



Understanding oceans  
Sustaining future



# Progress and Plan of China Deep Argo

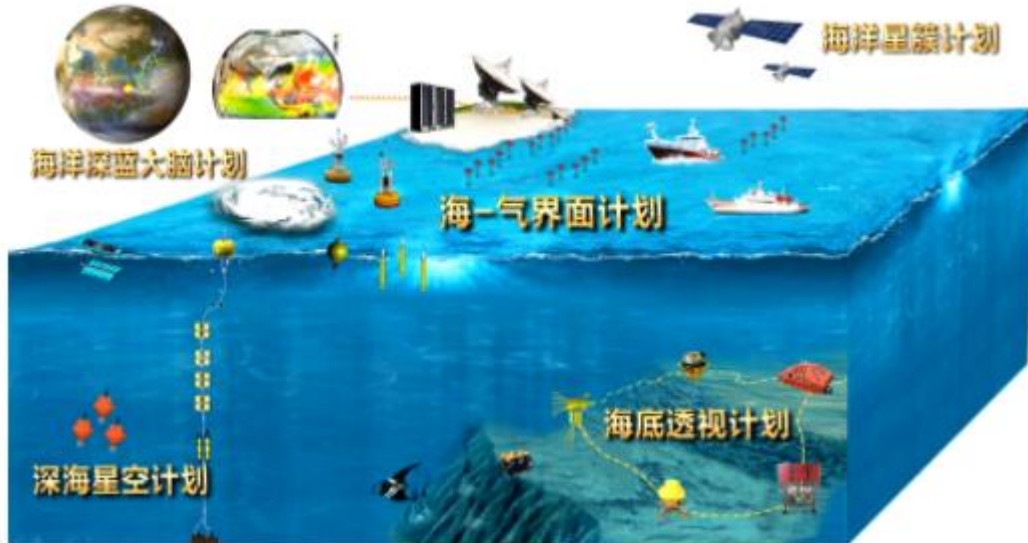
Zhaohui CHEN

Qingdao National Laboratory for Marine Science and Technology (QNLMT)  
Ocean University of China

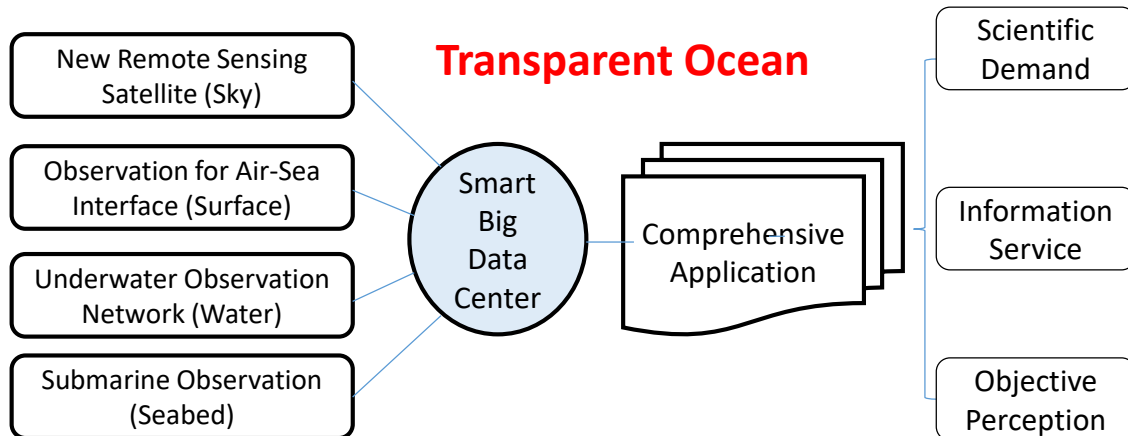
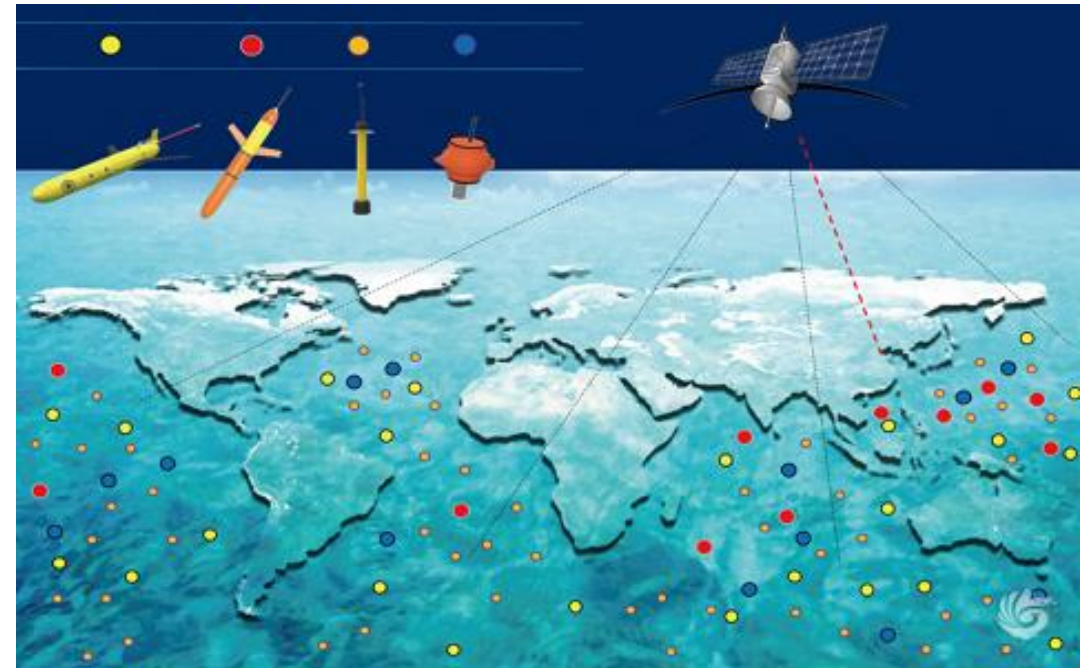
Transparent Ocean Community Workshop, 2020.1, Qingdao, China



# 'Starry Deep Sea' Program



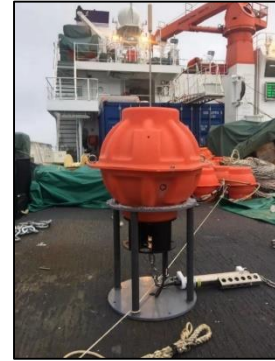
- A deep sea observing system with **deep Argo**, **deep gliders**, **intelligent buoys**, and other exploration facilities.
- The system, together with **real-time moorings and buoys**, will be key to transparent ocean.





