

Sail for Science



Igor Shkvorets

Presentation at the Shelter Bay Marina on 15th May 2026

Citizen science project “Sail for Science”



www.sailforscience.com

Our mission:

- To collect high-quality oceanographic data using a CTD measuring system aboard a low-carbon, wind-powered sailboat, ensuring rigorous quality control and submitting these data to recognized ocean data repositories.
- To empower the global cruising-sailor community to participate in ocean observation by sharing knowledge through our website, public presentations, and onboard workshops.

The activity of the Sail for Science project was endorsed by the UN Decade of Ocean Science for Sustainable Development



2021 United Nations Decade
2030 of Ocean Science
for Sustainable Development

Who we are

We are Igor Shkvorets and Iryna Troshyna — a couple of retired Oceanologists who have been sailing through life together since our university days. We both graduated from the Odesa Hydrometeorological Institute (Ukraine, USSR) with degrees in Engineer-Oceanologist. Soon after, we married and settled in Sevastopol, Crimea, Ukraine, where we began our scientific careers: Igor at the Marine Hydrophysical Institute, and Iryna at the Institute of Biology of the Southern Seas. There, we measured and scaled the physics and biogeochemistry of the ocean — and discovered our shared fascination with its endless horizons for study and exploration. At the turn of the century, we decided to change course completely and move to Canada. We were fortunate to join RBR Ltd., a company that designs and builds oceanographic instruments where we took part in developing, calibrating, and testing advanced high-accuracy oceanographic measuring systems. Sailing is our passion, so we bought 25-foot sailing boat and became members of the Nepean Sailing Club. Starting from zero knowledge about sailing, we have been sailing for 20 years and won 6 trophies in the club races.

Our other passion is traveling and trekking, which lead us to the peaks of Kilimanjaro and Cotopaxi. We visited many countries, especially in Latin America, sailed the Caribbean Sea on chartered sailboats, and always took RBR measuring instruments with us. After two decades we came to another turning point. Life, we realized, is finite — and our dreams should not wait. So, we traded the comfort of home for the freedom of the open sea, embarking on a voyage aboard SV Oceanolog. The question was how to leave behind a beloved profession, stay useful, and remain free. The answer came naturally: **Sail for Science!**



SV Oceanolog

**Built: 1966 by the Cheoy Lee Shipyard,
Hong Kong**

Design: Gulf40 by William Garden

Rig: Long-keeled Bermuda sloop

Length: 40 feet

Breadth: 11.2 feet

Draft: 6 feet 3 Inches

Weight: 9.66 net ton

Engine: Perkins 4.108 diesel

**Electronics: Raymarine Axiom+9, Wind
instrument i60, Radar Quantum, AIS**

Power: Solar 700W, 1kW DC/AC

Communication: VHF Ray70, Starlink

Accommodation: Sleeps 6



RBR*concerto*³CTD

Specifications:

Conductivity

Range 0-85mS/cm
Initial accuracy ± 0.003 mS/cm
Resolution 0.0001mS/cm
Typical stability
0.010mS/cm/year

Temperature

Range -5°C to 35°C
Initial accuracy $\pm 0.002^{\circ}\text{C}$
Resolution 0.00005°C
Typical stability $0.002^{\circ}\text{C}/\text{year}$

Pressure

Range 0-2000 dbar
Initial accuracy ± 1 dbar
Resolution 0.02 dbar

Axillary sensors:

Dissolved Oxygen (RBRcodaODO)

Range: 0-500uM/L (0-120%)
Accuracy: ± 8 uM/L or $\pm 5\%$

Backscatter (RBRtridente)

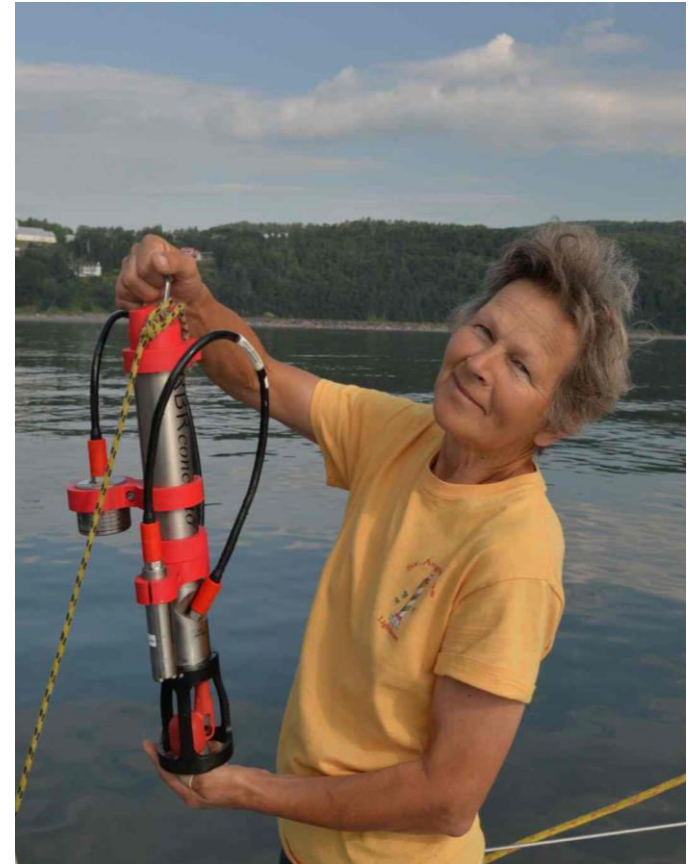
Range 0-0.05 $\text{m}^{-1}\text{sr}^{-1}$, Accuracy $\pm 5\%$

Chlorophyll a (RBRtridente)

Range 0-50ug/L, Accuracy $\pm 5\%$

fDOM (RBRtridente)

Range 0-500ppb, Accuracy $\pm 5\%$



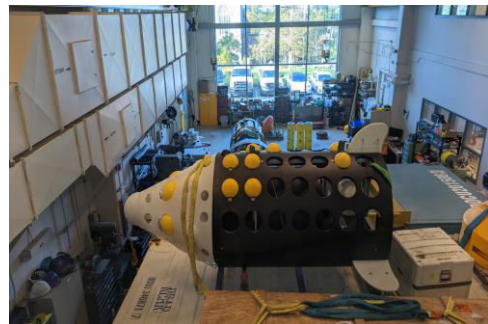
Our Path from Ottawa to Panama

July 2023 – July 2025

- More than 7 thousand miles sailed
- 22 countries visited
- 260 CTD casts and moorings performed
- 88MB of data for 7 EOVs collected and submitted to the ocean data repositories
- 1 ARGO float deployed
- Hurricane Beryl monitored



Visiting Ocean Research Centers



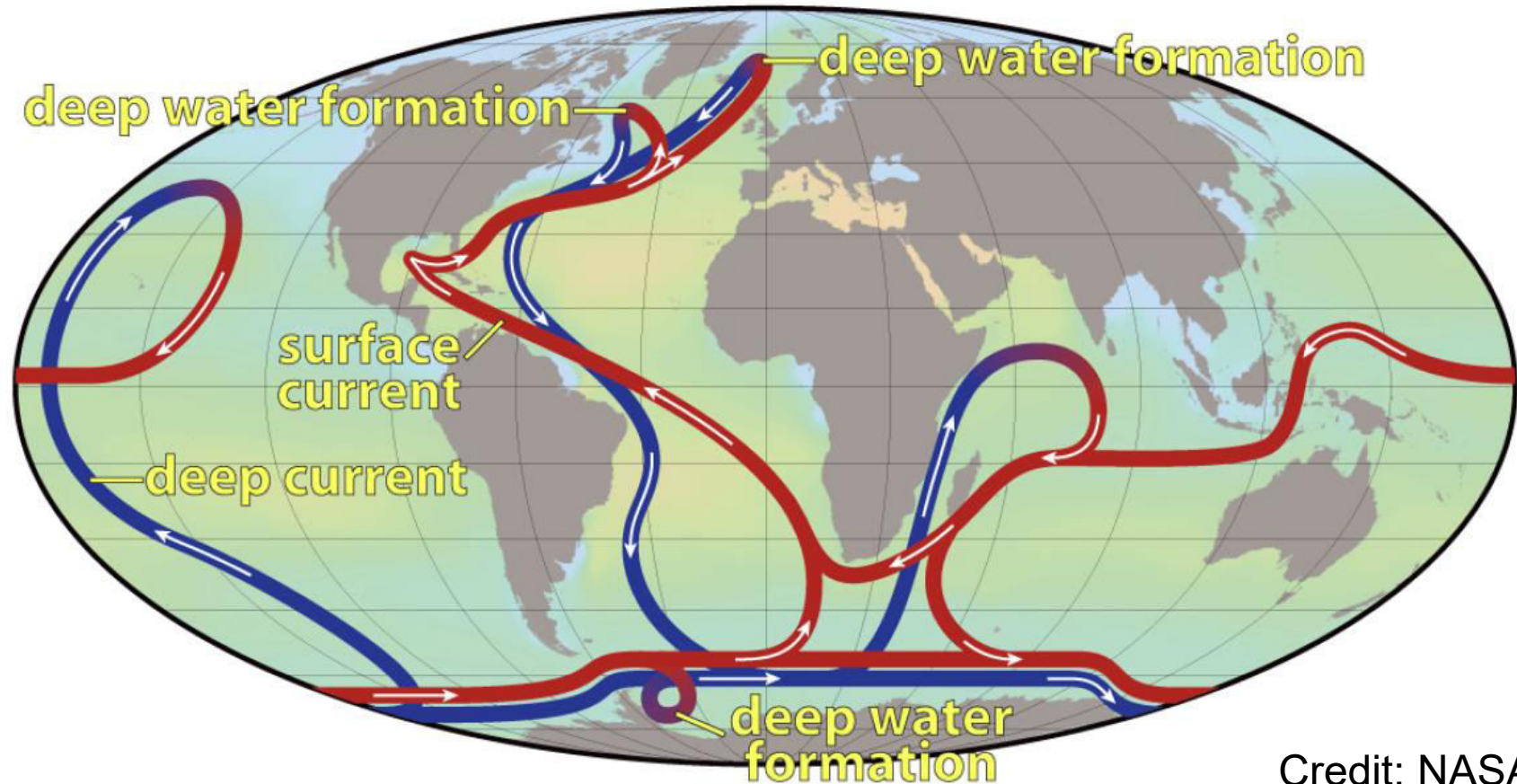
Why are temperature and salinity data important?

Collecting CTD data in oceanography is important for:

- **Understanding ocean circulation**
- **Studying climate change**
- **Monitoring marine ecosystems**
- **Improving weather forecasts**

In summary, temperature, salinity and density data is essential for understanding the complex processes that govern the world's oceans and for predicting how they will change in the future.

