○: Statistically significant

1.8 Toshimasa Doi

Global Ocean Dissolved Iron Distribution

Inferred from an Optimized Model and Its Sensitivity to Observational Data Coverage

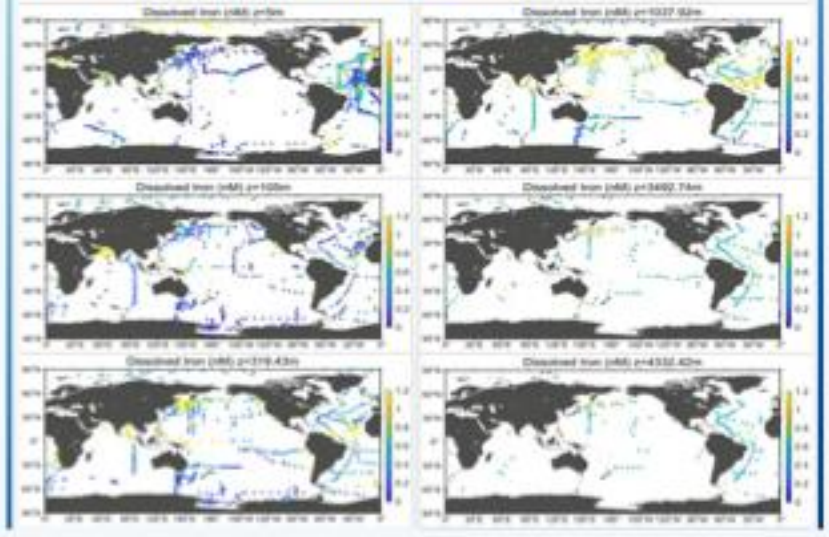
Toshimasa Doi, Satoshi Osafune, Shinya Kouketsu (JAMSTEC)

MacroCoast

We combined dissolved iron observations with an ocean iron-cycle model.

Model parameters were optimized using a Green's function approach.

Dissolved Iron Observations



+

Iron Cycle Model

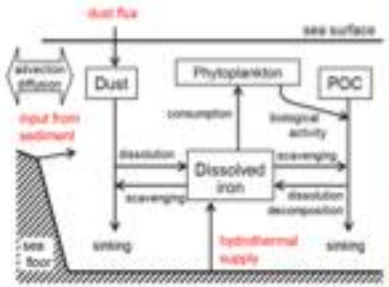
A simplified offline iron cycle model that accounts for iron sources and removal, as well as advection and diffusion in the ocean.

$$\frac{\partial\, \mathrm{dFe}}{\partial t} = ADV(\mathrm{dFe}) + DIFF(\mathrm{dFe}) + SMS(\mathrm{dFe})$$

$$\frac{\partial\, \mathrm{pFe}}{\partial t} = ADV(\mathrm{pFe}) + DIFF(\mathrm{pFe}) + SMS(\mathrm{pFe})$$

dFe : dissolved iron
pFe : particulate iron
(aeolian dust, particulate organic matter)

Prescribed distributions of phytoplankton biomass and POC were constructed from SeaWIFS data and provided as input to the model.



Schematic diagram of the simplified iron cycle model
Moore and Braucher (2008), Tagliabue et al. (2017)

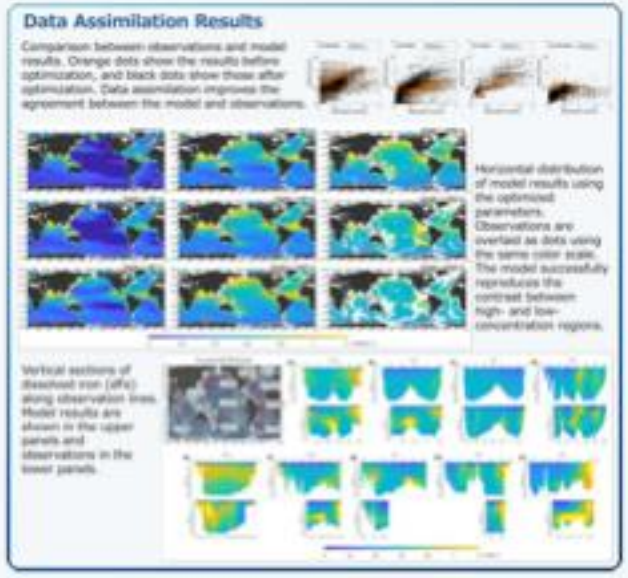
Region : 75°S to 80°N, 0-5500m depth.
A quasi-global model covering the full ocean depth.

Resolution : 1° x 1° in horizontal and 45 + BBL vertical levels.

Physical Fields : The published data-set as ocean state estimate, ESTOC (Estimated State of Global Ocean for Climate Research). https://www.jamstec.go.jp/estoc/e/

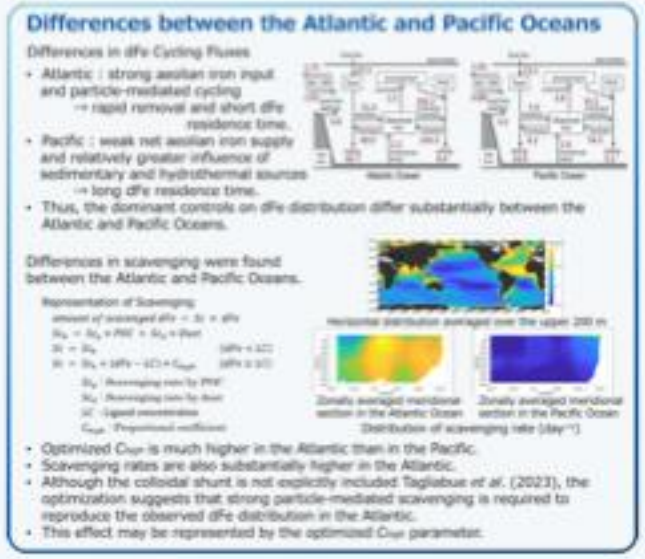
The optimized model was used to infer the 3-D distribution of dissolved iron.

Result : data assimilation improves model-observation agreement



- Agreement improves after optimization.
- High- and low-concentration regions are better reproduced.
- The result is a 3-D gridded global dissolved iron field constrained by observations.

Basin-scale interpretation : Atlantic and Pacific controls differ



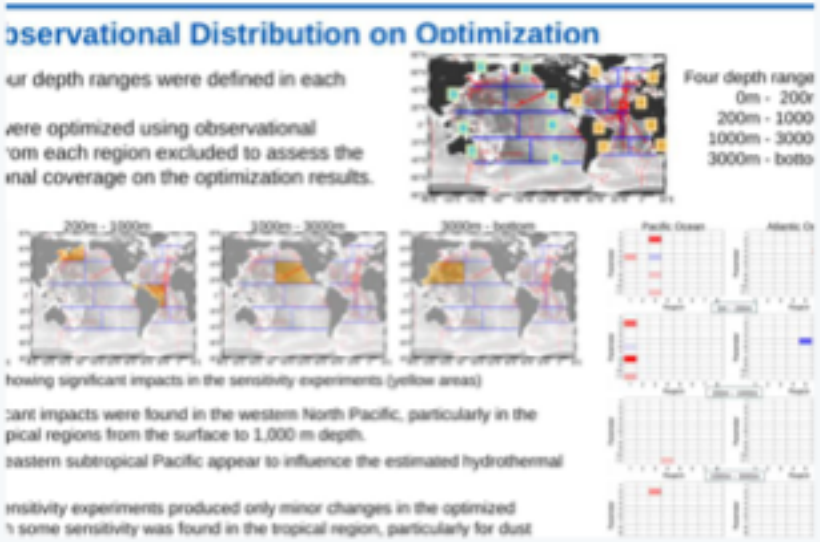
Atlantic

- Strong aeolian iron input
- Strong particle-mediated scavenging
- Rapid particle-mediated vertical transport and short dissolved iron residence time

Pacific

- Weaker net aeolian supply
- Relatively weak particle-mediated vertical transport
- Longer dissolved iron residence time

Observation coverage sensitivity in this model : Western North Pacific shows high sensitivity



Sensitivity experiment

Remove observations by region and depth.

Re-optimize parameters.

Compare optimized parameters across cases.

Largest impact : western North Pacific, mainly 0–1000 m

Atlantic: only minor parameter changes

- Pacific : observations in the western North Pacific have the largest impact on the optimized parameters.
- Atlantic : sensitivity is generally limited, with some tropical-region effects.
- A plausible explanation is the longer dissolved iron residence time in the Pacific.