# Innovation in ocean observing : 'WENHAI' project

- In 2016, 'WENHAI' project was initiated with focus on developing profiling float down to 4000m.
- Both local government and QNLM have funded over 3 million US dollars.
- Additional 1.5 million US dollars after 2020.



Ocean University of China



Qingdao HiSun Ocean Equipment Co., LTD



Tianjin University



Shandong University

2016.8

2018.3

2019.3

2019.5-11

Phase I ends

'WENHAI' project Start, with 4 institutions winning the bidding

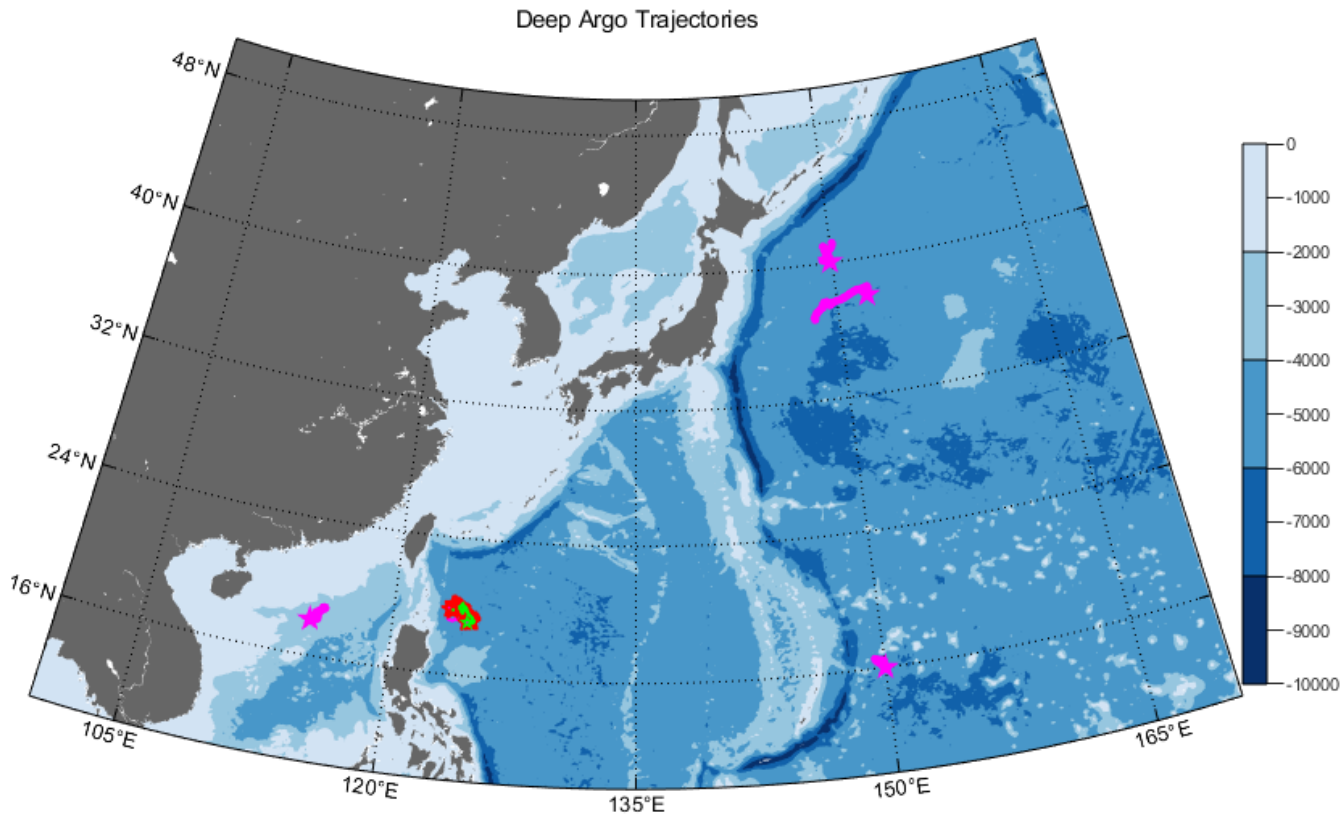
Prototype Floats Deployment around the Pacific's Mariana Trench

Pressure cycle testing in the western Pacific

Deployment (10 floats) in the western Pacific,



# Pilot deployment of Deep Argo prototype in 2019 (1 cycle per day)



Region	Deep Argo	Cycle Number
SCS	OUC_005	122
KE	OUC_016	68
	OUC_010	112
WP	OUC_007	114
	OUC_012	63
	TJU	42
	710_7	130
	710_8	129
	710_9	53
	710_10	55