The Ocean Thermohaline Circulation (The Global Conveyor Belt)

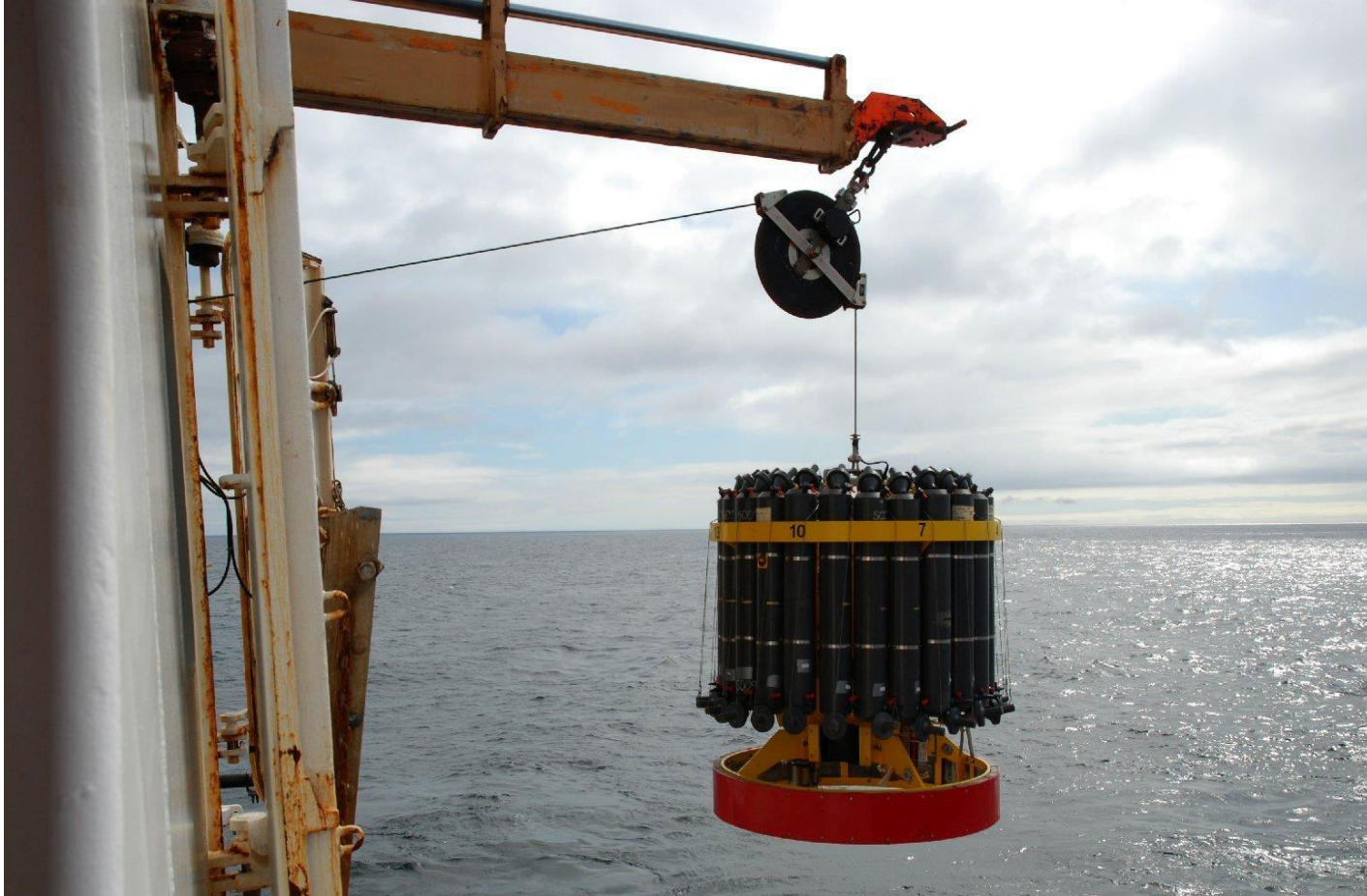


Ocean Observing

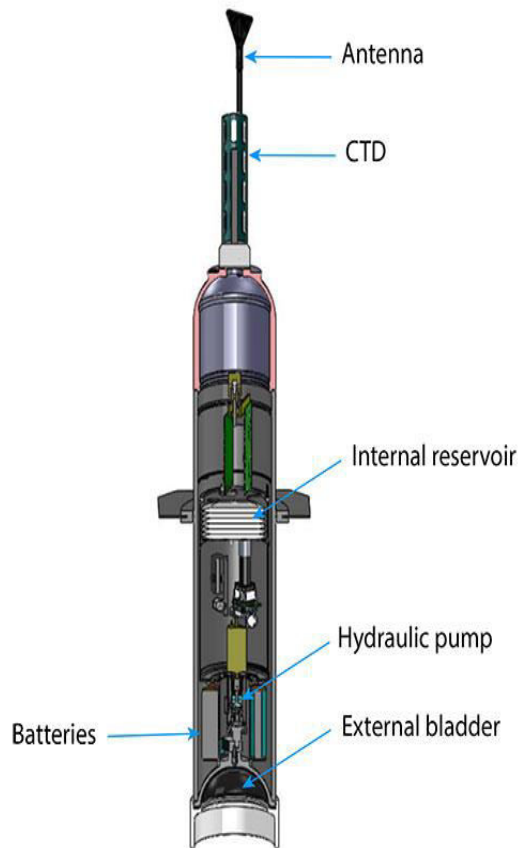


Credit: Ocean Observing Initiative

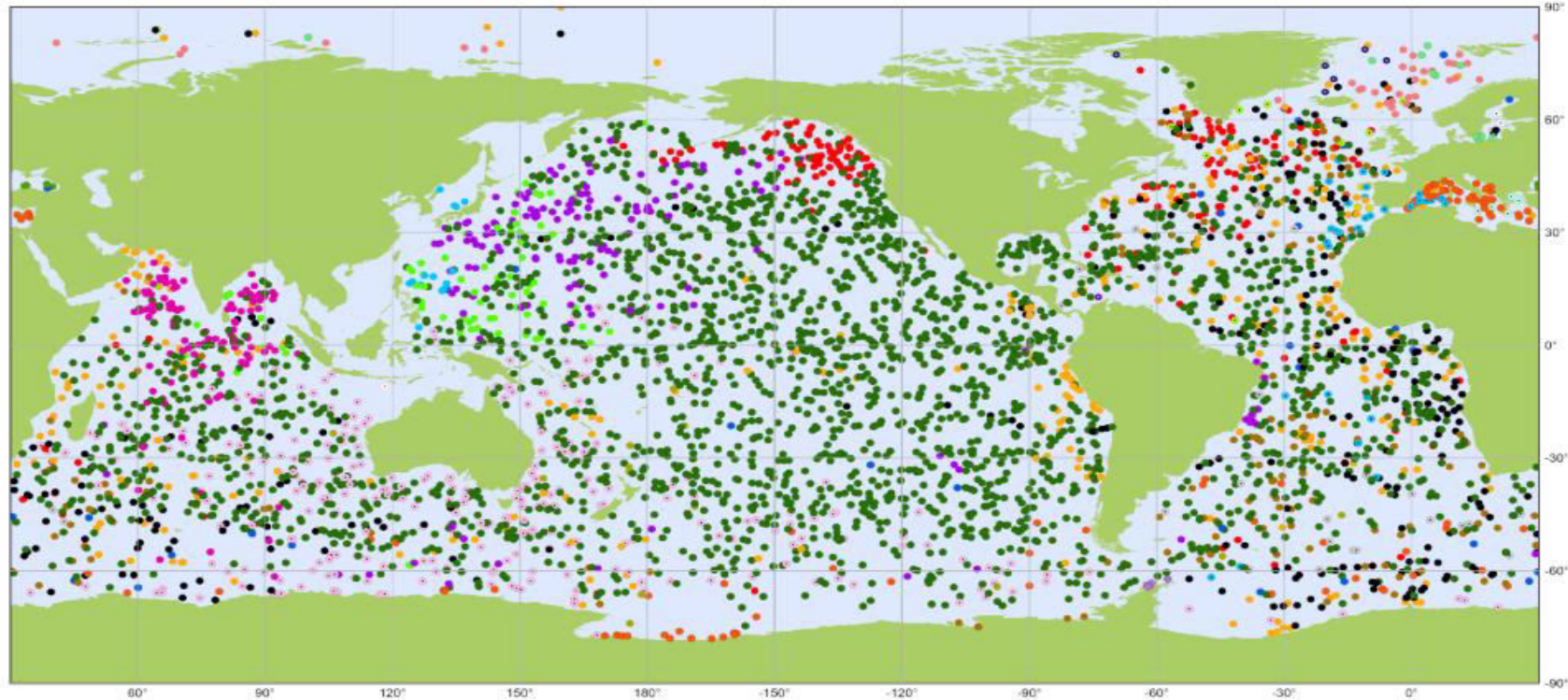
CTD measuring system onboard CCGS Hudson



Argo floats – “Sea-work-horses” for collection of oceanographic data



The global network of ARGO floats



Argo

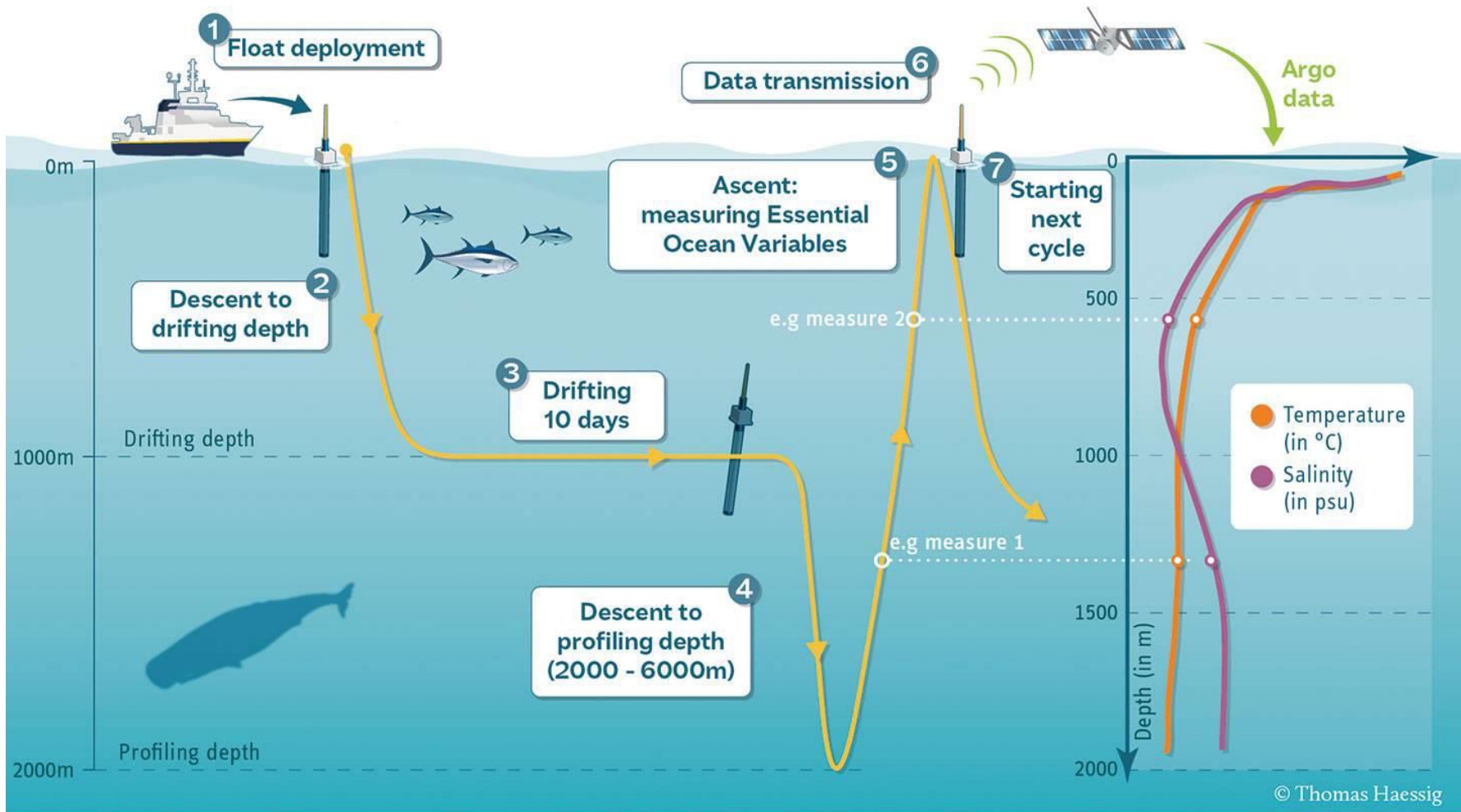
National contributions- 4362 operational floats

