Understanding oceans
Sustaining future

HM4000 float

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Outline

- HM4000/HM6000 prototypes
- Pilot deployment of HM4000 in the Western Pacific
- Deployment Plan in 2022

HM4000/HM6000 prototypes update

Hardware of control system:

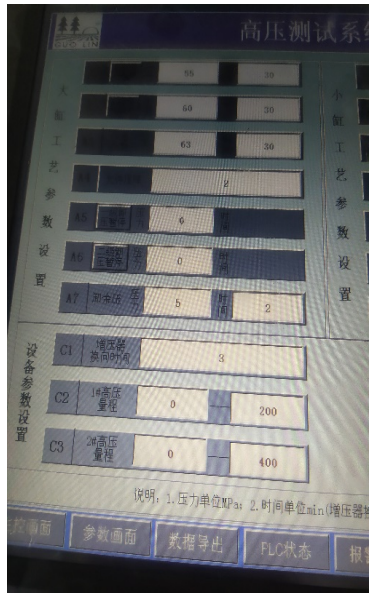
- power supply module and main control system
- compatible with SBE61/RBRargo CTD sensors

The power supply system:

- increased the battery capacity by 67%
- optimized the low power management module
- expected lifetime

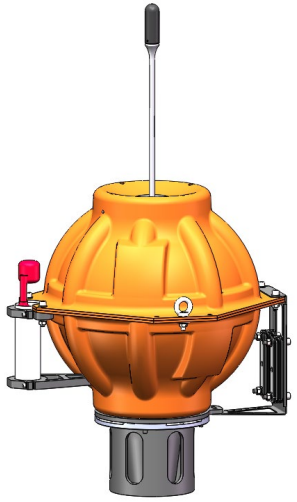
Buoyance drive system:

- HM6000 buoyancy drive system is developed
- operated under 63Mpa
- maximum buoyancy driving capacity over 60Mpa was verified.



HM4000

- Parking depth: 500 m to 4000 m; nominal parking depth 1000 m
- Adjustable ascending/descending speed
- Safety strategy: grounding detection; emergent ascending for a time-out or an excessive profiling
- Low-power strategy