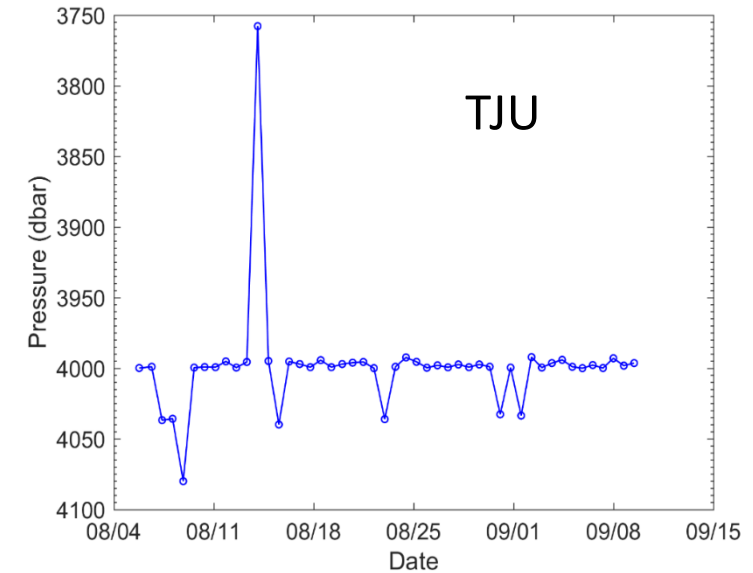
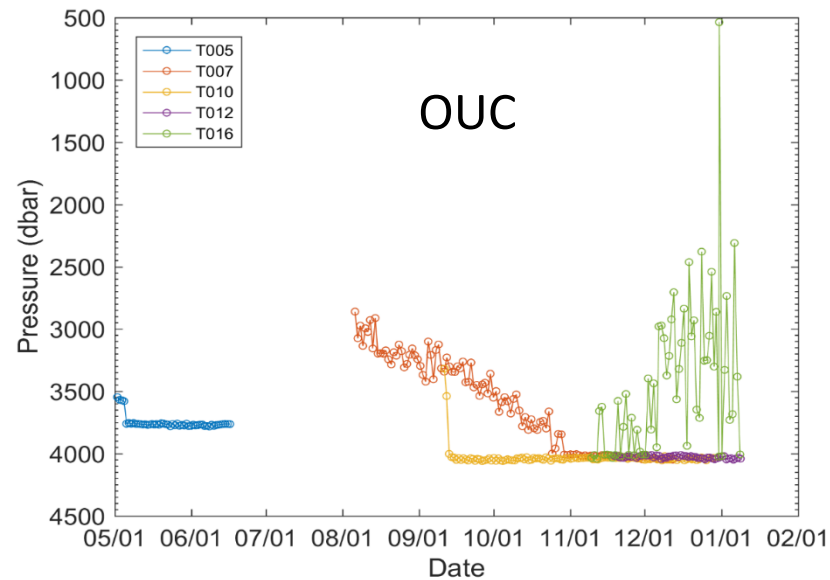
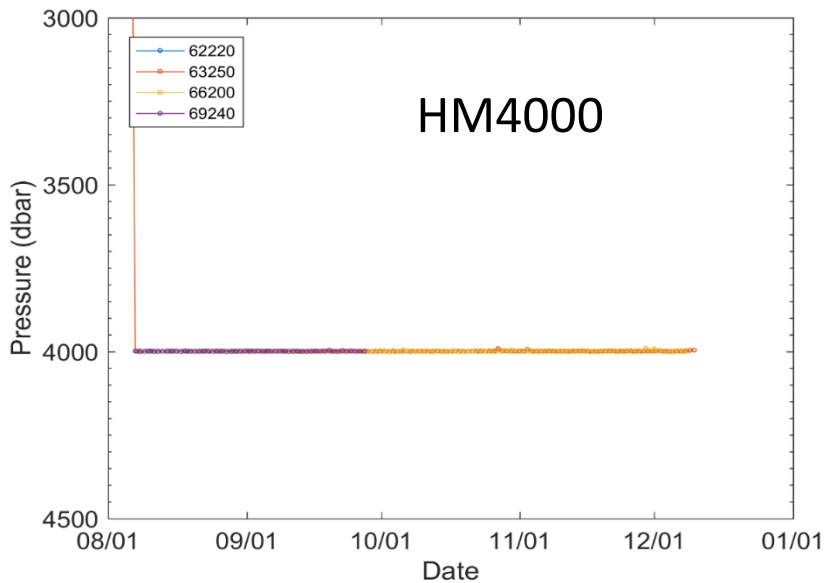


# Performance of Deep Argo prototype

No.	Date of Deployment	Location	Profiles	Last Day at Work
62220	2019.8.7	19.09N, 124.61E	61	2019.9.22
63250	2019.8.6	18.99N, 124.55E	130	2019.12.9
66200	2019.8.7	19.10N, 124.58E	127	2019.12.8
69240	2019.8.7	19.11N, 124.60E	52	2019.9.27