Theme 3:
Sharing experiences of co-designing ocean observing systems

3.1 Baek-Jo Kim

SynObs&Ocean Observing Co-design International Workshop
(24-29 August 2026., Mutsu, Japan)

Recent Activities in the Marine Observation Research of the NIMS/KMA



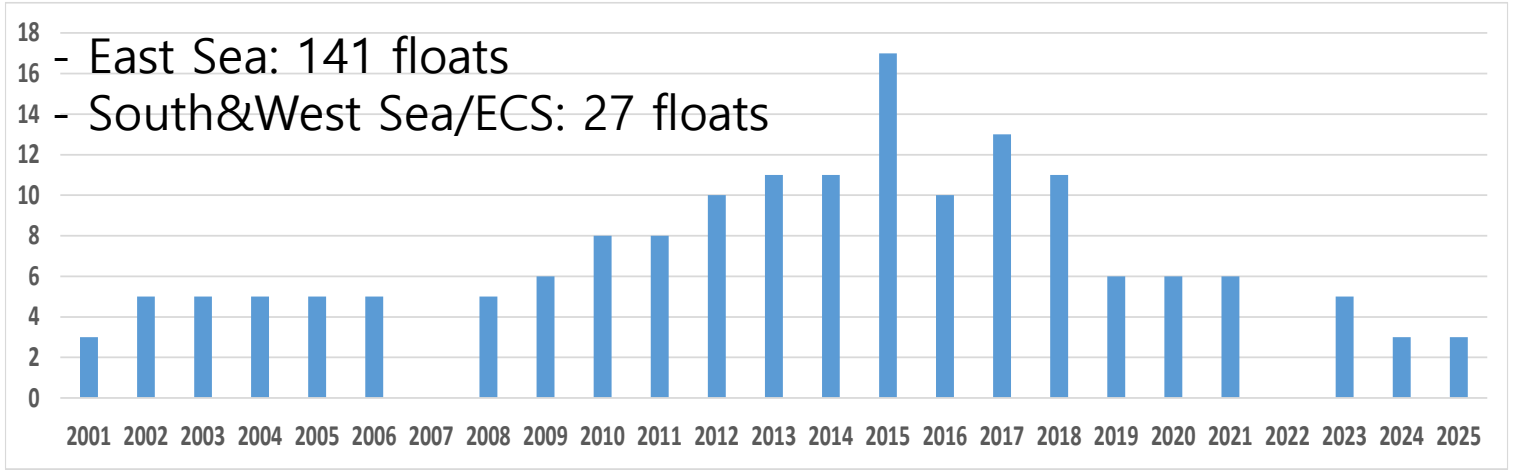
Baek-Jo Kim[1], Dongjin Kim[1], Jong-Jin Park[2], Ju-Hye Kang[1], Se-Yoon Moon[1], ChulKyu Lee[1]

[1]Observation Research Department, National Institute of Meteorological Sciences, Rep. of Korea

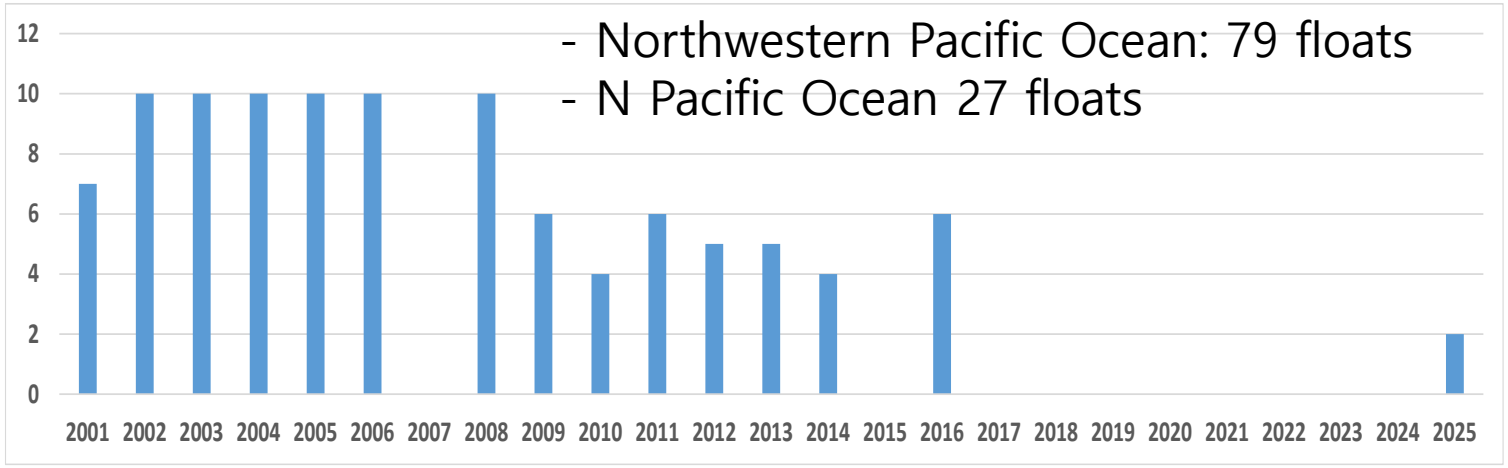
[2]School of Earth System Sciences, Kyungpook National University, Rep. of Korea

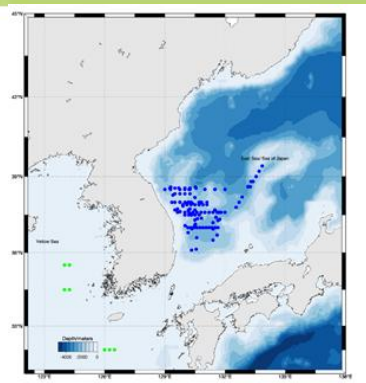
NIMS/KMA Argo Program

<Around the Korean peninsula (168 floats since 2017)>



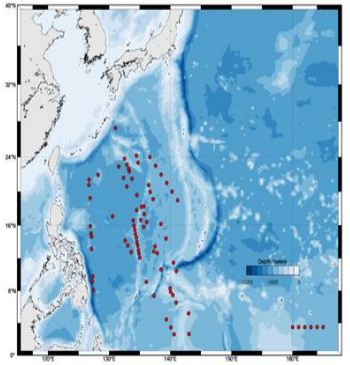
<Northwestern Pacific Ocean (103 floats since 2001)>





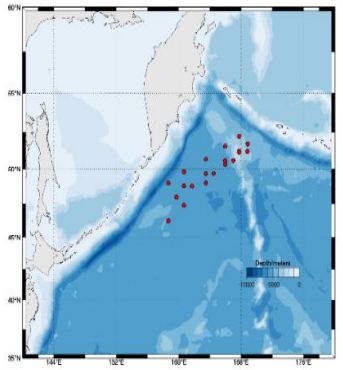


< Gisang 1/KMA >





< Araon/KOPRI >



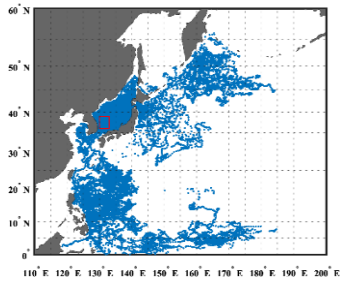


< ISABU/KIOST >

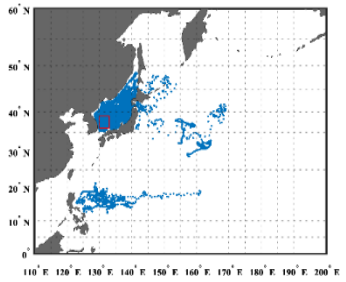
Long-term Variability of Ocean Heat Content

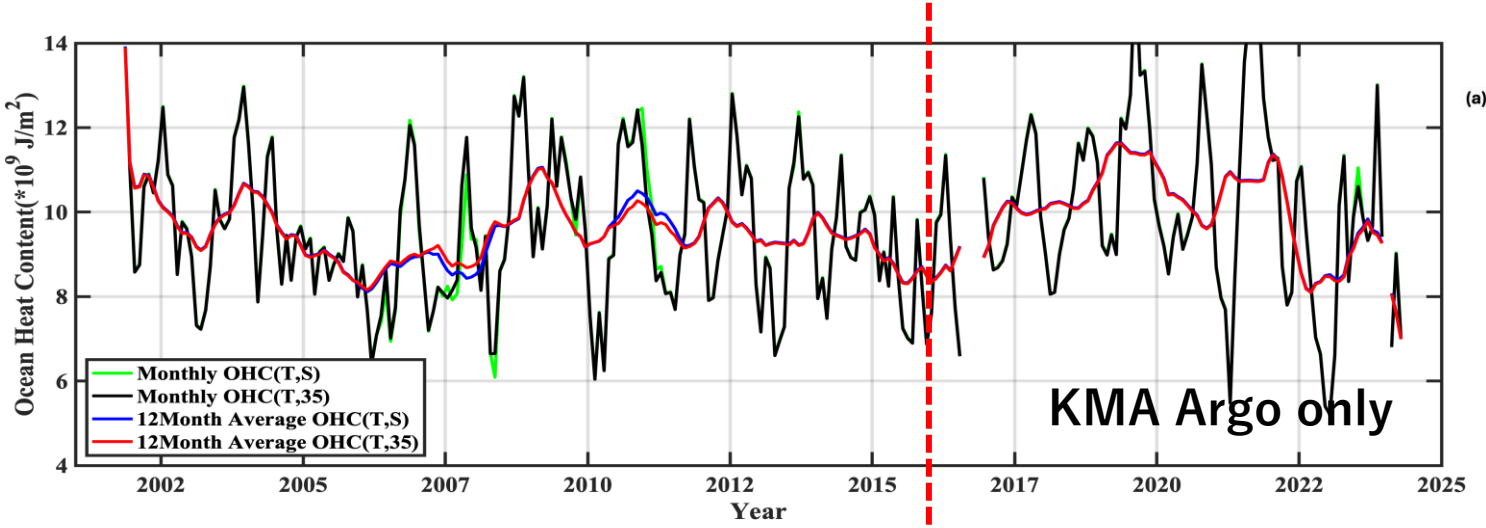
in the Ulleung Basin of the East Sea ('01~'25)