April 2026

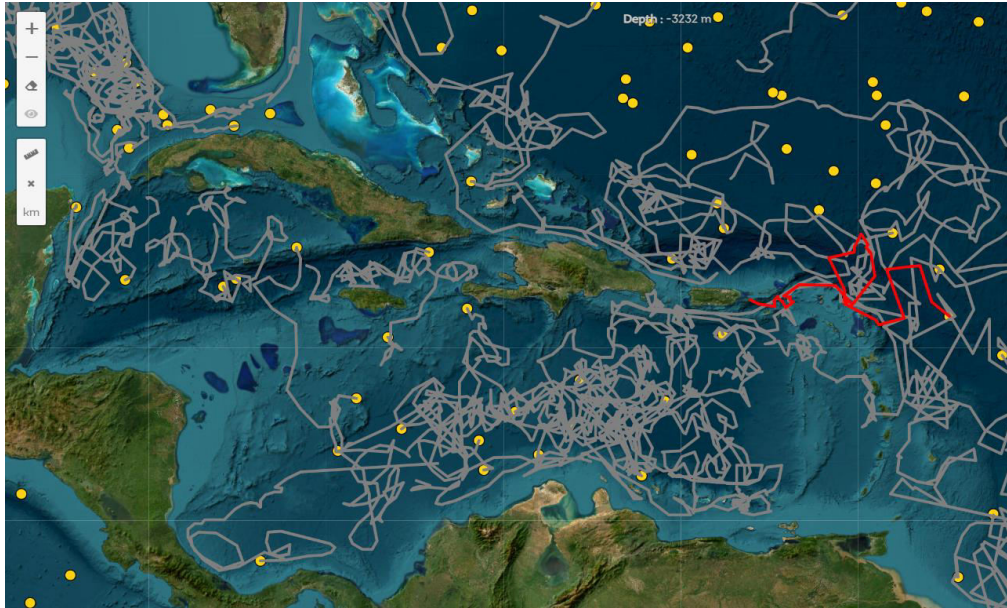
Latest location of operational floats (data distributed within the last 30 days)



ARGO Float Mission



SV Oceanolog and ARGO Floats Tracks Through the Caribbean



Plot of all tracks of ARGO floats around Caribbean Islands well show areas with gaps in ocean data, caused by limitation of parking (drifting) depth in 1000m, set for the floats. In red is the track of ours deployed float

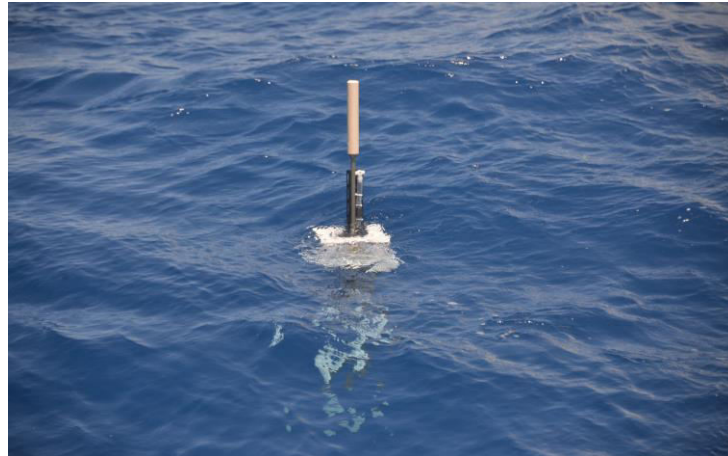


A plot of SV Oceanolog track through the Caribbean with marked points of underway CTD casts to fill in gaps with ocean data.

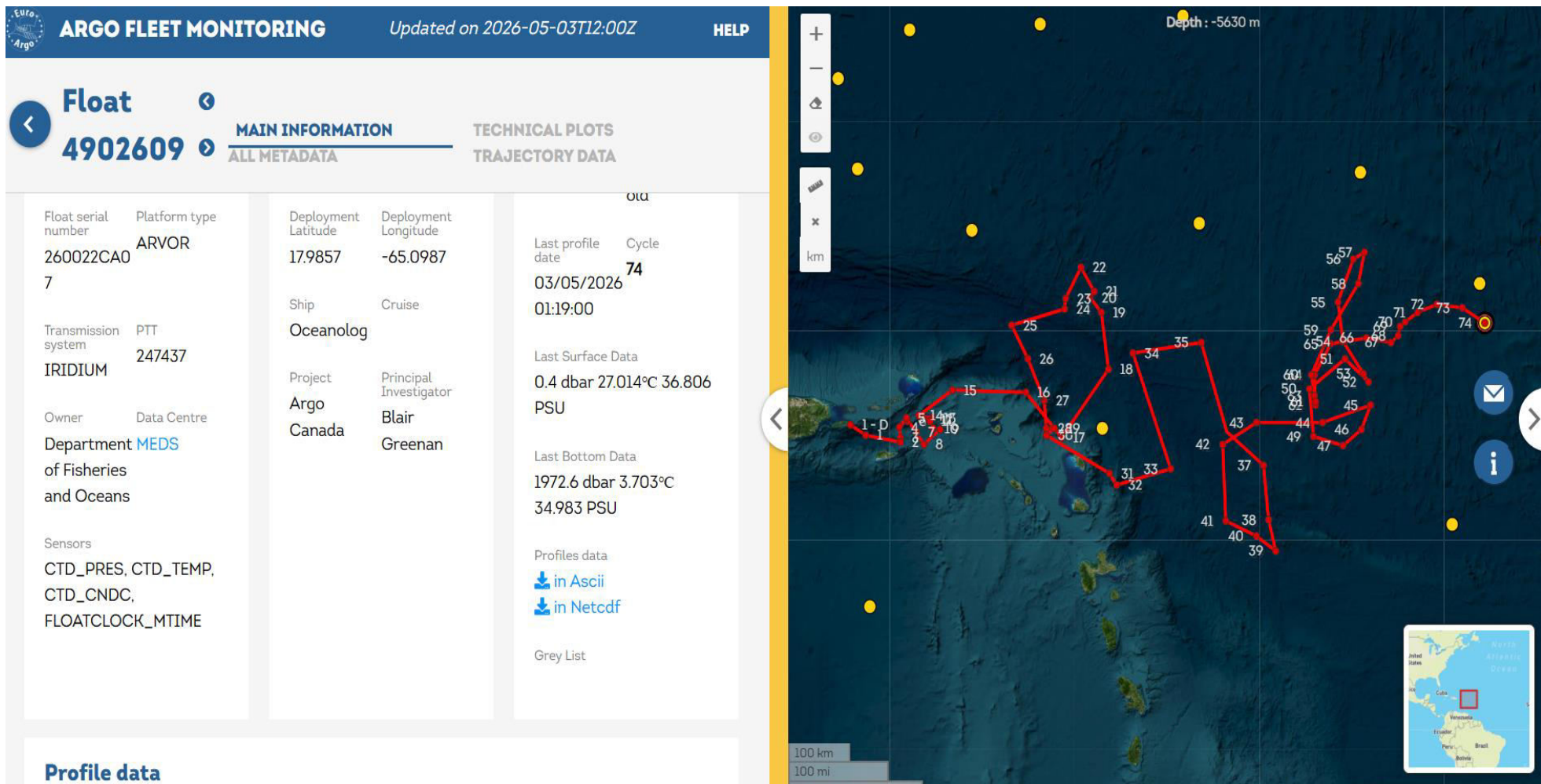
Vendee Globe Race Argo program - NKE floats equipped with RBR argo3CTD