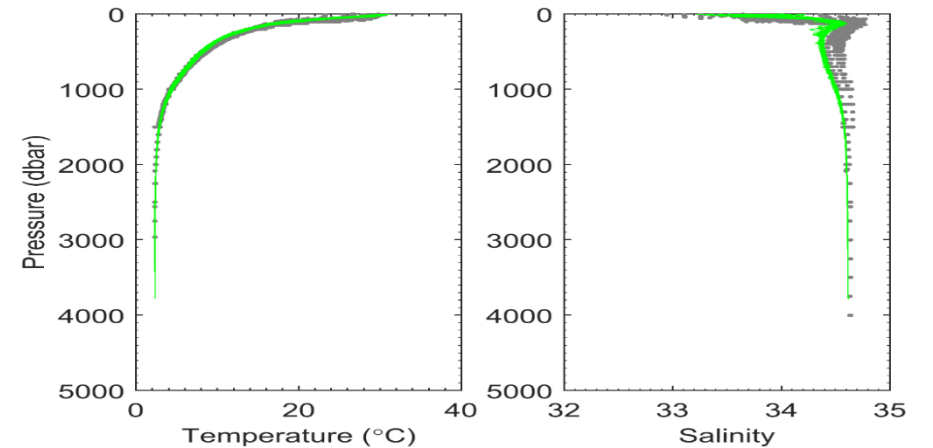
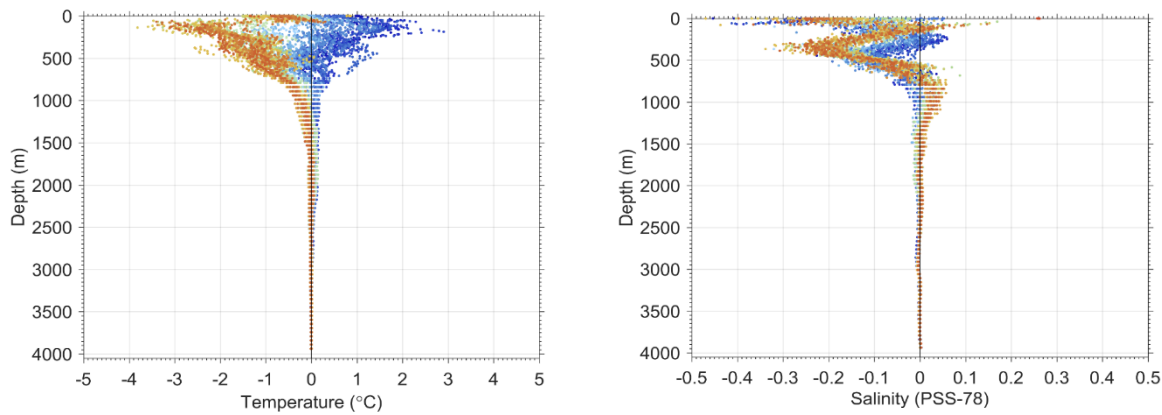
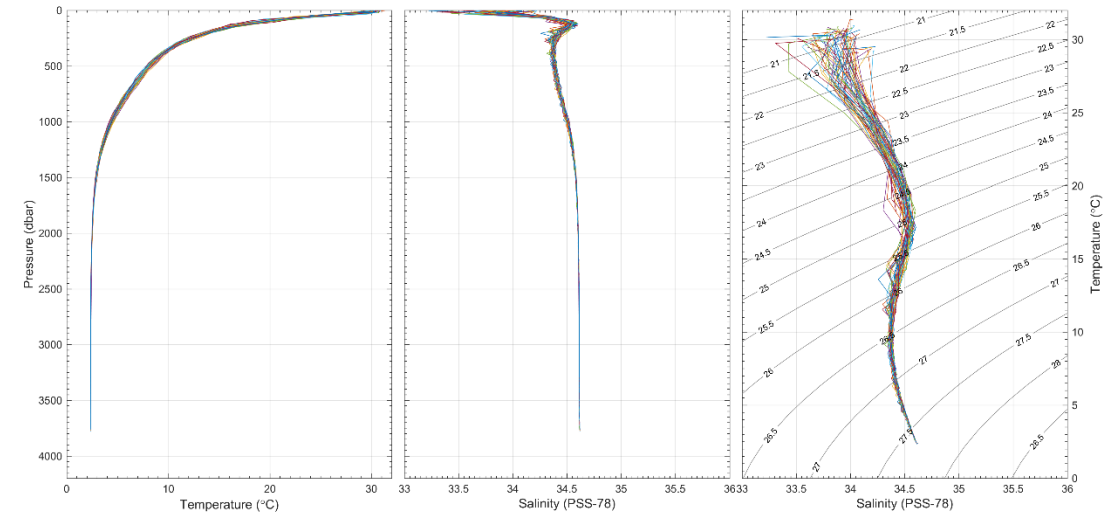
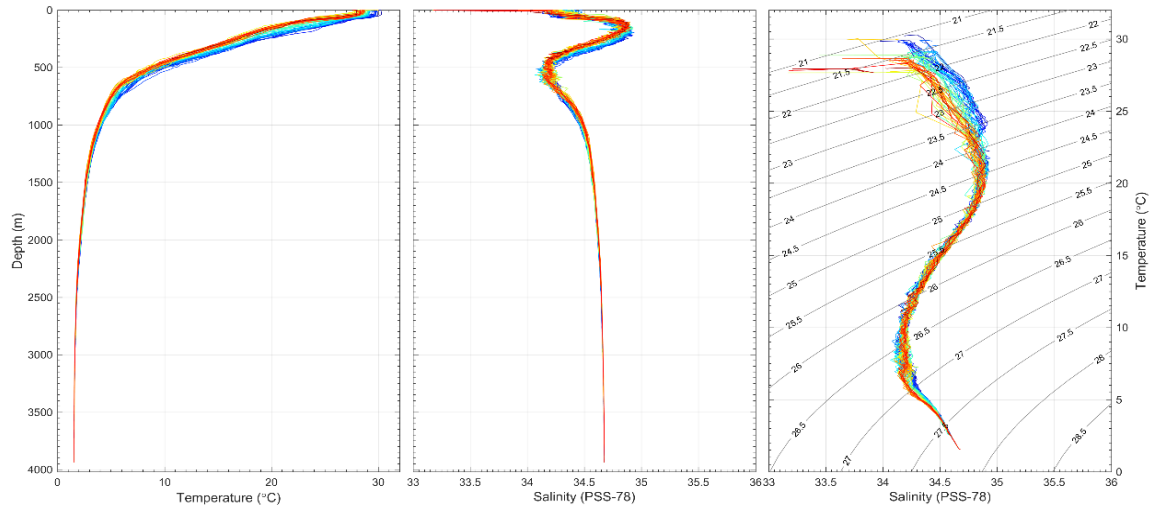
No.	Date of Deployment	Location	Profiles	Last Day at Work
T005	2019.5.1	18.098N , 114.98E	122	2019.8.11
T007	2019.8.6	19.076N , 124.67E	115	2019.12.12
T010	2019.9.11	37.87N , 152.28E	112	2019.12.28
T012	2019.11.18	16.01N , 150.01E	53	2020.1.8
T016	2019.11.9	40.07N , 149.85E	59	2020.1.8