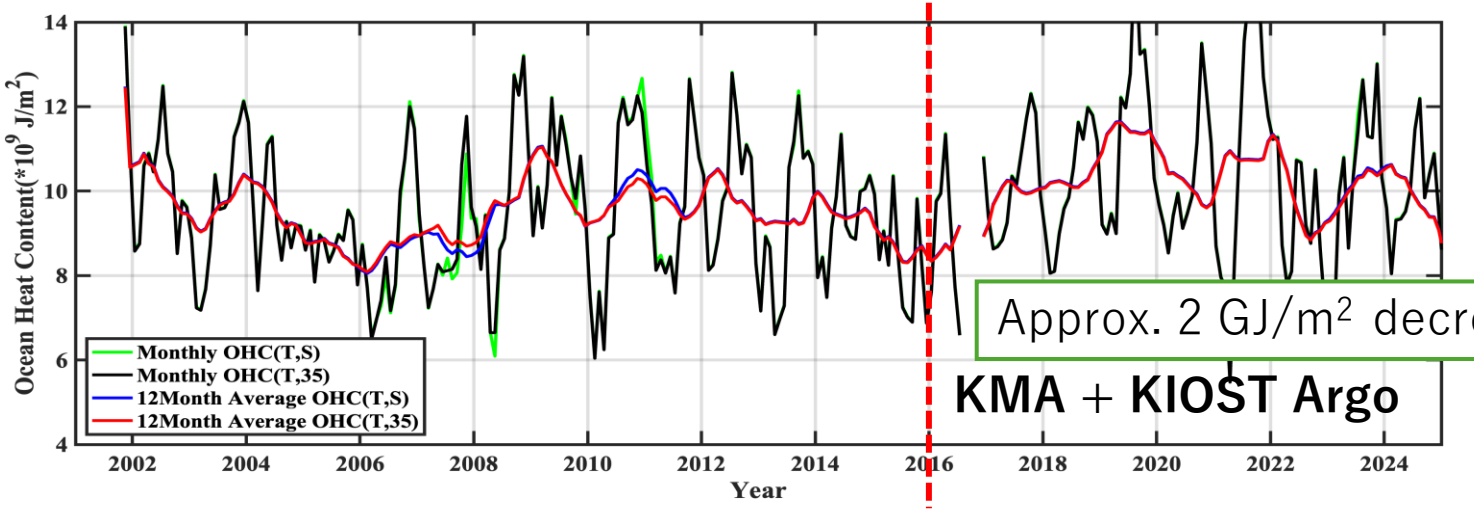
KMA Argo only (2001~2025)



KIOST Argo only (2001~2025)

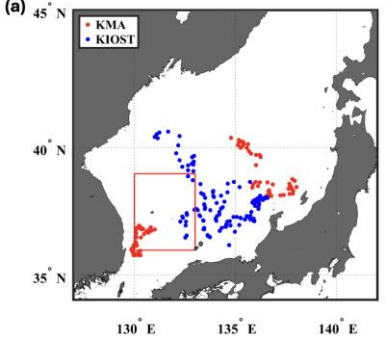




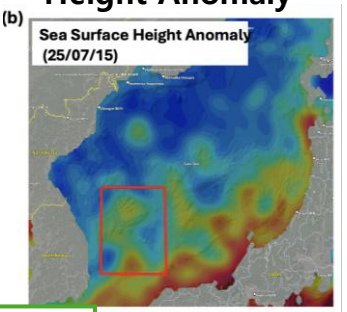


Approx. 2 GJ/m² decrease

Korea Argo in 2025



Sea Surface Height Anomaly

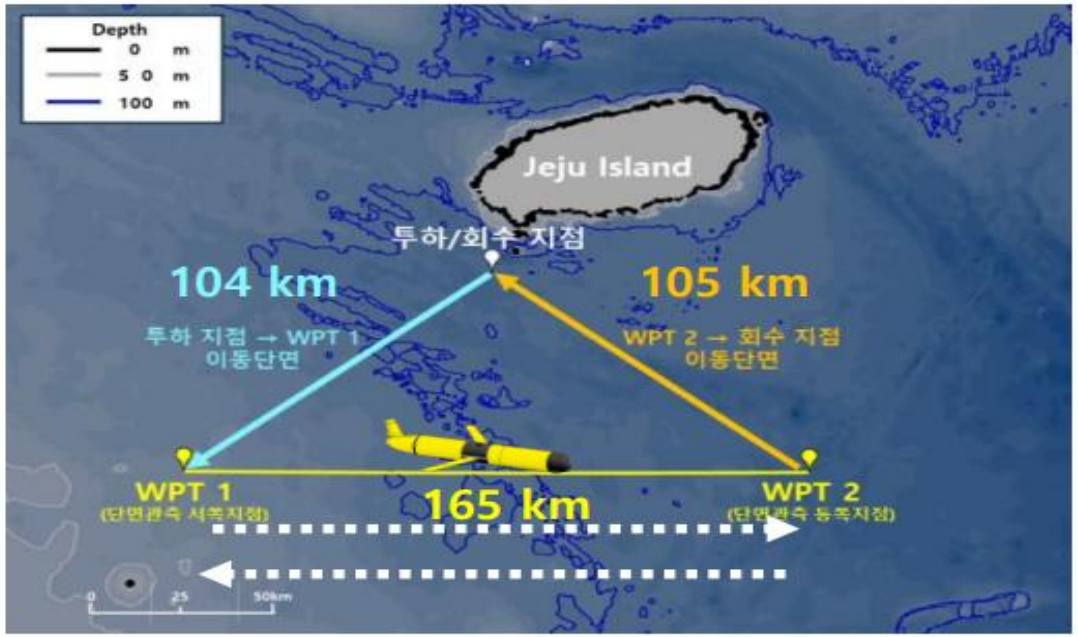


-Source: Annual Climate Characteristics Report in 2025('26.2)

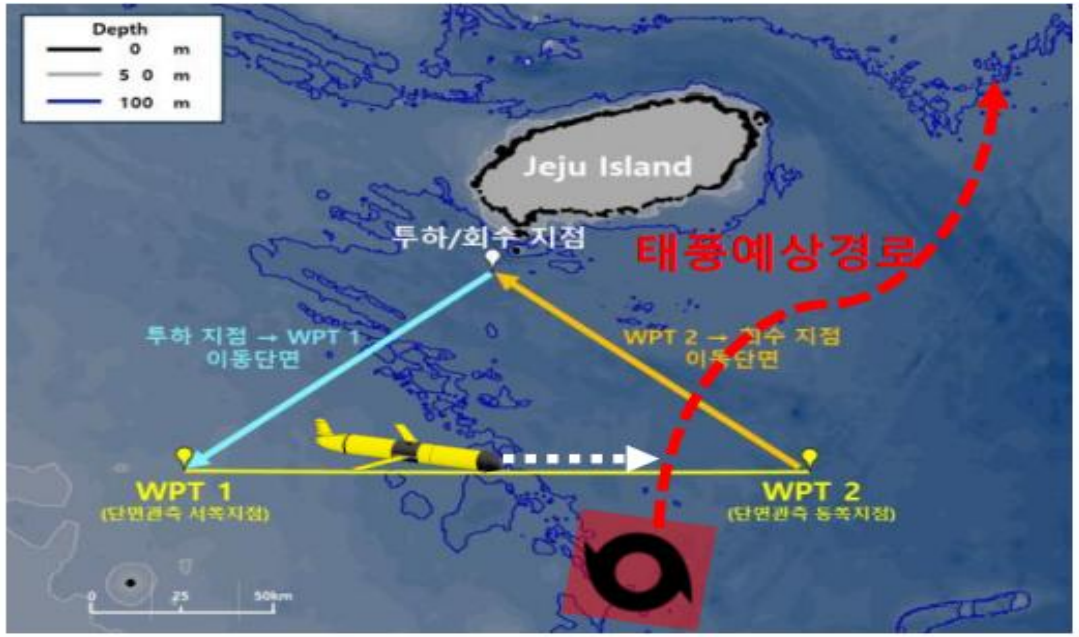
Typhoon–Ocean Environ. Observation using Ocean Glider

<Purpose> Build a real-time ocean-environment information system for the East China Sea using an ocean glider, providing temperature/salinity time series and vertical heat-content profiles to support forecasting

Observation Strategy (No Typhoon)