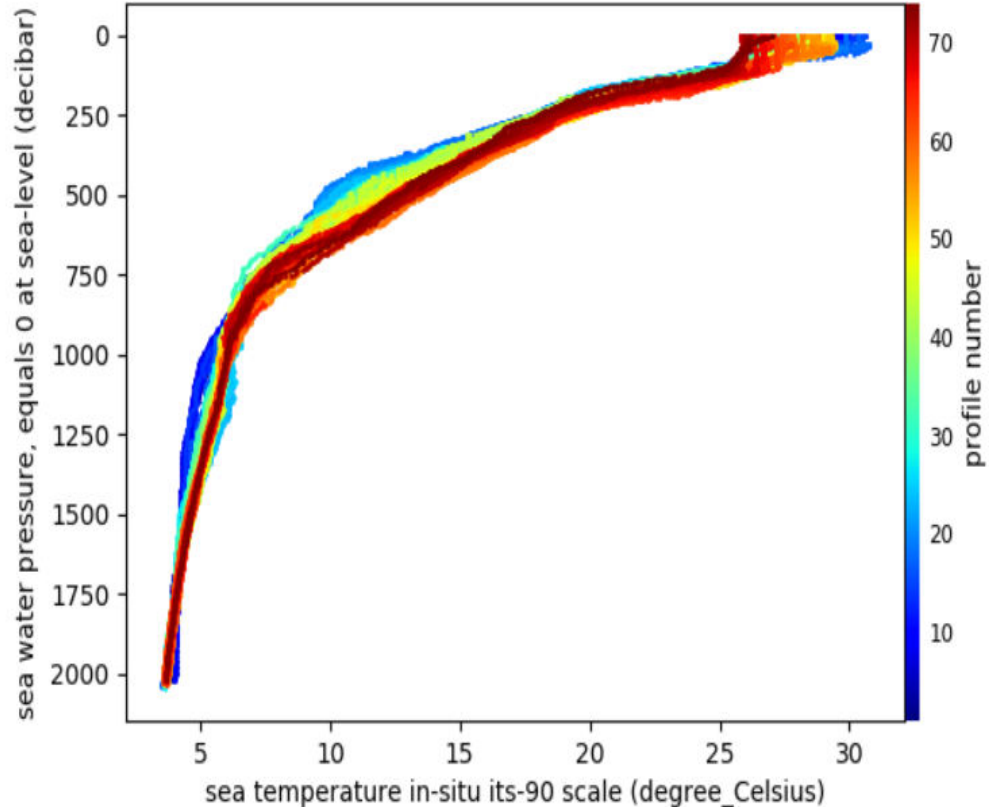
Deployment of ARGO float May, 16th 2024



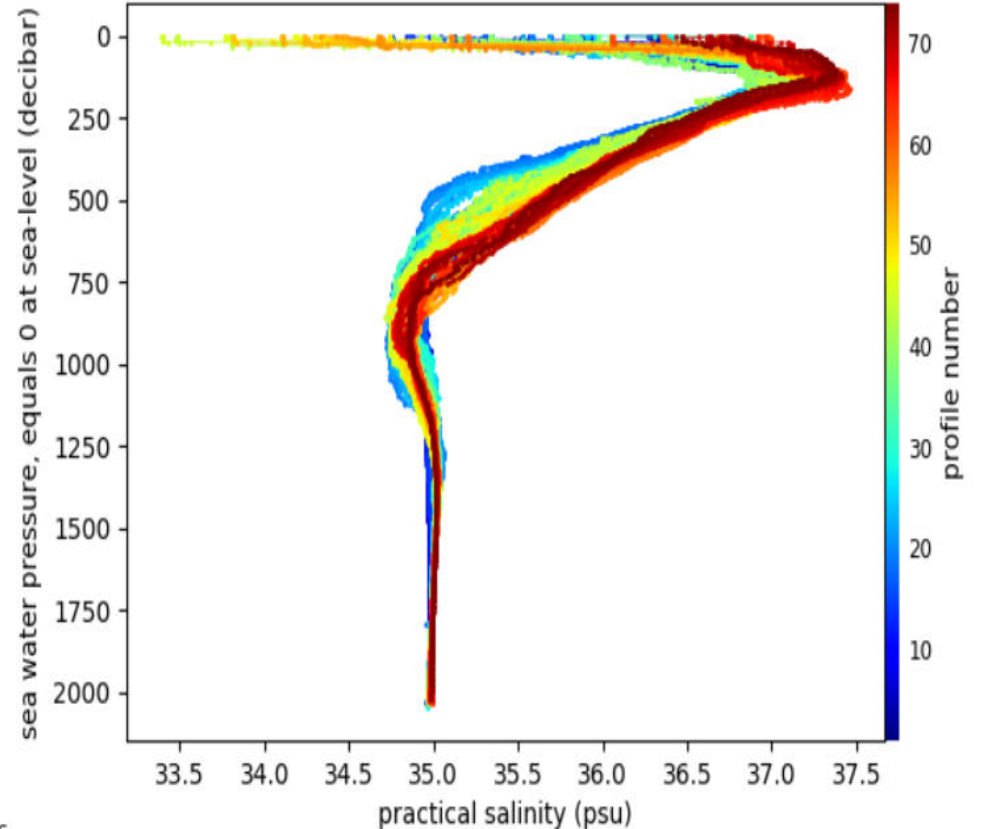
<https://fleetmonitoring.euro-argo.eu/float/4902609>



Temperature and Salinity Data from ARGO Float #4902609



© coriolis data centre - 03/05/2026



© coriolis data centre - 03/05/2026

CTD casts on moorings

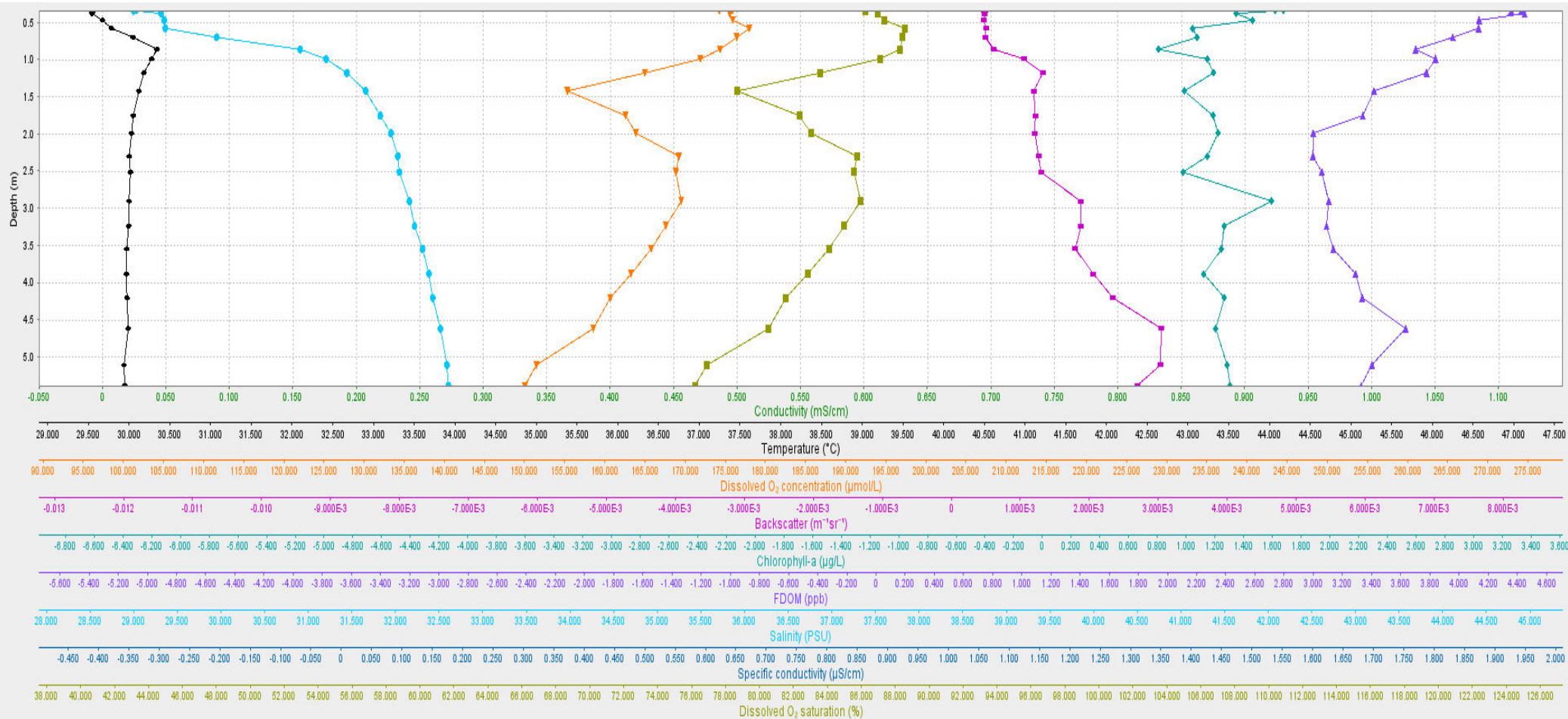


CTD cast in the Shelter Bay Marina (Panama)