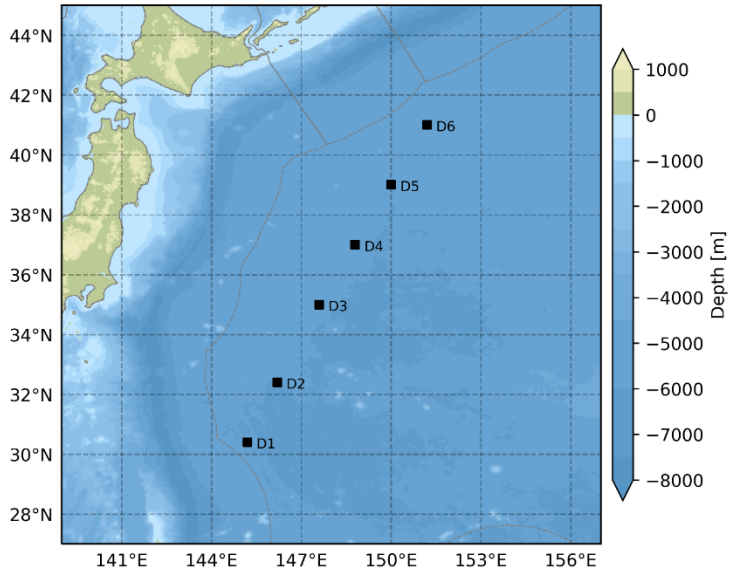


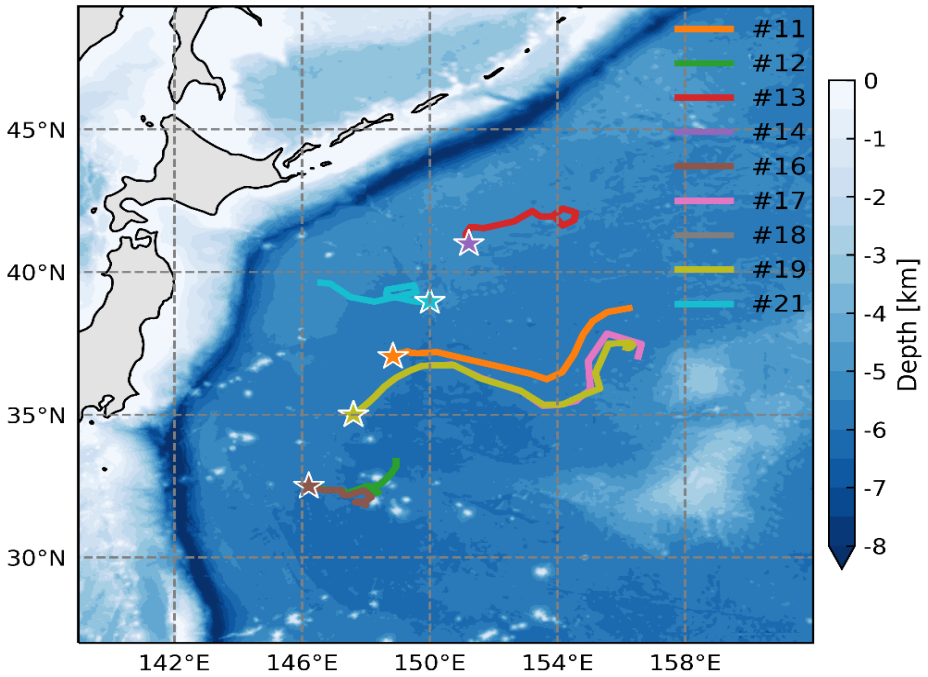
RBRargo^3 CTD

SEB61 CTD

- 10 HM4000 floats were assembled and tested, with 9 of them are equipped with RBRargo^3 CTD and one with SEB61.

Pilot deployment in 2021





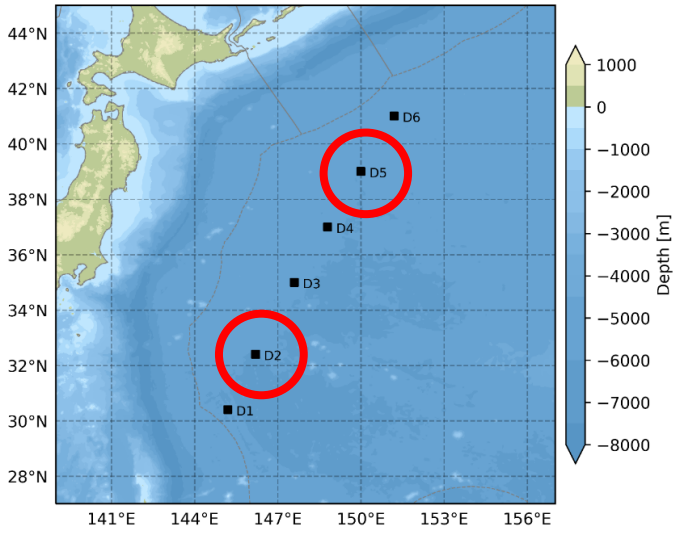
- 9 HM4000 deployed in the Kuroshio/Oyashio Extension region in the northwestern Pacific, covering the subtropical, transition zone (mixed zone) and sub-polar ocean.
- Concurrent CTD cast and on-board salinity measurement were conducted after deployment.