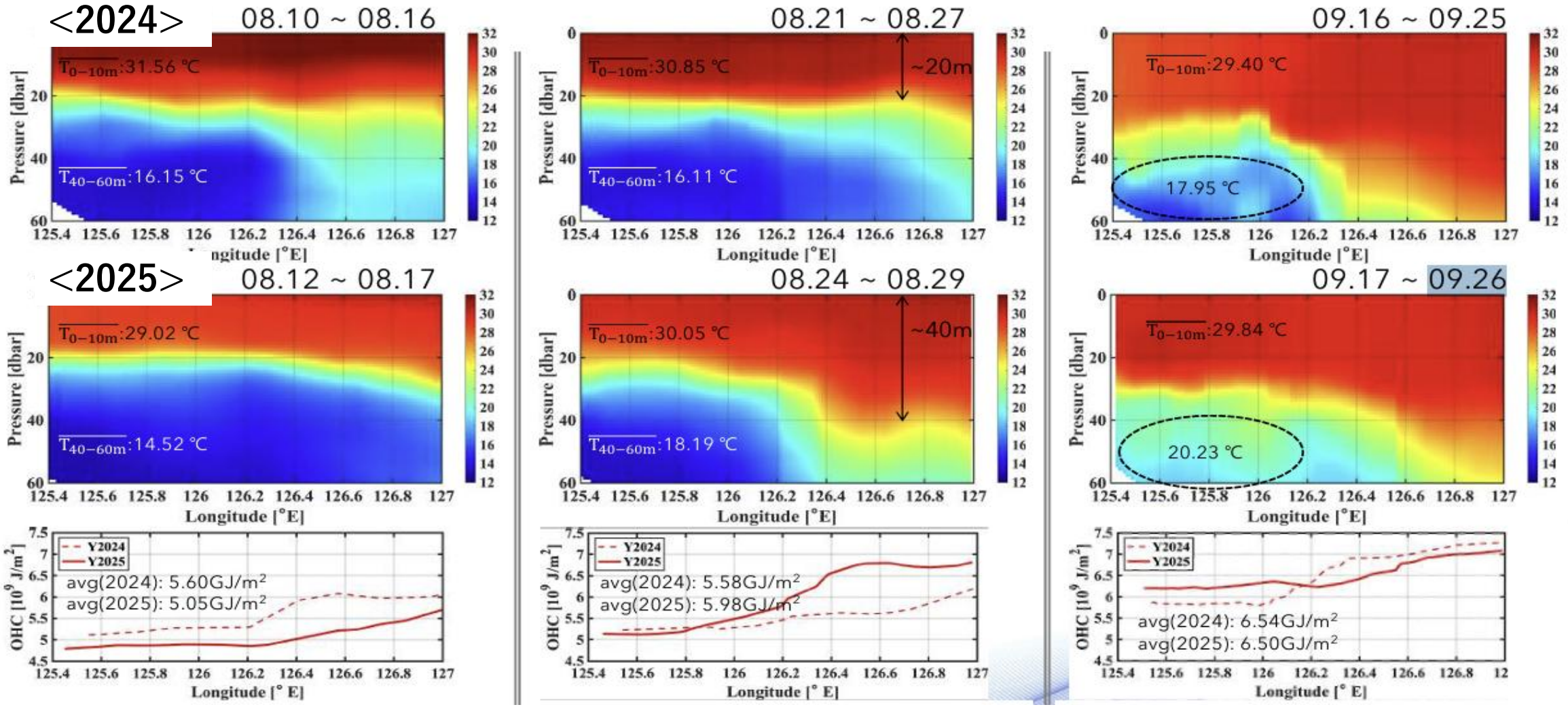


Observation Strategy (Typhoon Approaching)



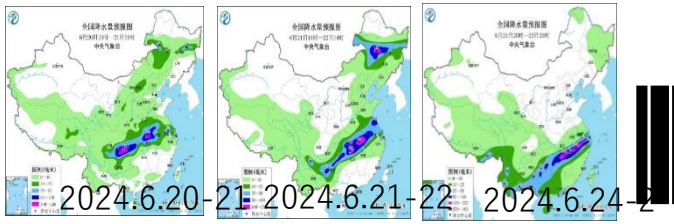
※ Evaluated feasibility through a survey of domestic/international ocean glider use ('22) → Pilot operation for ocean-environment monitoring (East China Sea, Aug. 13–Sep. 19, 860 km) ('23) → Secured technical capability for long-term ocean-environment monitoring (3+ months, Jul. 22–Oct. 11, 2,823 km) ('24) → Analysis of ocean-environment characteristics affecting typhoon intensity (Aug. 8–Sep. 30, 54 days/1,300 km) ('25)

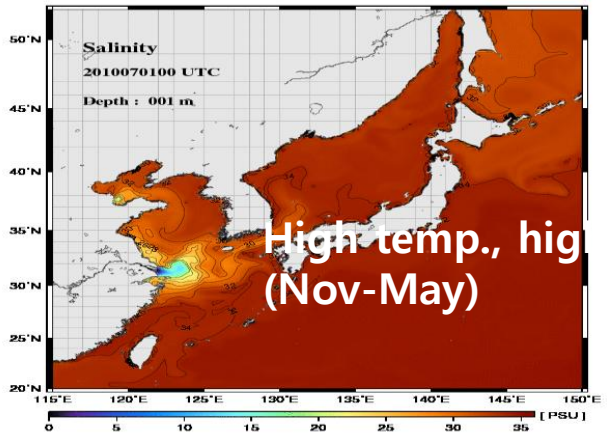
Temp. Section & Ocean Heat Content: '24 vs '25

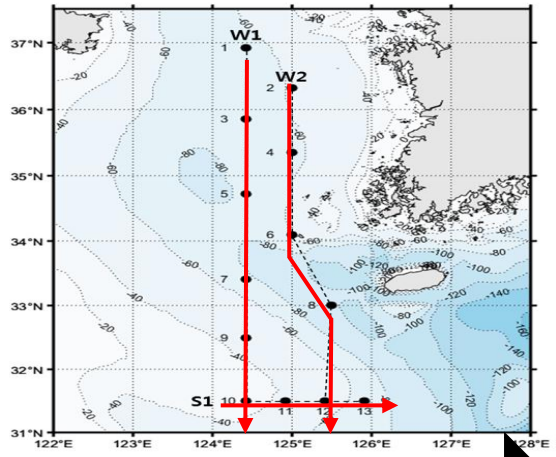


Low-Salinity Special Observations using a Research Vessel

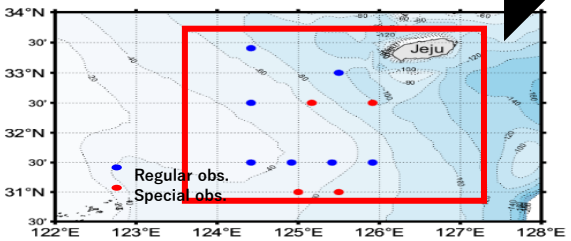








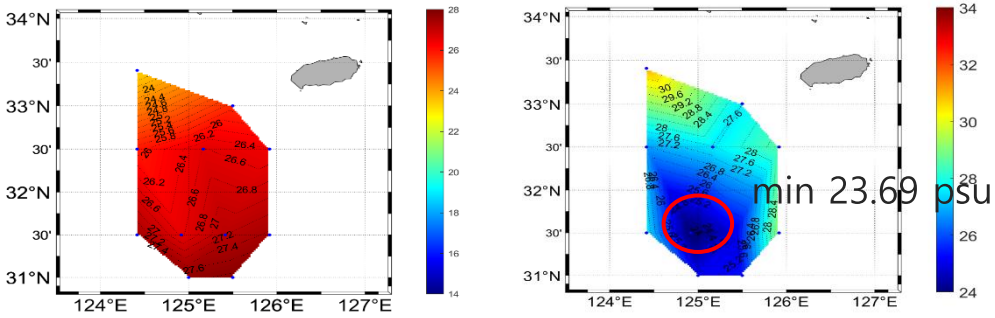
40,000-50,000 m³/s freshwater
discharge 25.4-28.0 psu, thickness 6 m
(~30 km off western Jeju coast)



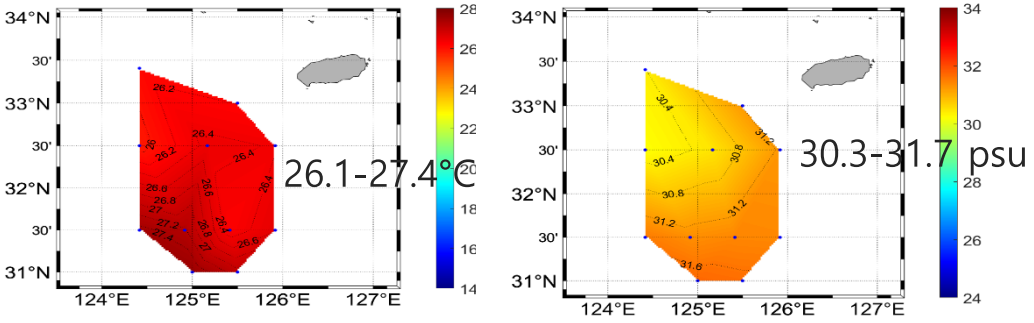
- **Recent Observation periods:**
  - **2024.07.16-17.**
  - **2025.07.10.-14.**
  - **2026.06.29-07.07**