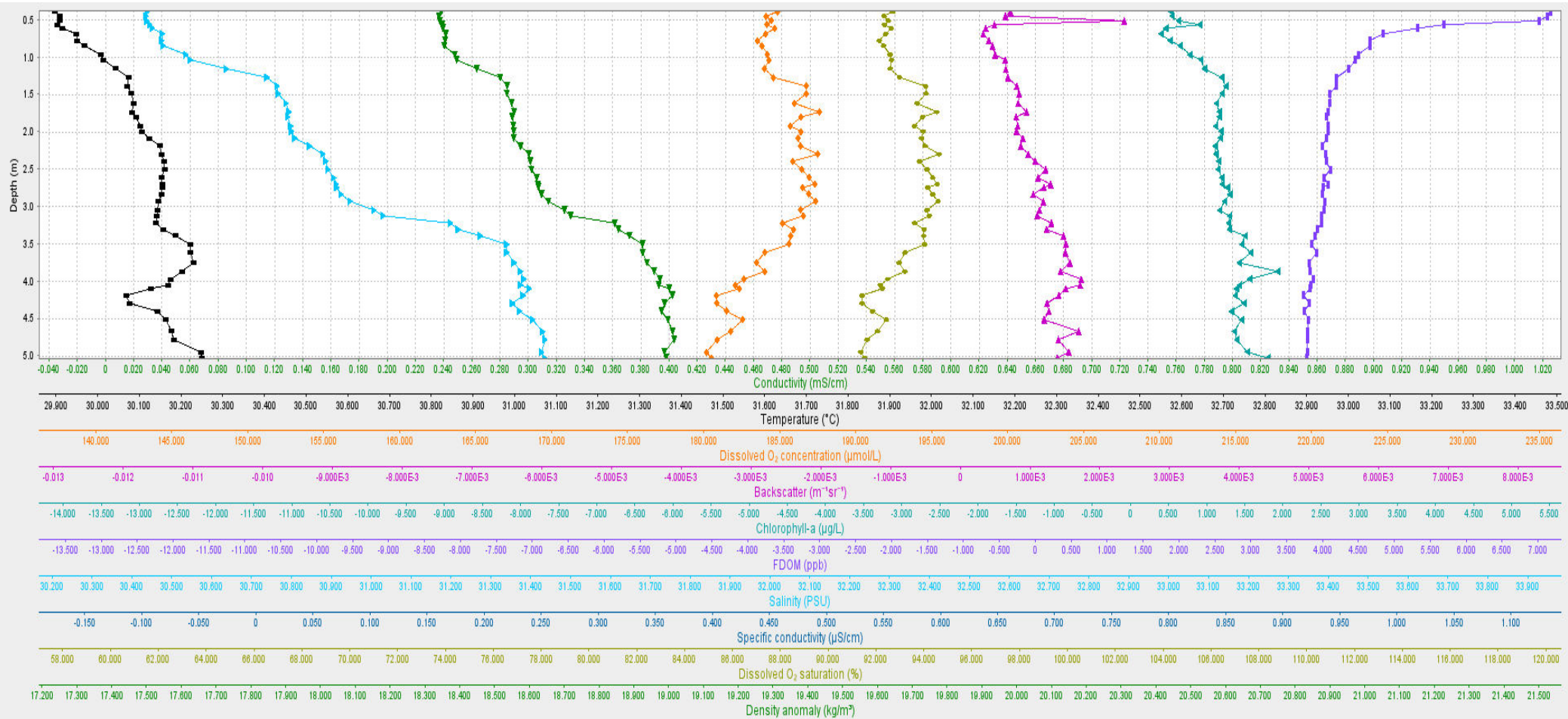
15/05/2025 Plot of the CTD cast data

Panama, Colon, Shelter Bay Marina, dock E38

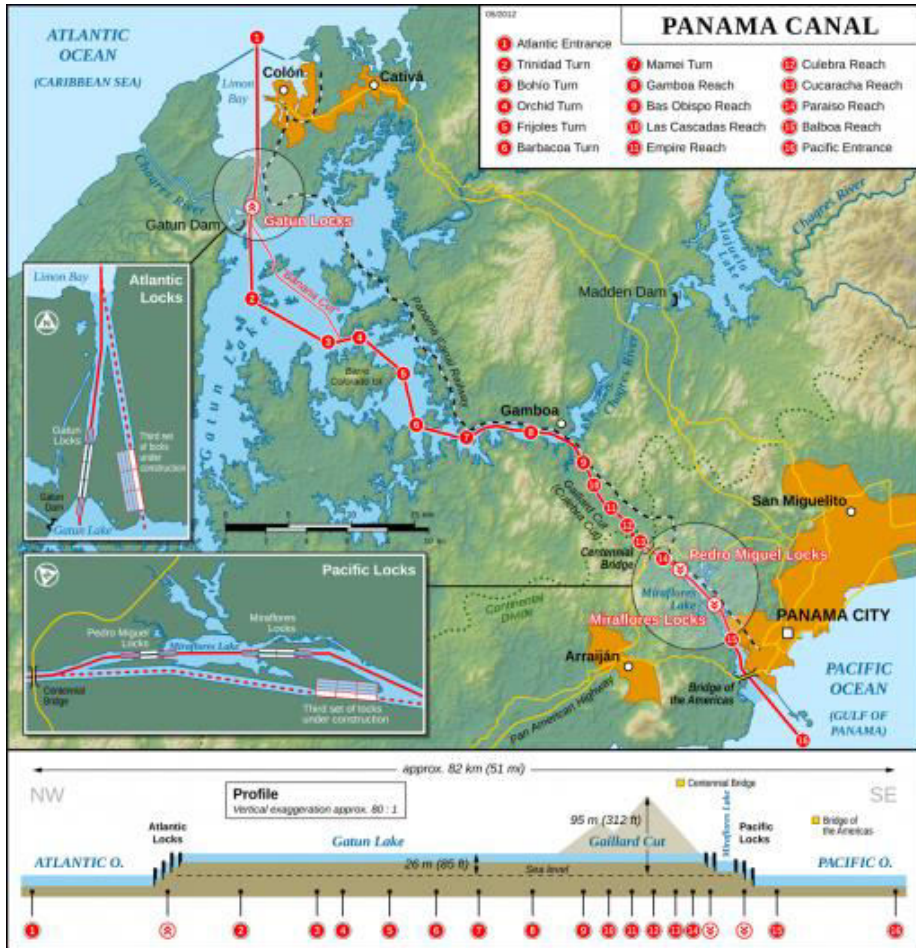


11/05/2026 Plot of the CTD cast data

Panama, Colon, Shelter Bay Marina, dock E40



27/04/2026 CTD casts on the Panama Canal

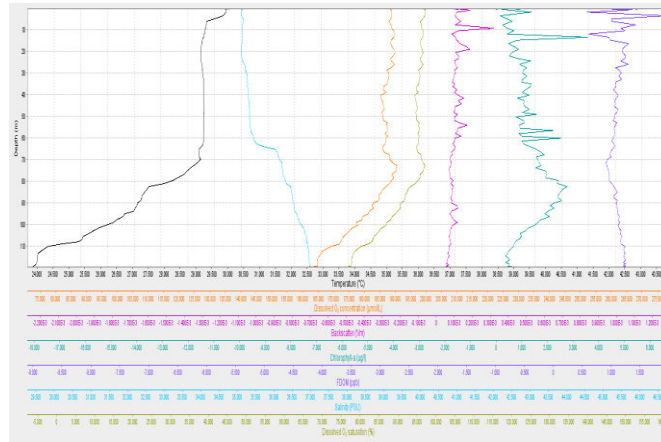


Panama Canal Oceanographic Survey

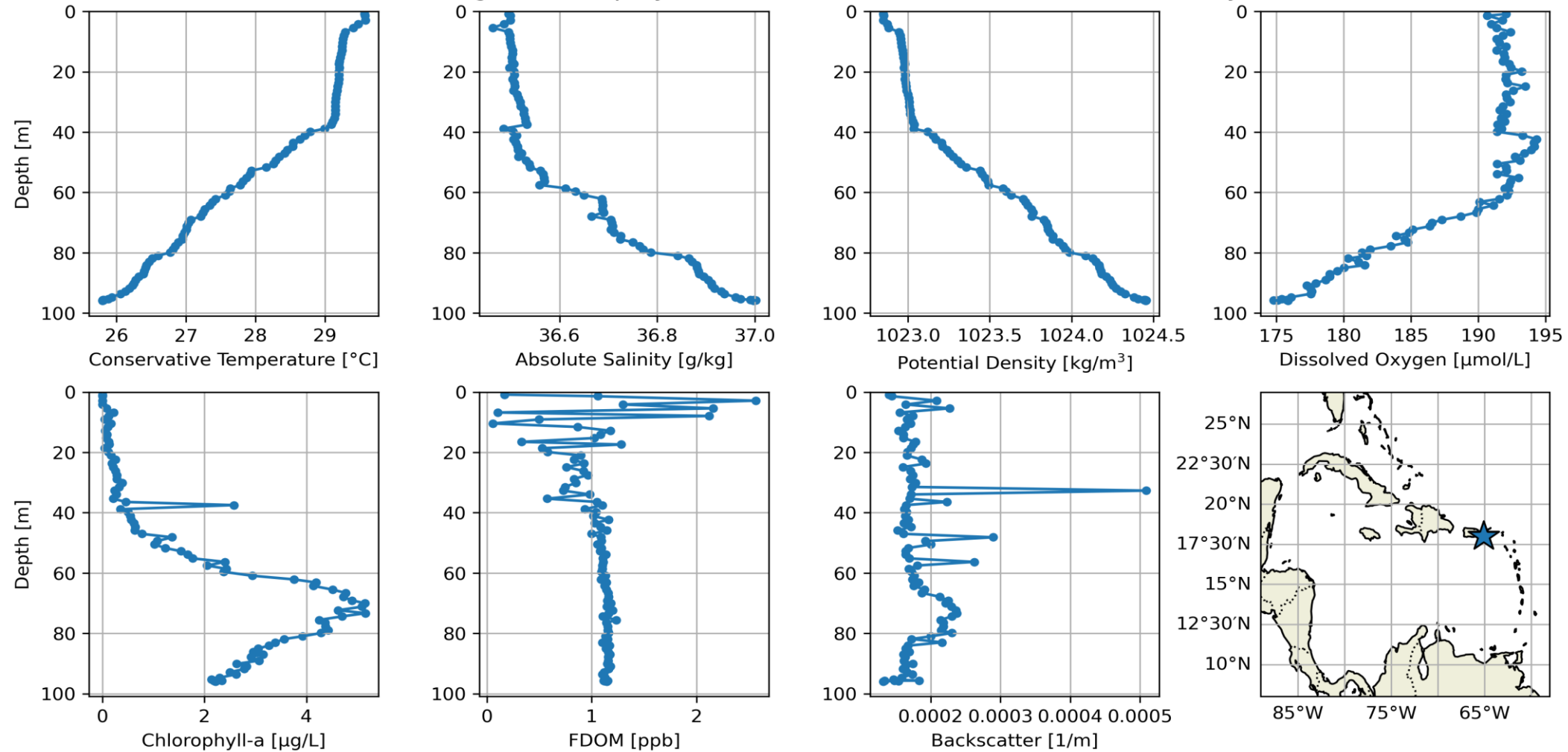
27 April 2026 “Sail for Science” Project, SV Flying Fish,
RBRconcerto³CTD sn210470

Parameter/Location	Atlantic Ocean	Gatun Locks	P. Miguel Locks	Miraflores Lock1	Miraflores Lock2	Miraflores Lock3	Pacific Ocean
Temperature, degC	28.88	29.61	29.68	29.66	29.51	28.66	27.67
Salinity, PSS-78	28.63	1.06	0.62	1.96	3.13	9.42	31.78
Dissolved Oxygen, uMol/L	181.1	213.6	222.6	220.8	213.2	188.3	222.8
Oxygen Saturation, %	88.2	90.4	94.2	94.1	91.2	82.2	108.3
Backscatter, 1/m*sr	0.0101	0.0034	0.0063	0.0186	0.0192	0.0234	0.0030
Chlorophyll a, ug/L	0.780	0.429	2.877	3.722	3.066	2.557	3.311
FDOM, ppb	3.64	7.31	9.65	10.54	10.37	9.59	3.87

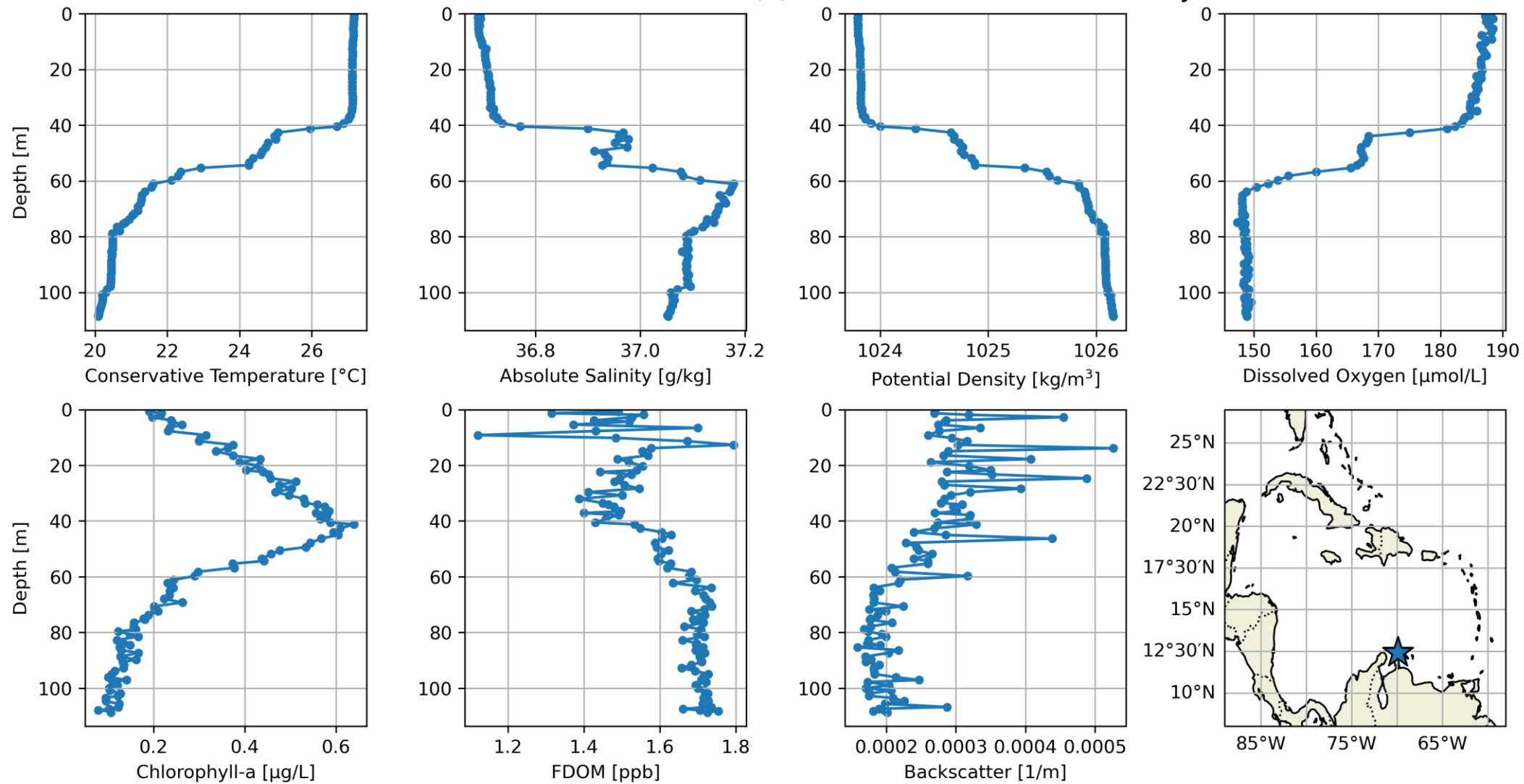
Underway “heaving to” CTD casts



Sail for Science Profiles: Argo float deployment (1) at 17.985°N, 65.098°W on 16 May 2024, 17:22 UTC



Sail for Science Profiles: Aruba, offshore St.Nicolas (1) at 12.417°N, 69.915°W on 31 Jan 2025, 15:09 UTC