No.	Date of Deployment	Location	Profiles	Last Day at Work
TJU1	2019.8.5	19.09N, 124.61E	48	2019.9.9





# Performance of Deep Argo prototype

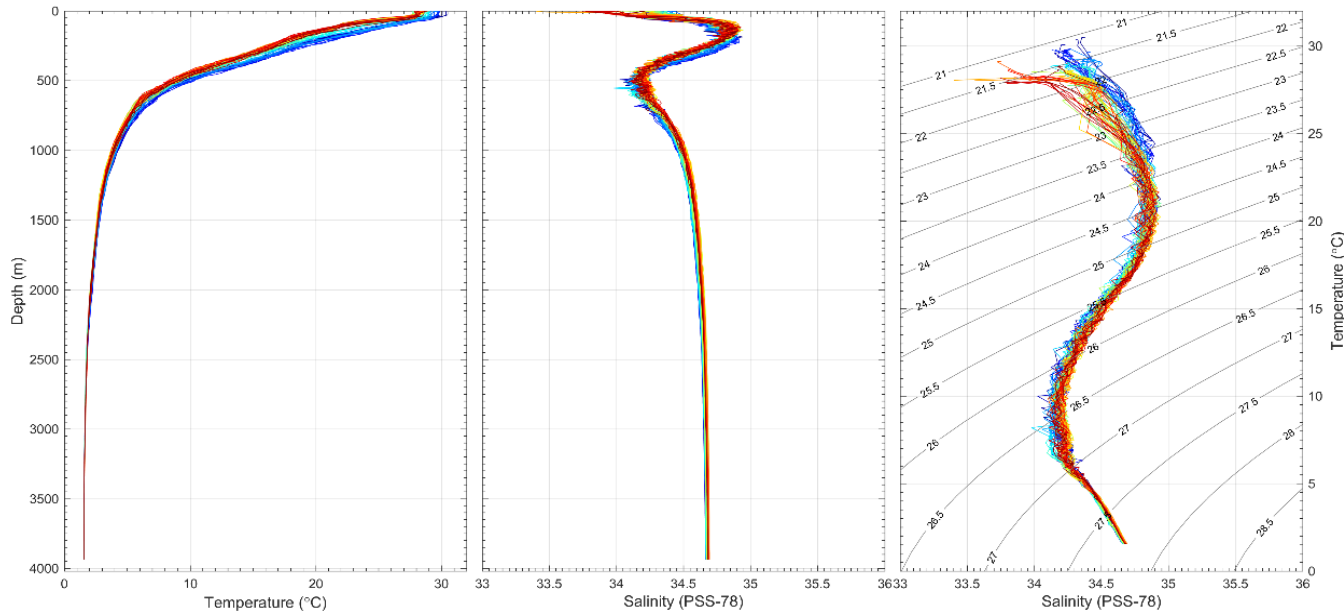


HM4000-62220 @ WP

OUC-005 @ SCS



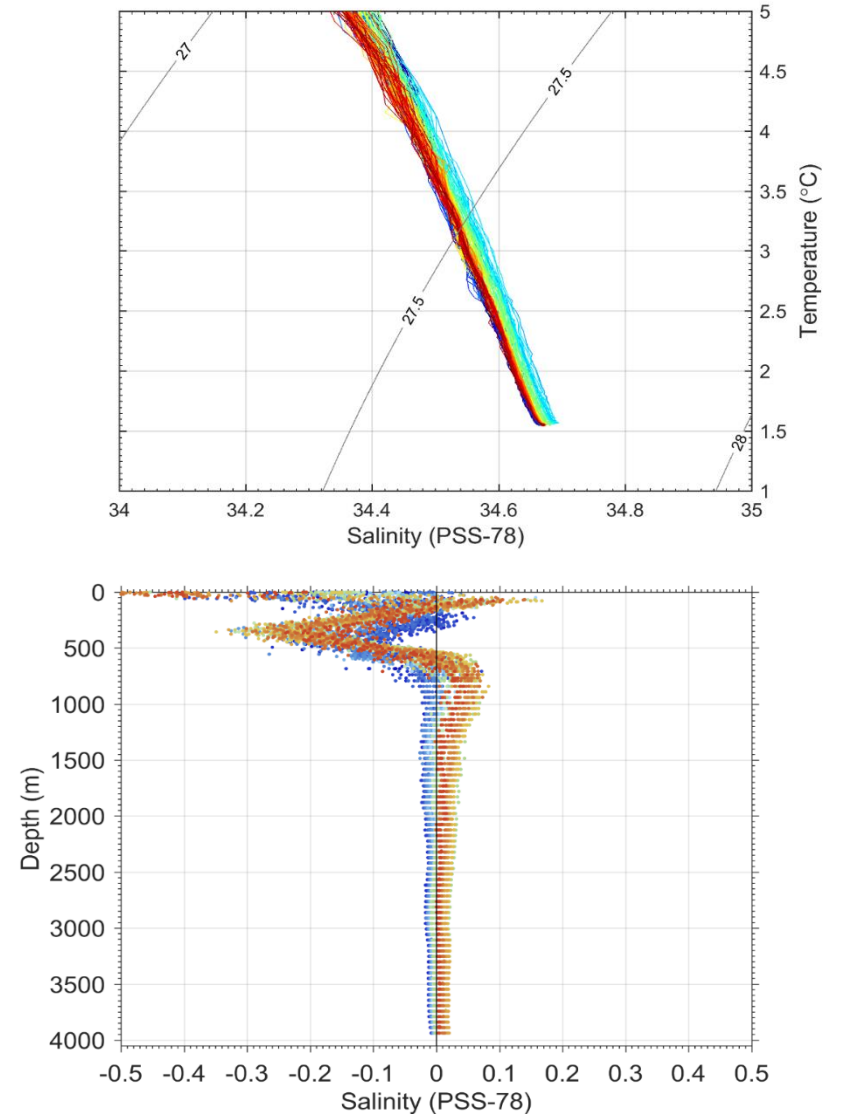