Temp. **Sainity**

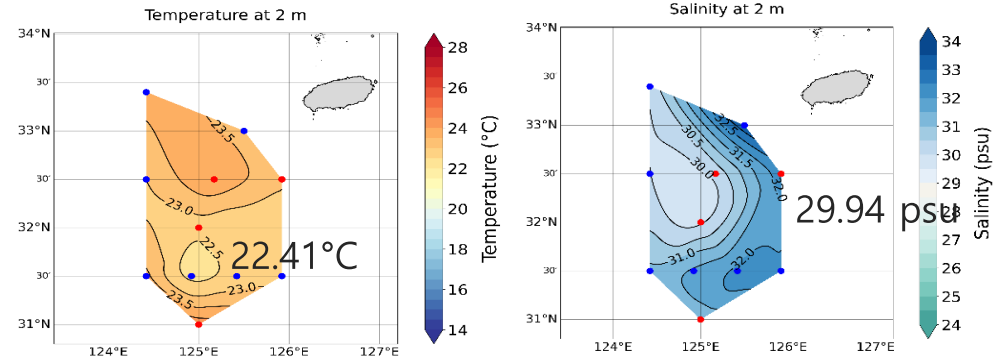
2024



2025



2026



3.2 Hitoshi Kaneko

The spread of terrestrial waters around the Shimokita Peninsula into the coastal region and its impacts:

An analysis based on coastal observations
and high-resolution ocean model outputs.

Hitoshi KANEKO

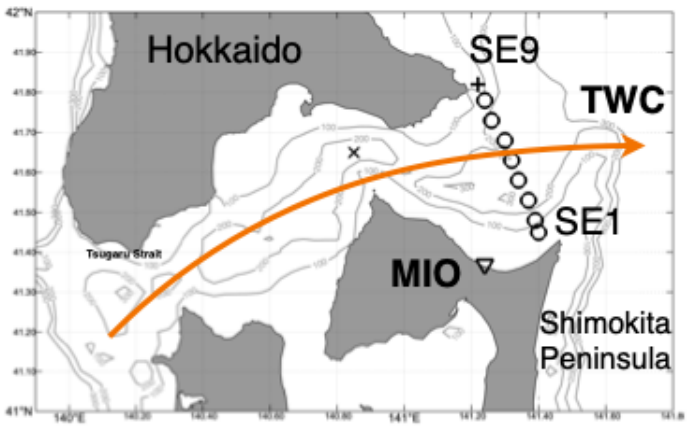


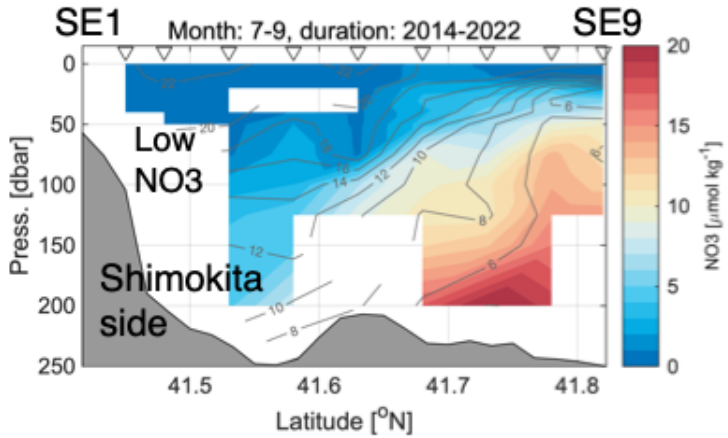


Affiliation one Mutsu Institute for Oceanography (MIO), Research Institute for Global Change (RIGC), Japan Agency for Marine-Earth Science and Technology (JAMSTEC)

Background

Along the northern coast of the Shimokita Peninsula is strongly influenced by water transported by the Tsugaru Warm Current (TWC), which is characterized by higher temperature, higher salinity, and lower nutrient levels than those on the Hokkaido side of the strait (e.g., Coastal Oyashio Current Water); consequently, the nutrient environment here has traditionally been considered poorer. However, recent research using new approaches is beginning to change this long-held view: **abundant diatoms during summer.**

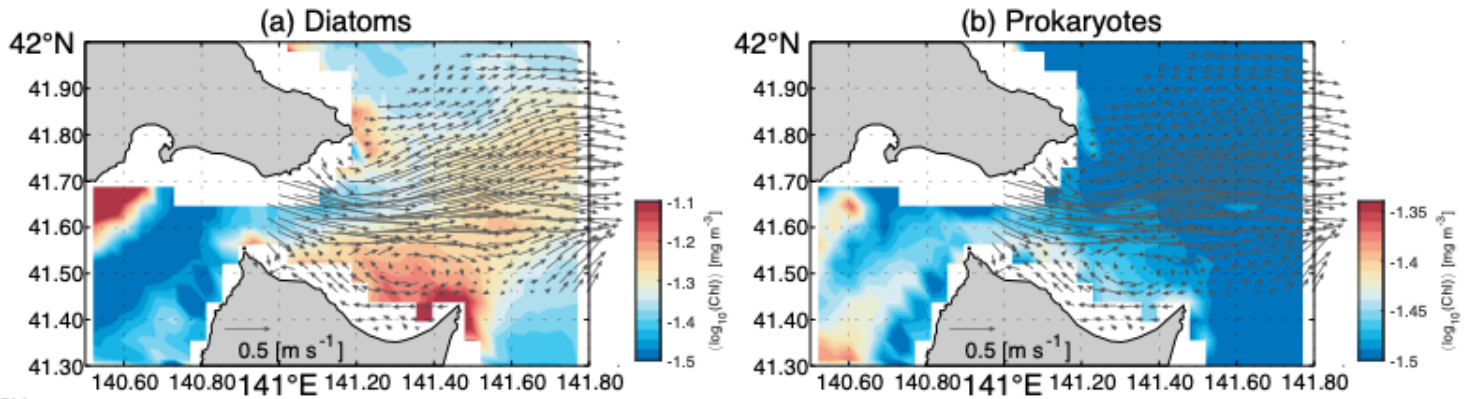




Cross-sectional distribution of nitrate along the SE line (SE1 to SE9) (2014–2022, average of observations from July to September). The contour lines represent water temperature.

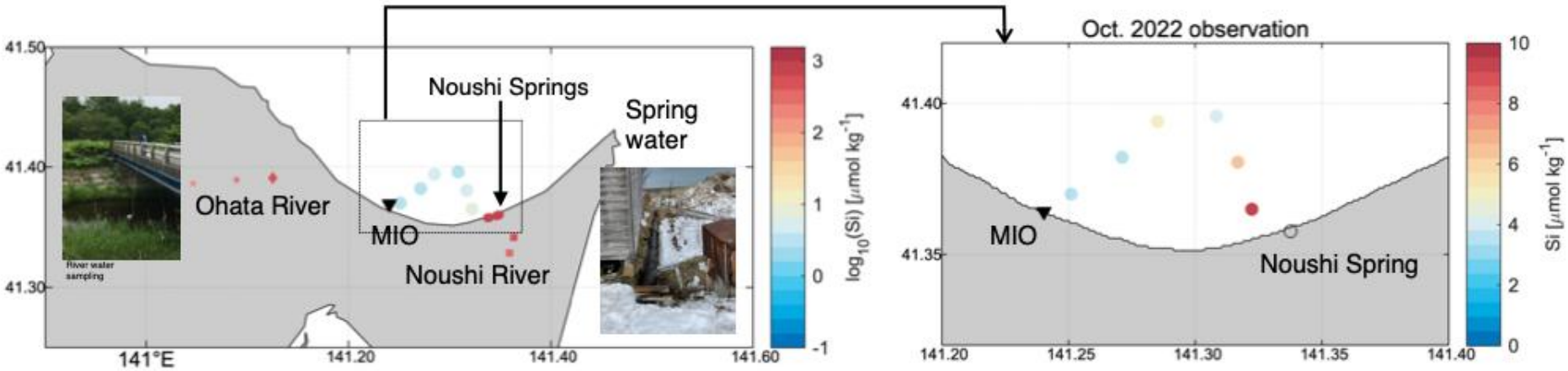
Average chlorophyll-*a* concentrations in (a) diatoms and (b) prokaryotes in August (2003–2024, Copernicus-GlobColour, Bio-Geo-Chemical, L4).