Caribbean Through-Flow

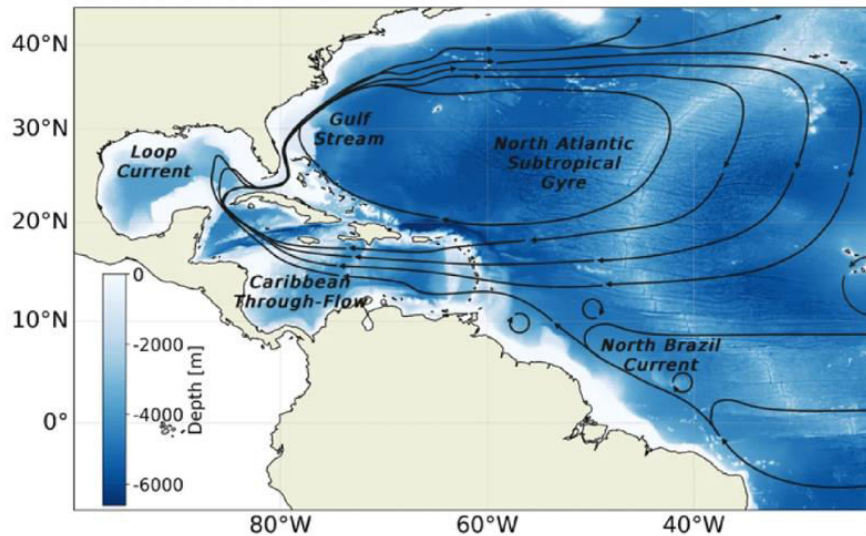


Deep Sea Research Part I: Oceanographic
Research Papers

Volume 225, November 2025, 104581

Westward modification of Caribbean through-flow water mass structure

Joseph C. Gradone ^a ✉, W. Douglas Wilson ^b, Scott M. Glenn ^a, Travis N. Miles ^a

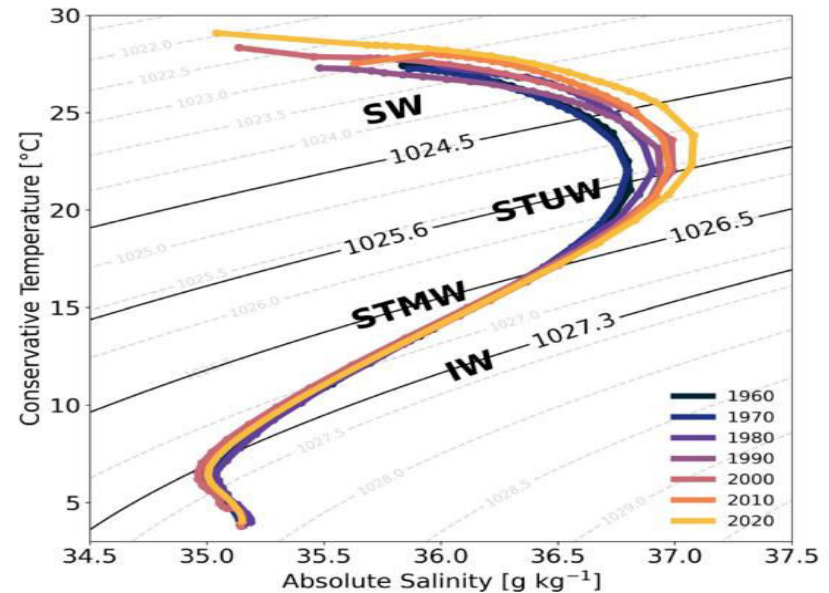


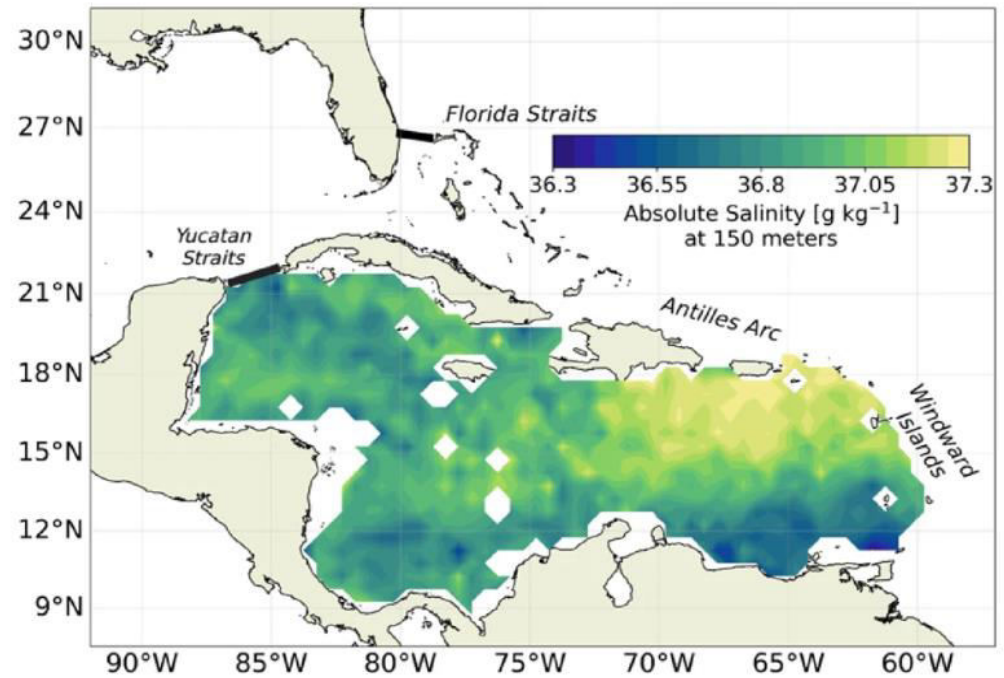
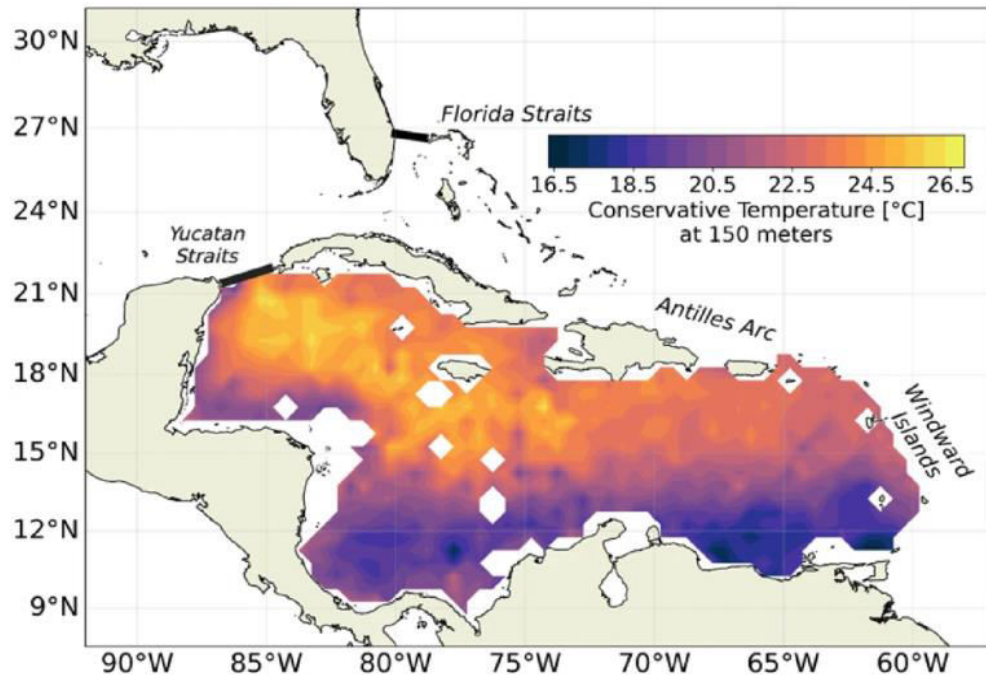
Article | [Open access](#) | Published: 02 July 2025

Warming and salinity changes of the upper ocean Caribbean through-flow since 1960

[Joseph C. Gradone](#) ✉, [T. N. Miles](#), [J. B. Palter](#), [S. M. Glenn](#) & [W. D. Wilson](#)

[Scientific Reports](#) 15, Article number: 23157 (2025) | [Cite this article](#)





*"These findings highlight the CTF as a bottleneck for climatically important water masses and **emphasize the need for sustained subsurface observations here.**"*

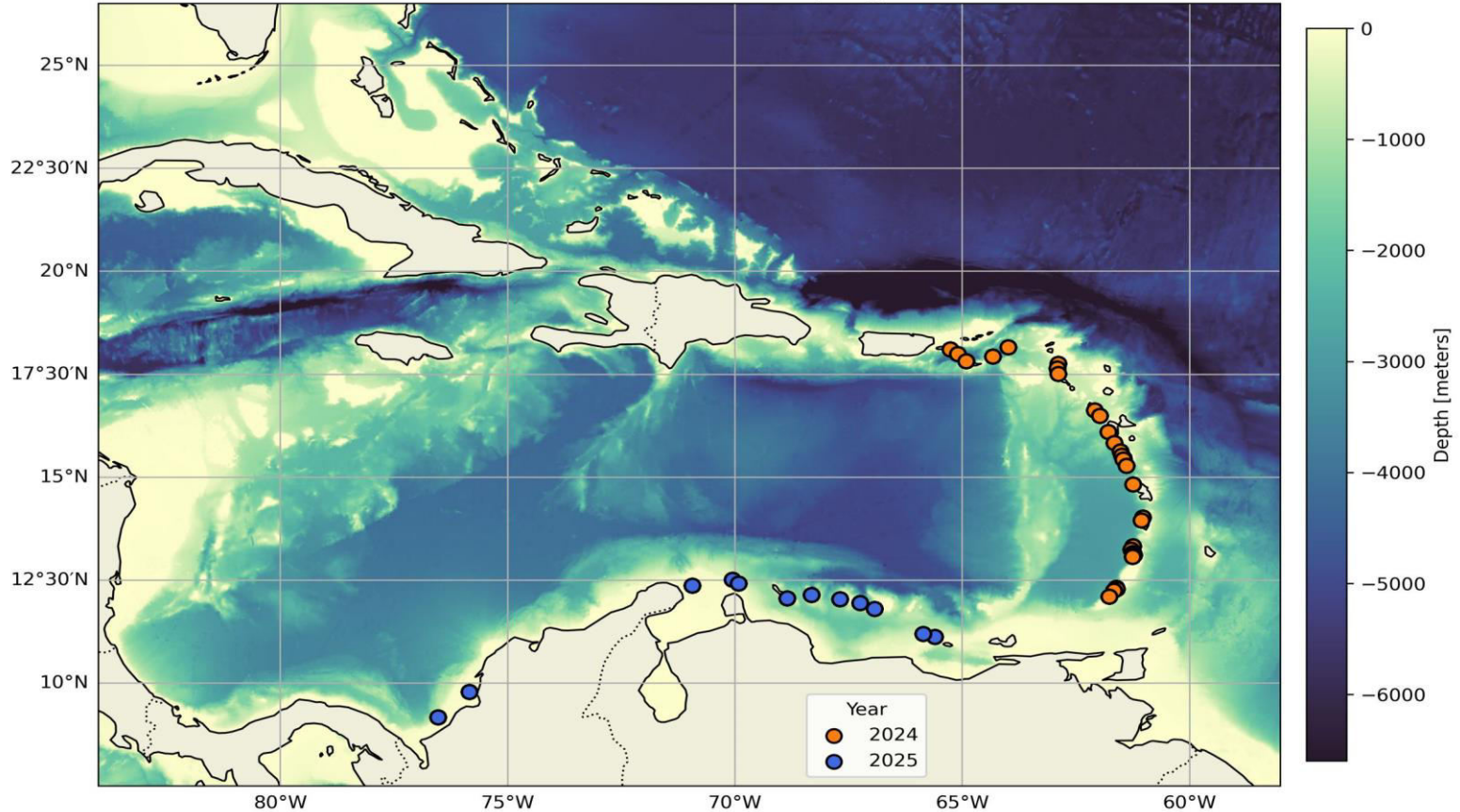
Joe Gradone, RUCOOL

• “Enjoying looking at this data!”