# Performance of Deep Argo prototype



HM4000-63250 @ WP

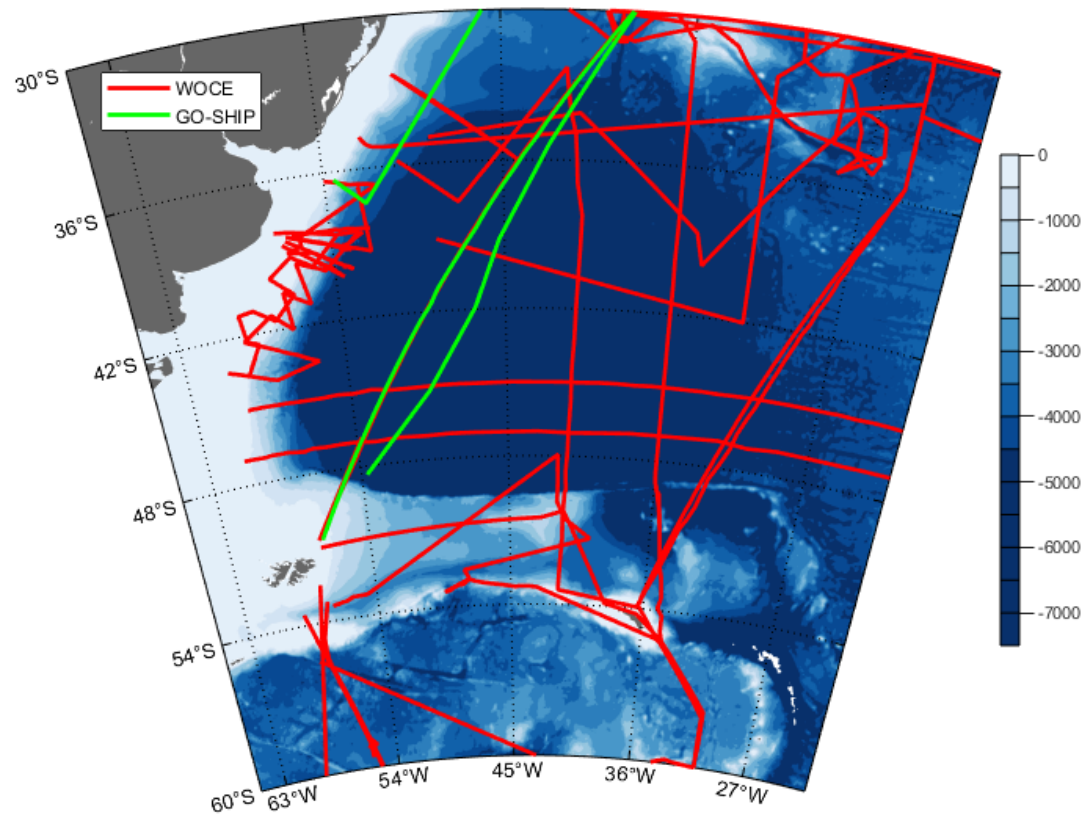
SBE37 Micro CAT → SEB61 and RBR CTD

## Salinity drift (conductivity sensor)

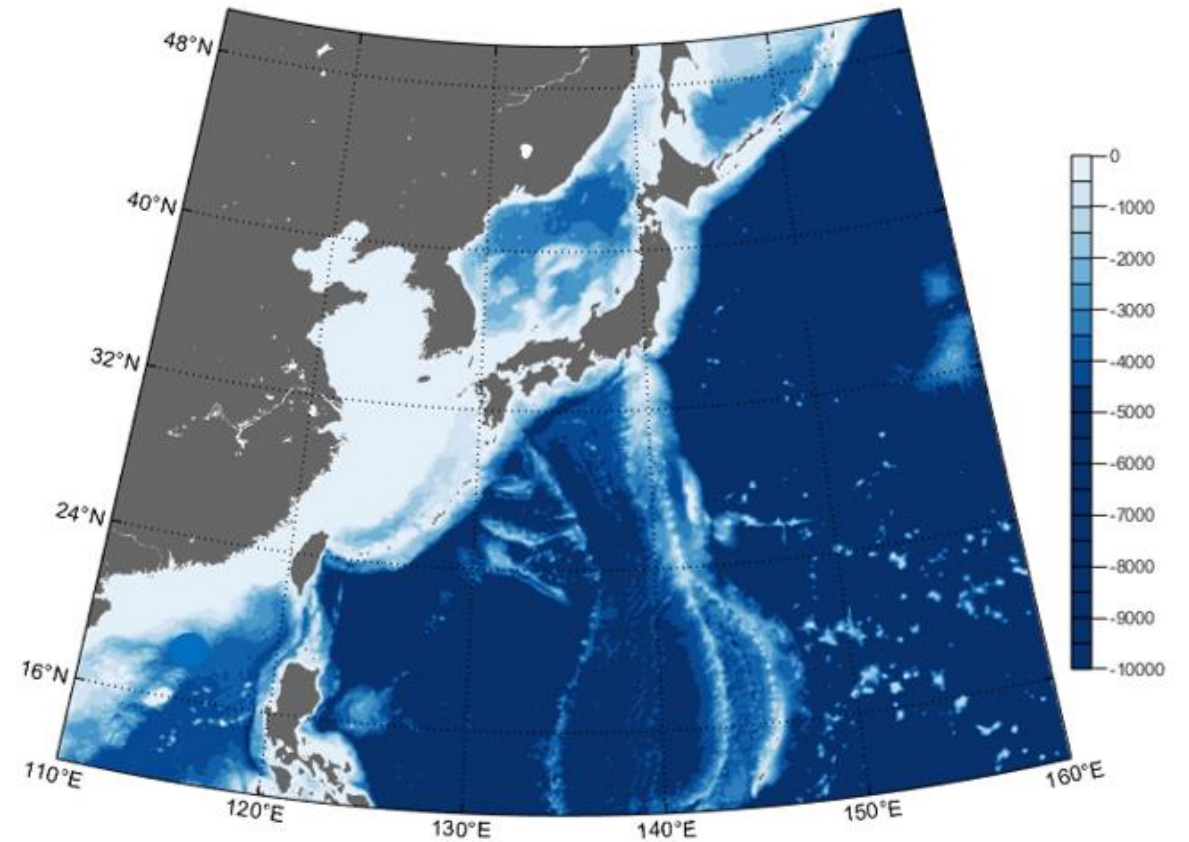




## Plan of Deployment in 2020 (10-day cycle)



Argentine Basin  
June-July (10 Deep Argo)