Vectors represent average August sea surface current velocities from High-Frequency Radar (HFR; 2014–2023)

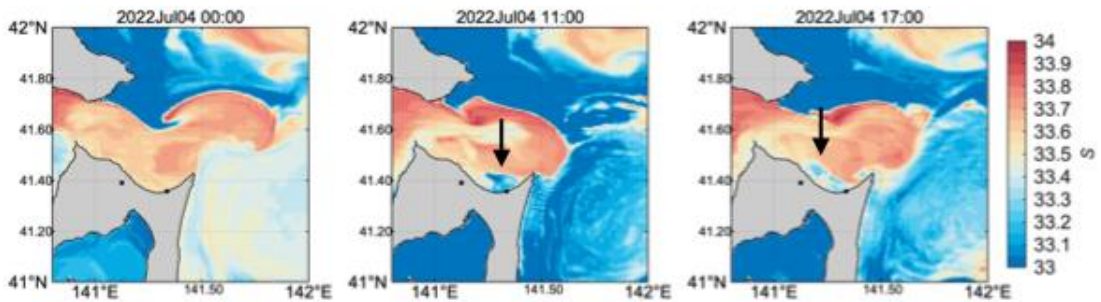


Investigations

In this study, we examined the background supporting this unique biological production environment by focusing on **the inflow of nutrients from land-based sources** and assessing their impact using chemical tracers.



JCOPE-T 1ks output (example for comparison)



'Ocean Weather Forecast' outputs suggests that following rainfall, low-salinity surface water — likely from rivers — flowed out from the northern coast of Shimokita and spread locally.

We concluded that; the supply of silicate from terrestrial sources is important for the distinctive distribution of diatoms along the northern coast of the Shimokita Peninsula during summer.

3.3 Naoko Kosaka

• SynObs & OOC Workshop 2026 (Aug. 26, 2026)

Evaluation of Operational ASV Observation Strategy in Tropical Cyclone Strong-Wind Regions Using OSSEs

Naoko Kosaka[1,2], Kosuke Ito[2,3], Yusuke Umemiya[1], Tsuneko Kura[1], Toshiyuki Bandai[1], Gota Yamasaki[1], Hiroshi Matsubara[1], Satoshi Mitarai[2,4], Daiki Suzuki[2], Hironori Fudeyasu[2]

[1]NTT, Inc., Japan; [2]Typhoon Science and Technology Research Center, Yokohama National University, Japan; [3]Kyoto University, Japan;
[4]Okinawa Institute of Science and Technology Graduate University, Japan

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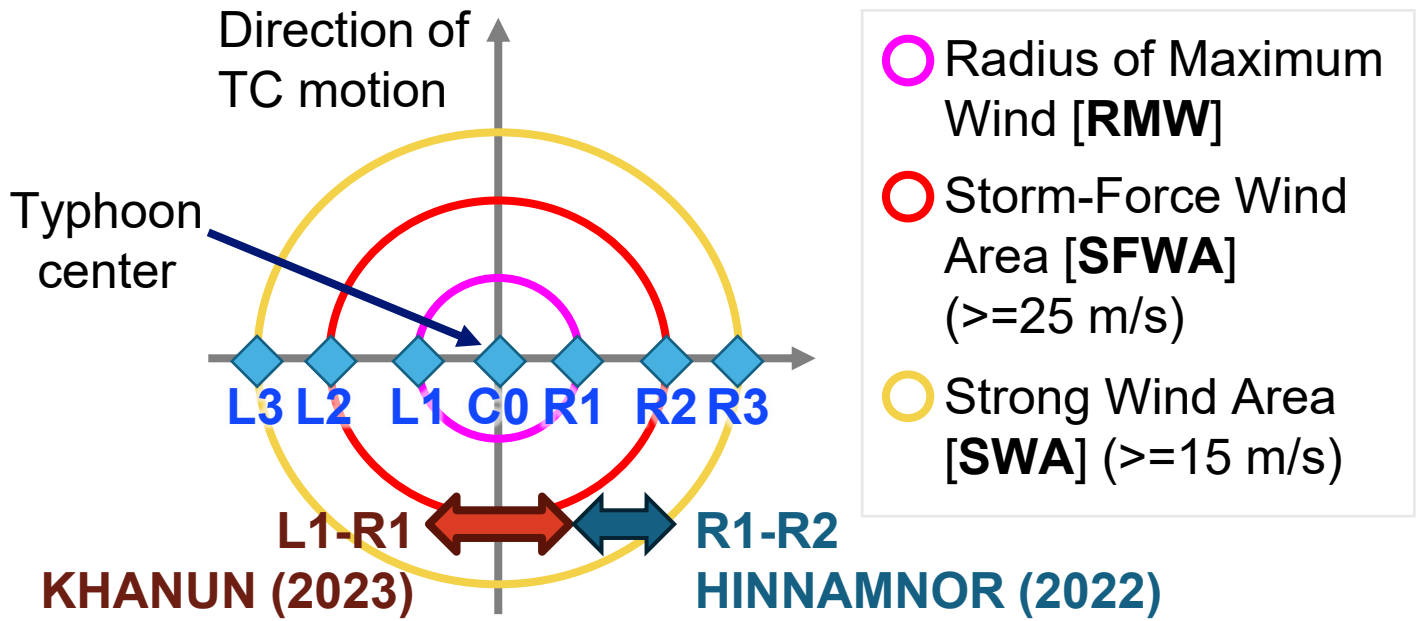
Where should we deploy two ASVs for tropical cyclone observation?

- ASVs can observe tropical cyclones at sea.
- Their mobility is limited, so deployment locations are important.
- We tested all 21 pairs from 7 candidate locations.
- We used OSSEs and evaluated 24-hour forecasts.





OSSE:
Observing System Simulation Experiment



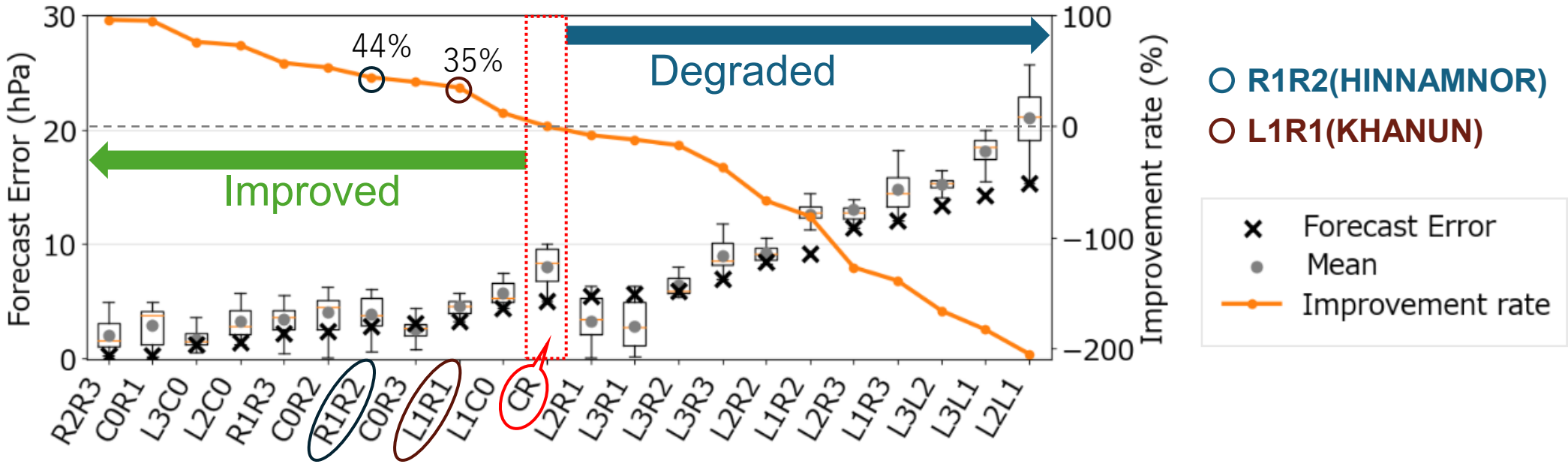
Seven candidate locations: defined using TC track forecast information

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Observation placement strongly affects the forecast

- About half of the configurations improved the forecast.
- Some configurations made the forecast worse.
- L1–R1 produced a wind field closest to the Nature Run.
- Actual KHANUN and HINNAMNOR configurations improved the forecast.

Where we observe matters.



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3.4 Norihisa Usui

Statistical typhoon intensity forecast with oceanic conditions predicted by an ocean model

Norihisa Usui, Munehiko Yamaguchi, Nariaki Hirose, Yosuke Fujii

(Meteorological Research Institute, Japan Meteorological Agency)

TIFS: Typhoon Intensity Forecasting scheme based on SHIPS

- JMA has operated a statistical typhoon intensity forecast scheme called TIFS since March 2019.
- TIFS uses a multiple linear regression model to predicts typhoon intensity up to five days ahead.
- There are 26 predictors including oceanic conditions such as SST and OHC.
- In the operational TIFS, SST and OHC are treated as static; thus, changes in SST and OHC within the 5 days forecast period are not considered.