• Joe Gradone, Ph.D., Assistant Research Professor

• Center for Ocean Observing Leadership, Rutgers University

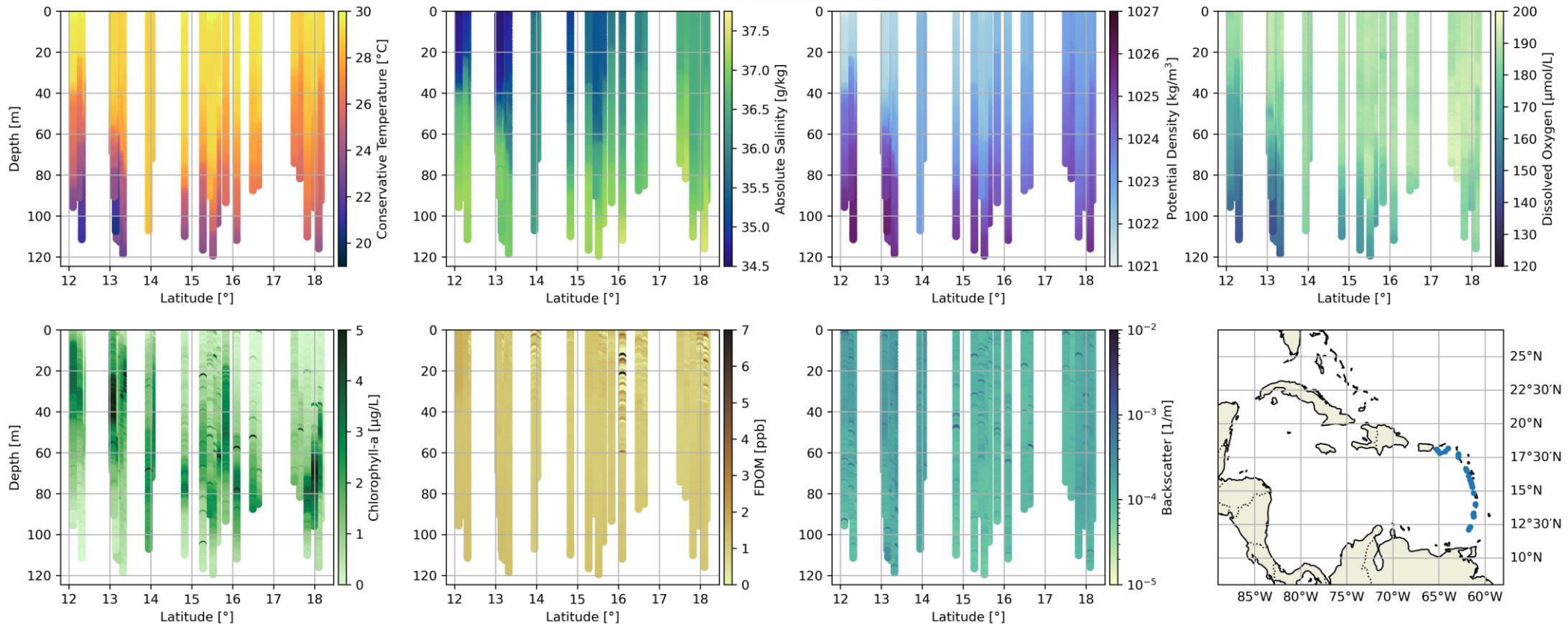
Sail for Science 2024-2025 Sampling Locations



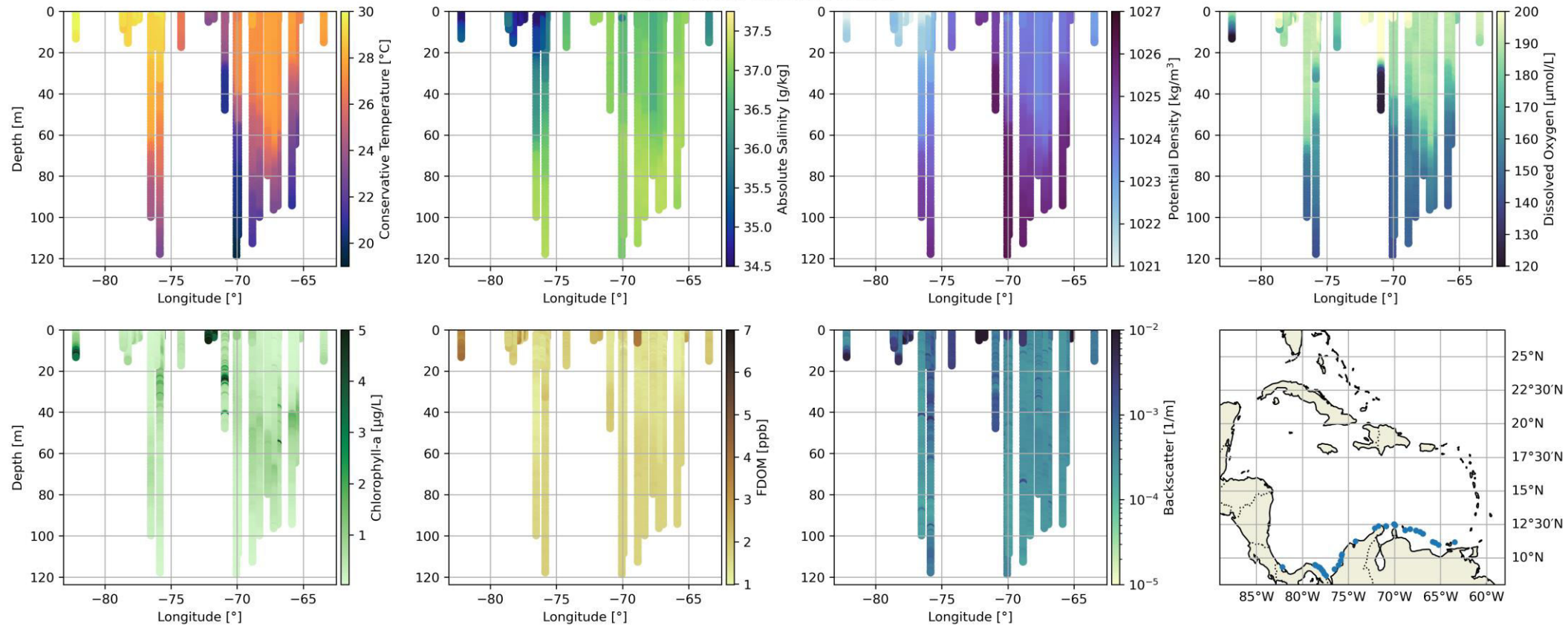
Caribbean Sea meridional CTD profiles

Sail for Science-2024

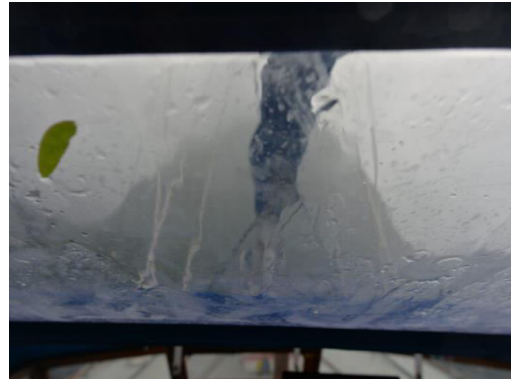
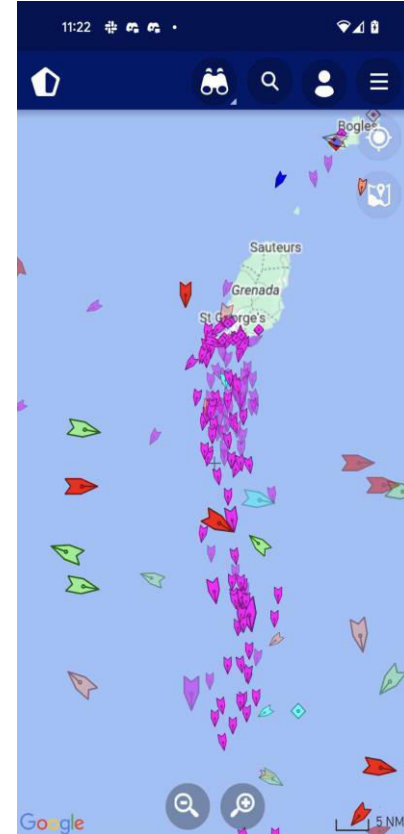
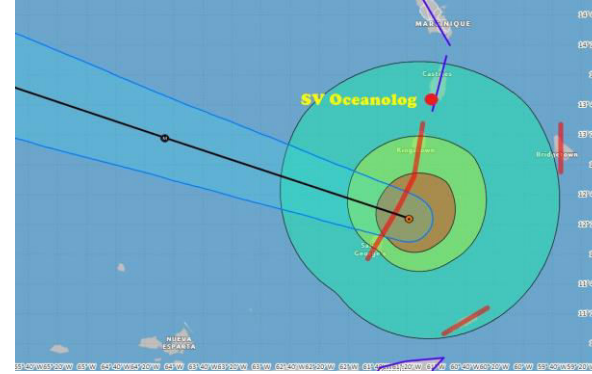
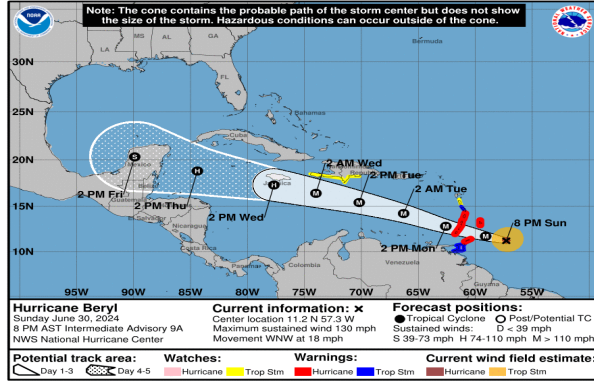
2024 Sail for Science Profiles



2025 Sail for Science Profiles



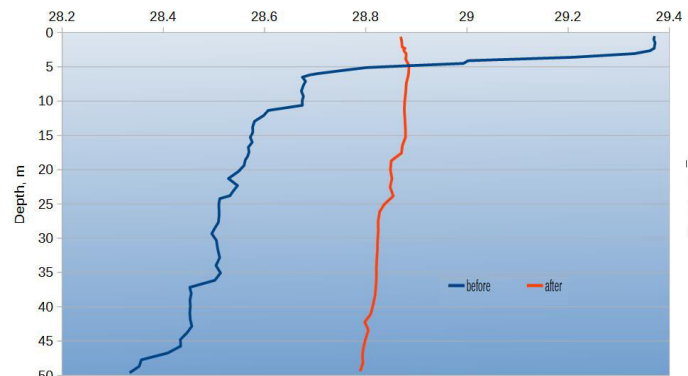
Surviving and monitoring Hurricane Beryl