Western Pacific  
Sep. to Dec. (10 Deep Argo)  
**3-4 6000-m Deep Argo**





# China Deep Argo Plan in this decade

2020-2021

2022-2025

2026-2030

- 20 Deep Argo floats will be deployed at Southern ocean and WP in 2020, and 60 in 2021;
- 6000m deep Argo floats development.

- Industrialization;
- Data Center (QNLN+SIO);
- Certified by Argo program.

China will maintain at least 300 deep Argo floats in the North Pacific and the Southern Ocean, providing data down to 6000-m for scientific community.

Key region

- South China Sea
- Northwest Pacific (Kuroshio Extension)
- West Pacific (Mariana Trench area)
- Southern Ocean (CSHOR)

Globally



# 2<sup>nd</sup> Deep Argo Workshop

## Deep Argo Mission Team

Deep Argo Implementation Workshop 13-15<sup>th</sup> May 2019

Deep Argo Implementation Workshop 13-15<sup>th</sup> May 2019



**Report on the 2<sup>nd</sup> Deep Argo Implementation Workshop**  
Hobart, May 13-15<sup>th</sup> 2019



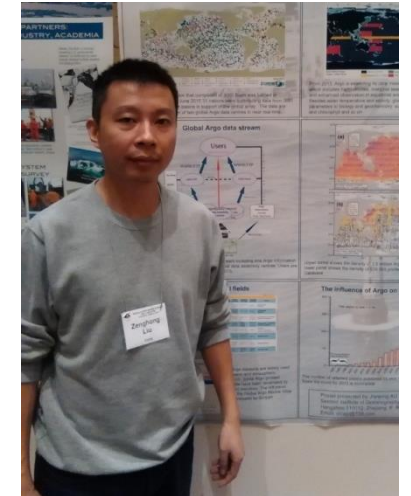
The Deep Argo workshop committee: Nathalie Zilberman, Brian King, Sarah Purkey, Virginie Thierry, and Dean Roemmich

**6.7. China**

China began its development of 4000-m profiling float in 2016. The ‘Wenhai’ project was initiated and funded by Qingdao National Laboratory for Marine Science and Technology (QNLN) with over 3 million U.S. dollars. The 4000-m profiling floats prototypes developed by Ocean University of China, Tianjin University and Qingdao HiSun Ocean Equipment Co., LTD have been tested in South China Sea and Mariana Trench region in 2018 and 2019. More testing will be done in the Western Pacific Ocean during the second half year of 2019. In the next decade (2021-2030), 7 million US dollars will be funded by the China government to continue the development of 4000-m (and 6000-m) profiling floats. 20 Deep Argo floats will be deployed in the Southern Ocean and Western Pacific Ocean in 2020 and 60 in 2021 by Chinese research vessels. The 4000-m (6000-m) profiling floats are planned to be industrialized before 2025, and the data center will be built by QNLN and the second institute of oceanography (SIO). Hopefully the 4000-m (6000-m) profiling floats manufactured by China will be certified by the Argo Program. Before 2030, China will maintain at least 300 Deep Argo floats in the North Pacific (e.g., South China Sea, Kuroshio Extension regions and Mariana Trench regions) and the Southern Ocean, providing data down to 6000-m for the scientific community.



Zhaohui Chen  
(QNLN/OUC)