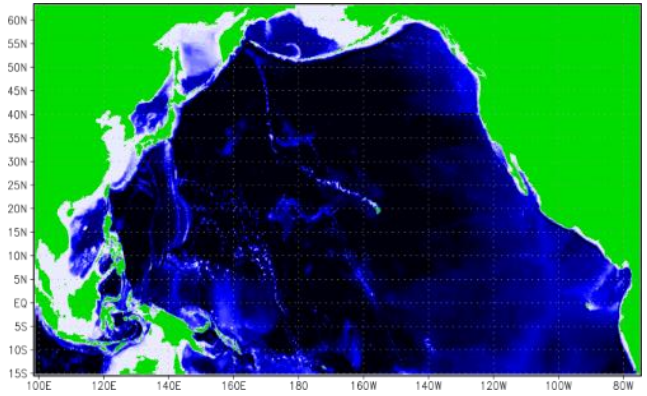
Purpose of this study:

To account for changes in ocean conditions within the forecast period, we utilizes SST and OHC predicted by an ocean model and examine their impact.

Operational Ocean Forecasting System (MOVE-JPN)

- MOVE-JPN includes three component models:
  - Japan area (JPN) model with 2 km resolution
  - North Pacific (NP) model with 10 km resolution
  - Global (GLB) model with 100 km resolution

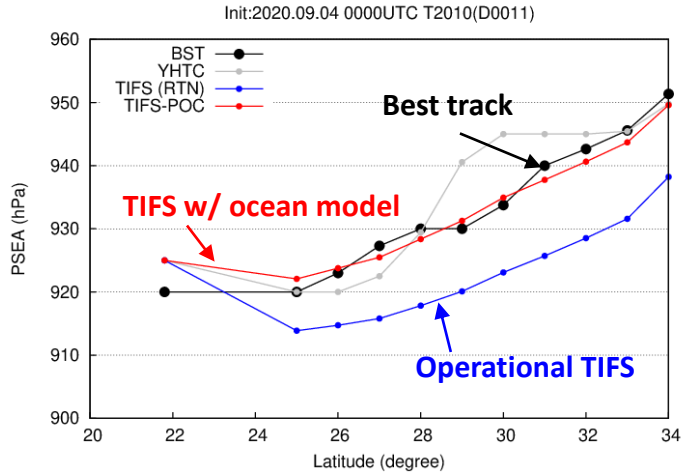
In this study, we utilize SST and OHC predicted by the NP model

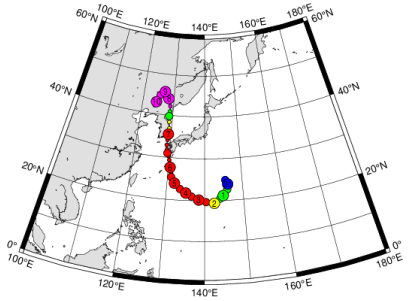


Model domain and bathymetry of the NP model.

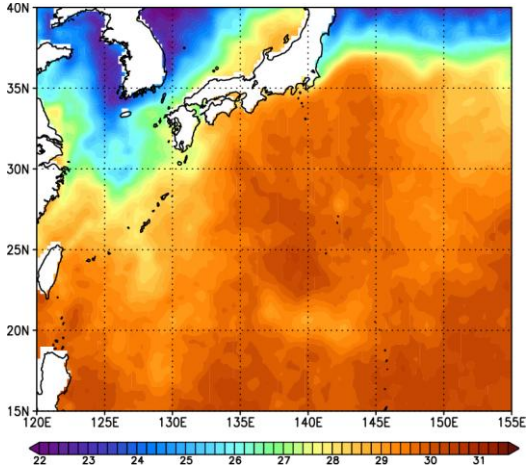
Impact of using ocean-model-predicted SST and OHC on TIFS forecasts

Typhoon HAISHEN in 2020

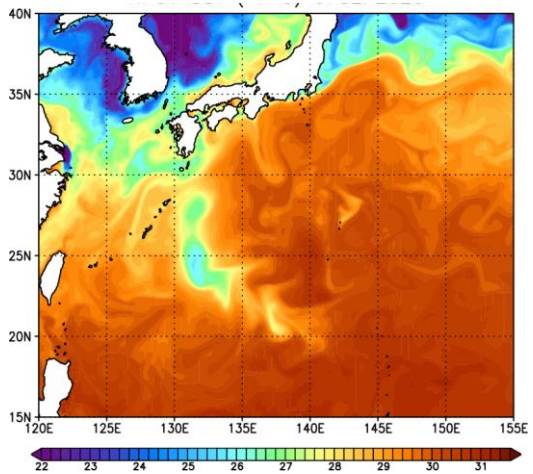




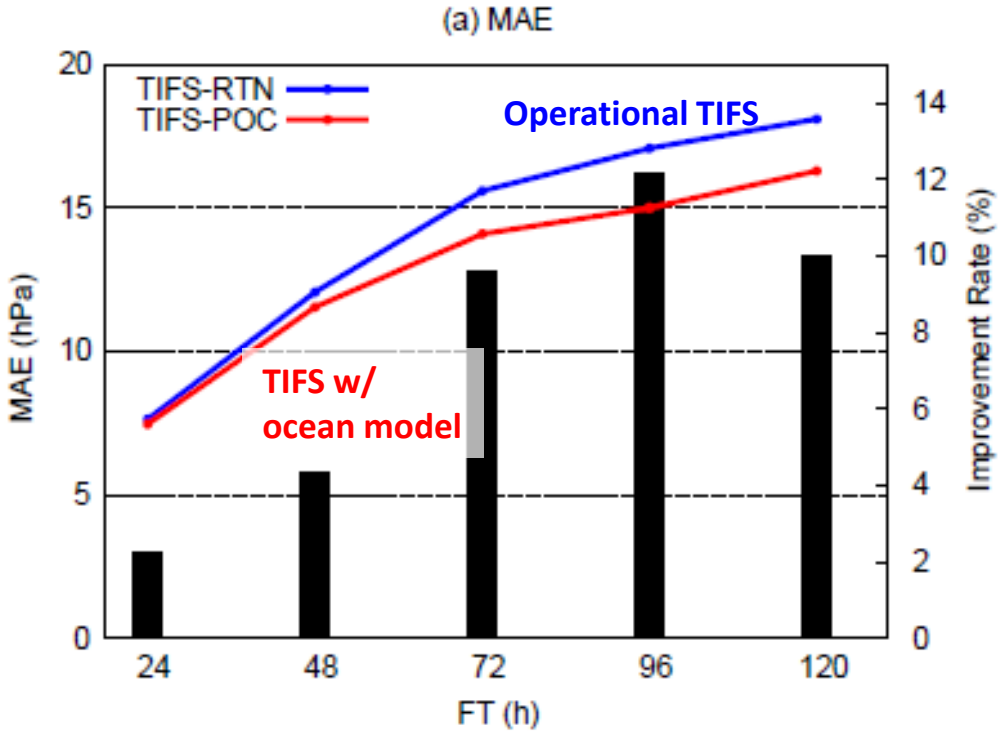
(Persistence) SST
used in operational TIFS



NP model SST



Forecast skill for all typhoons in 2020



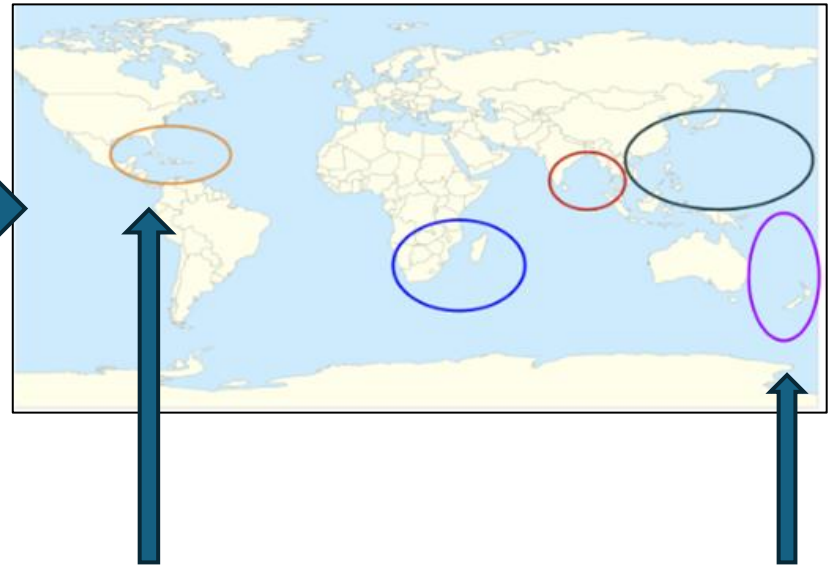
Approximately 10% improvement in forecast skill at 3- to 5-day lead times

Tropical Cyclone Exemplar Pilot Studies in the Caribbean & South Pacific Islands:

GOOS Co-Design Progress within IOCARIBE-GOOS & PI-GOOS

TC Exemplar co-developed Pilot Study Regions (2022):