CTD cast near Petit Piton, Saint Lucia before and after passing Hurricane Beryl

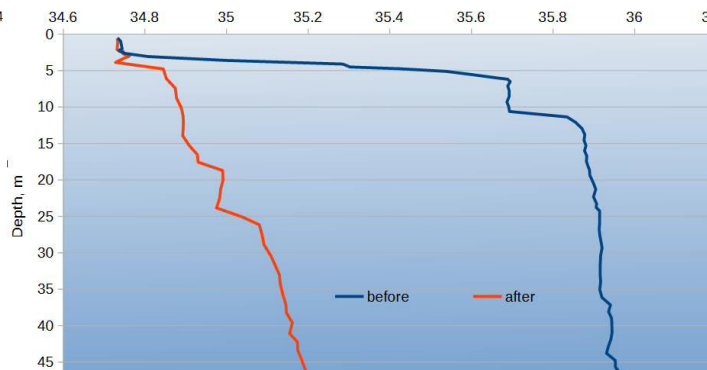
Temperature profiles near Petit Piton, Saint Lucia before and after hurricane Beryl

Temperature, ITS-90



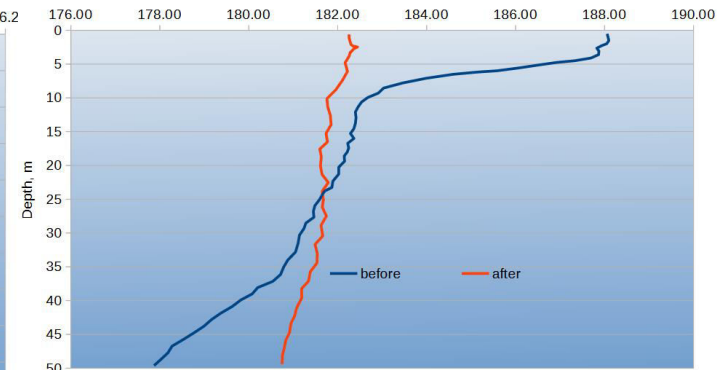
Salinity profiles near Petit Piton, Saint Lucia before and after hurricane Beryl

Salinity, PSS-78



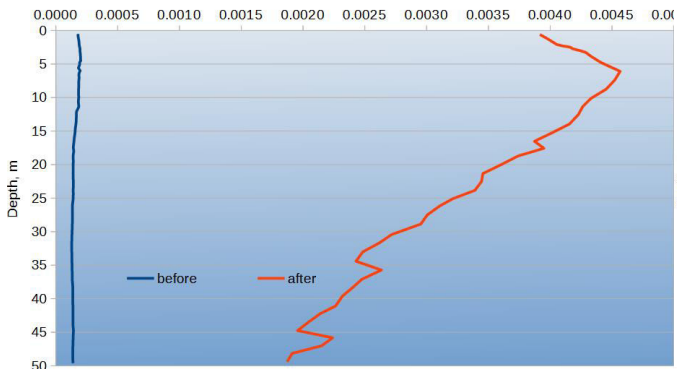
Dissolved Oxygen profiles near Petit Piton, Saint Lucia before and after hurricane Beryl

Dissolved Oxygen, uMol/L



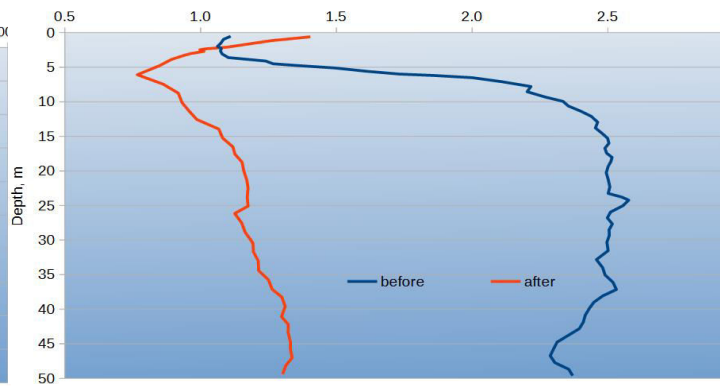
Backscatter profiles near Petit Piton, Saint Lucia before and after hurricane Beryl

Attenuation, 1/m



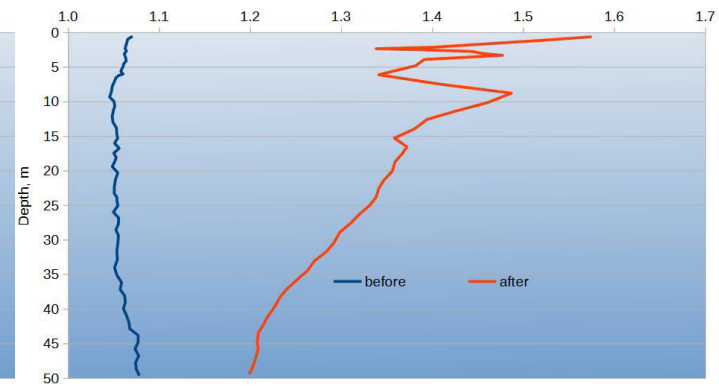
Chlorophyll-a profiles near Petit Piton, Saint Lucia before and after hurricane Beryl

Chlorophyll-a, ug/L



FDOM profiles near Petit Piton, Saint Lucia before and after hurricane Beryl

FDOM, ppb



Aftermath of Hurricane Beryl on sailing community Carriacou Island, Grenada



The Tipping Point for Warm-water Corals

“The central estimate of the thermal tipping point for warm-water coral reefs of 1.2°C global warming above pre-industrial is already exceeded and without stringent climate mitigation their upper thermal threshold of 1.5°C may be reached within the next 10 years, compromising reef functioning and provision of ecosystem services to millions of people.”

The Global Tipping Points Report 2025



Dead coral reef in Tobago Cay (St.Vincent and Grenadines), 10 years ago we saw it alive...

Quality Control of *in situ* Temperature and Salinity Data



QC tests:

Group 1 <i>Required</i>	Test 1) Test 2) Test 3) Test 4) Test 5)	Gap Test Syntax Test Location Test Gross Range Test Climatological Test
Group 2 <i>Strongly Recommended</i>	Test 6) Test 7) Test 8)	Spike Test Rate of Change Test Flat Line Test
Group 3 <i>Suggested</i>	Test 9) Test 10) Test 11) Test 12) Test 13)	Multi-Variate Test Attenuated Signal Test Neighbor Test TS Curve/Space Test Density Inversion Test

Manual for Real-Time Quality Control of In-situ Temperature and Salinity Data

A Guide to Quality Control and Quality Assurance
for In-situ Temperature and Salinity Observations

Version 2.0
January 2016

Submission of Data to the World Ocean Database (NCEI)



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DATA CATALOG

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Oceanographic data collected from SV OCEANOLOG in the Caribbean Sea from 2024-07-21 to 2024-08-04. (NCEI Accession 0307044)

Metadata Updated: September 2, 2025

Physical and chemical data collected with CTD during Sail for Science 2024 Expedition in the Caribbean Sea, between Union Island and Trinidad Island, from 2024-07-21 to 2024-08-04.

Publishing of Data in the Catalogue of the Canadian Integrated Ocean Observing System (CIOOS Atlantic)



CIOOS | CANADIAN INTEGRATED OCEAN OBSERVING SYSTEM

FR



CIOOS
CANADIAN INTEGRATED
OCEAN OBSERVING SYSTEM

[Datasets](#) [Organizations](#) [About](#) [Catalogue Home](#)

/ [Datasets](#) / [Oceanographic data...](#)

Oceanographic data collected onboard SV Oceanolog during the Sail for Science - 2023 expedition in the Gulf of St. Lawrence

License

Creative Commons Attribution Share-Alike 4.0 [OPEN DATA](#)

Resource Type

Dataset

Format

Dataset

Responsible Organizations

Lineage

Activity Stream

Oceanographic data collected onboard SV Oceanolog during the Sail for Science - 2023 expedition in the Gulf of St. Lawrence

Presented collected with RBRconcertoCTD a set of oceanographic data, including variables: conductivity, temperature, practical salinity, specific density, dissolved oxygen, transmittance, chlorophyll-a, fDOM at sampling rate 8Hz in the Gulf of St. Lawrence at the moorings of SV Oceanolog on the route: Rivière-du-Loup - Gaspé - Magdalen Is. - Cape North. This is a pilot stage's set of high-accuracy and resolution oceanographic data collected during the citizen science project Sail for Science underway to the Caribbean: www.sailforscience.com

Submission of Data to the Ocean Data Platform (HubOcean)

[Dashboard](#)[Catalog](#)[My Data](#)[Support](#)[Documentation](#)[Workspaces](#)

< Oceanographic data from the Sail for Science-2024 Expedition



Dataset

Description: Oceanographic data collected onboard SV OCEANOLOG during the Sail for Science-2024 Expedition in the Caribbean Sea using RBRconcerto3CTD in profiling mode from 3m to 110m depth and sampling interval 1s for variables: Temperature, Conductivity, Pressure, Practical Salinity, Dissolved Oxygen, Chlorophyll a, Transmittance, fDOM, Speed of Sound, Density

Tags: temperature, practical salinity, dissolved oxygen, chlorophyll a, transmittance, fDOM, speed of sound, density

< Oceanographic data from the Sail for Science-2025 Expedition



Dataset

Description: Oceanographic data collected onboard SV OCEANOLOG during the Sail for Science-2025 Expedition in the Caribbean Sea using RBRconcerto3CTD in profiling mode from 3m to 100m depth and sampling interval 1s for variables: Temperature, Conductivity, Pressure, Practical Salinity, Dissolved Oxygen, Chlorophyll a, Transmittance, fDOM, Speed of Sound, Density Anomaly

Tags: temperature, practical salinity, dissolved oxygen, chlorophyll a, transmittance, fDOM, speed of sound, density

Poster presentation on the IODC-III

International Ocean Data Conference - III (IODC-III)

📅 March 10, 2025 - March 11, 2025

📍 Instituto de Investigaciones Marinas y Costeras José Benito Vives de Andreis, Santa Marta-Colombia

The Data We Need for the Ocean We Want

Sail for Science – how sailors can help science to fill gaps in oceanographic data

Igor Shkvorets, Iryna Troshyna, Sail for Science

“Sail for Science” is a pioneering initiative that bridges the gap between oceanographers and the global sailing community, enabling citizen scientists to contribute valuable oceanographic CTD data. Using advanced yet accessible instruments like the RBRconcertoCTD, we collect high-resolution and high-accuracy data of seawater properties, including temperature, salinity,

Introduction CTD to Sailors



Marine Citizen Science programs directory:

www.freerangeocean.org

1. Secchi Disk Study: www.secchidisk.org
2. Marine Debris Tracker: www.debristracker.org
3. The Globe Program: www.globe.gov
4. eOceans: www.eoceans.org
5. Sailors for the Sea: www.sailorsforthesea.org
6. Citizens of the Sea: www.citizensofthesea.org
7. Sailing4Science: www.sailing4science.org
8. The International SeaKeepers Society: www.seakeepers.org
9. Oceano-vox initiative: www.oceano-vox.com
10. Seabed-2030 program: www.seabed2030.org

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Thank you!
Any questions?