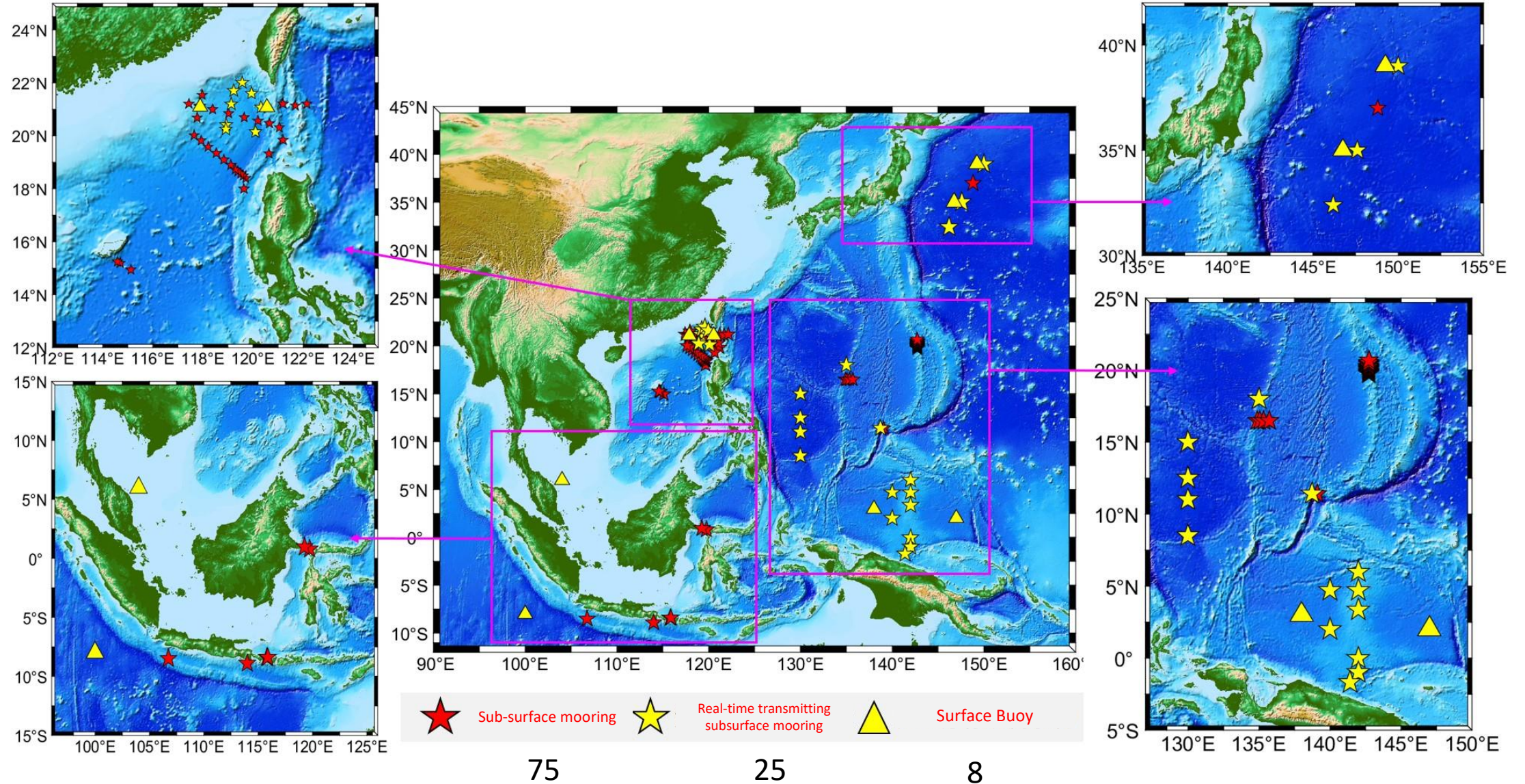


Zenghong Liu  
(SIO, China)





# Mooring network in WP-SCS-IO





Thank you very much!



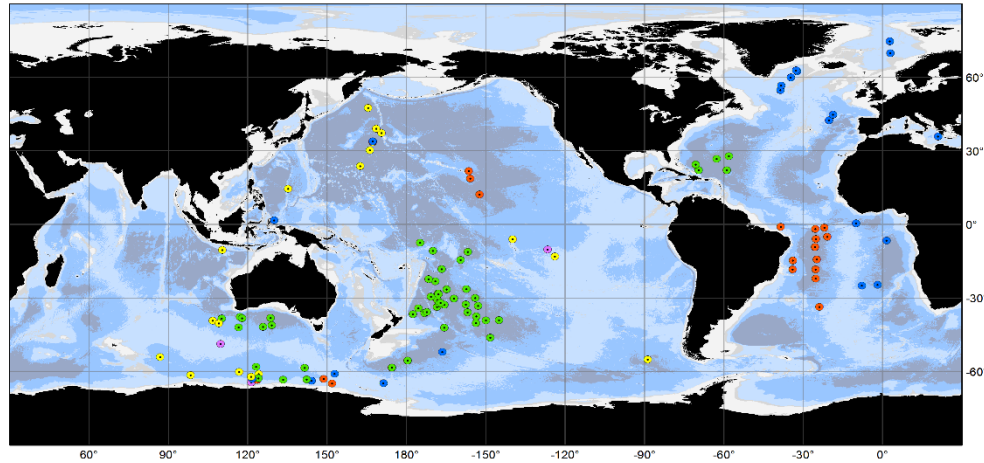
新年快乐  
2020

HAPPY CHINESE NEW YEAR  
Year of The Rat





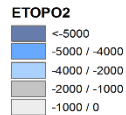
# Global Deep Argo Plan



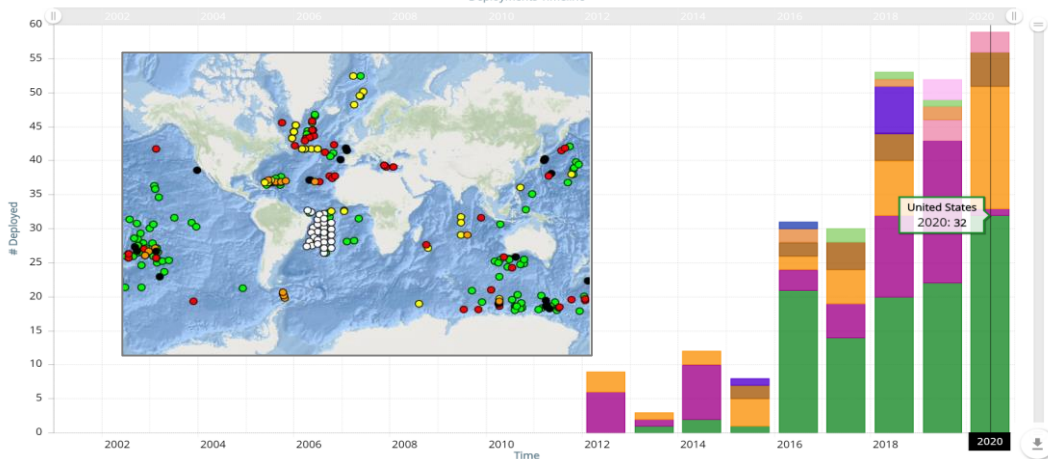
Argo Deep Float Models December 2019

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

- SOLO\_D\_MRV (18)
- NINJA\_D (3)
- APEX\_D (18)
- SOLO\_D (51)
- ARVOR\_D (21)



Generated by www.jcommops.org, 01/01/2020



- Float performance
- CTD accuracy and stability
- Float and sensor production capacity and diversity of sources
- Cost effectiveness of Deep Argo
- Commitments from Argo National Programs
- Timetable for progression towards a global array

A long-way to go