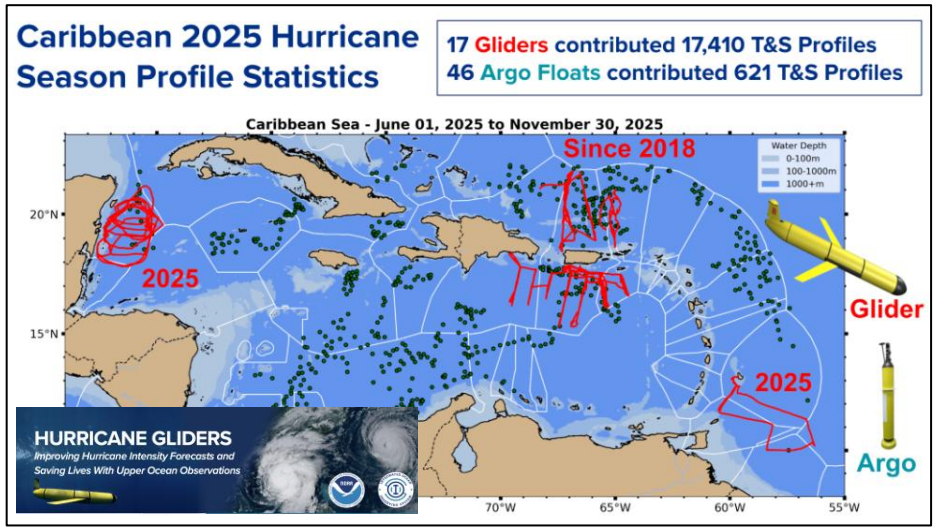
1. Caribbean Sea
2. NPOMS
3. Bay of Bengal
4. SW Indian Ocean
5. South Pacific Islands



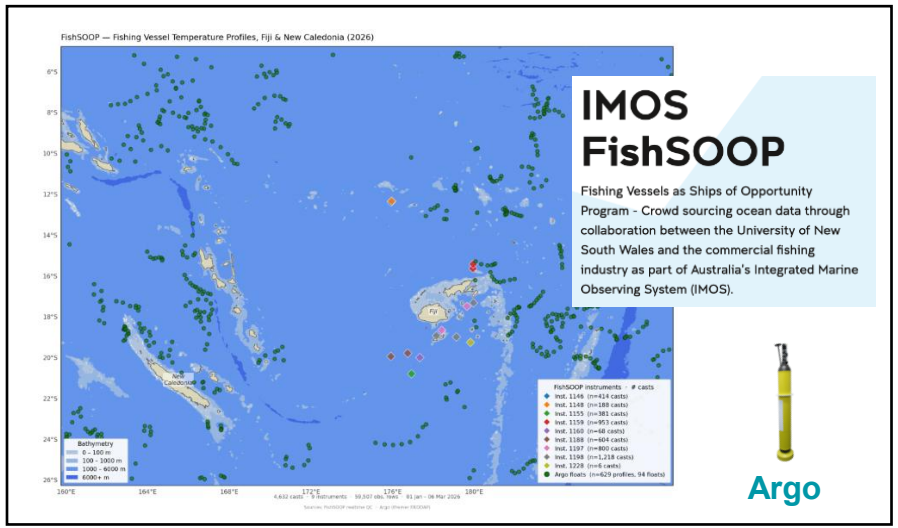
Outcomes (2026):

1. New Caribbean Glider Ports established
2. GOOS RA collaborations established to expand OceanGliders & FVON
3. WMO RA-II, RA-IV & RA-V collaborations established to improve TC forecasts

IOCARIBE-GOOS + IOOS (2022): Argo + Gliders



PI-GOOS + IMOS (2024): Argo + FVON



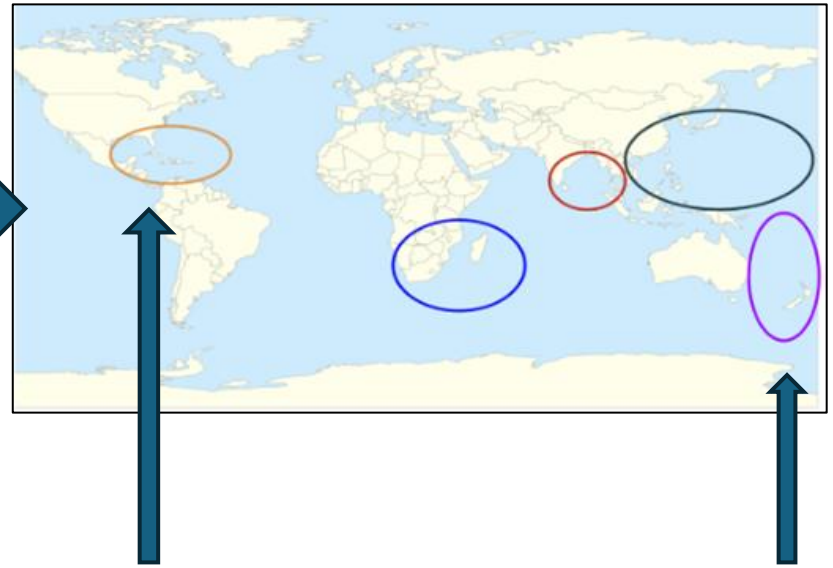
3.5 Scott Glenn

Tropical Cyclone Exemplar Pilot Studies in the Caribbean & South Pacific Islands:

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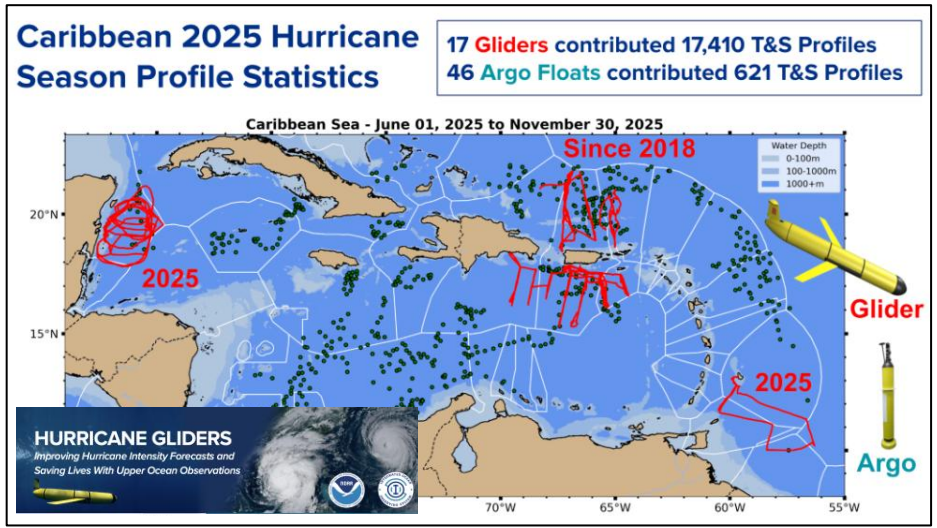
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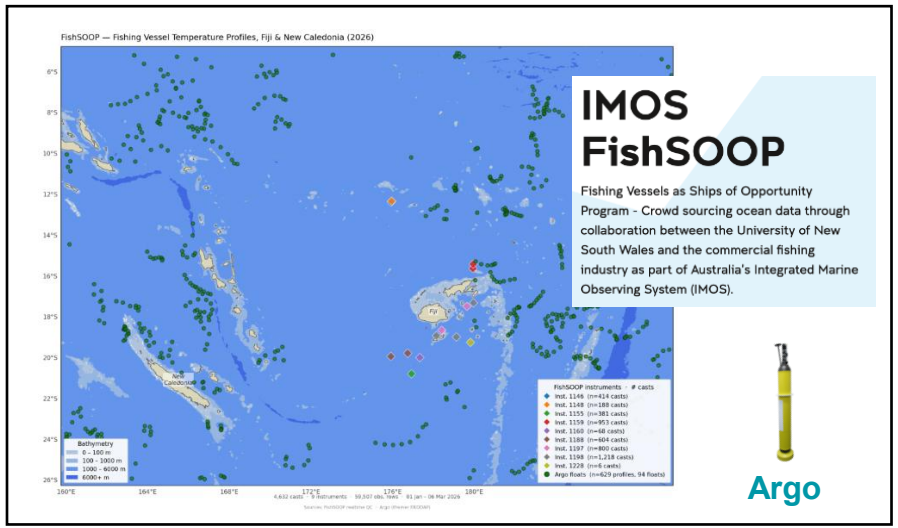
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IOCARIBE-GOOS + IOOS (2022): Argo + Gliders



PI-GOOS + IMOS (2024): Argo + FVON



Flash Talk Session Part 2
Theme 2 & 4

5 talks (theme2) & 1 talk (theme4)

Flash Talk Presenter Guidelines

Bell Signals

- **2:00**:
  30 seconds remaining. Please begin concluding your talk.
- **2:30 II:**
  End of presentation time. Please finish immediately.

On-Deck Speakers

- Please wait near the stage during the presentation prior to yours.
- Ensure a smooth transition by moving promptly when called.

Remote Presenters

- Slide advancement will be operated by the **LOC** (Local Organizing Committee).
- Please provide a clear verbal signal (e.g., *"Next slide, please"*) when ready to advance.