Stations	D2	D3	D4	D5	D6
Floats No.	#12, #16	#17, #19	#11	#18, #21	#13,#14
Date of Deployment	2021-05-20	2021-05-24	2021-06-07	2021-06-01	2021-05-30
Location	146.19E, 32.49N	147.67E, 35.00N	148.82E, 37.02N	150.00E, 39.00N	151.20E, 41.00N

Current status and preliminarily analysis of 9 HM4000 floats as of 2021.9.25

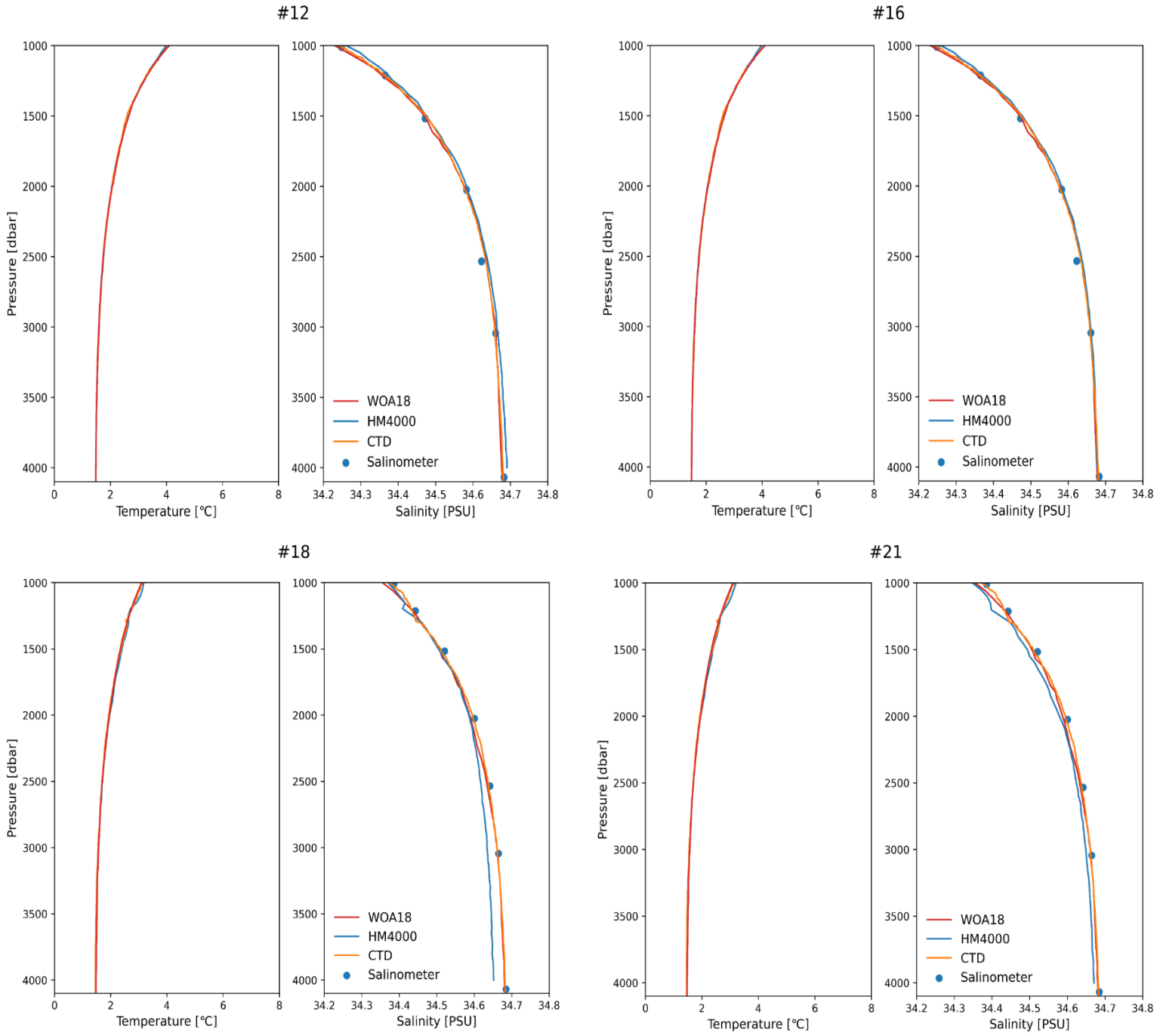
Station	Float	CTD model	Cycle Count	Current Status	Comparison with SBE911Plus	Comparison with Climatology
D2	#12	RBR	34	active	pressure-dependent bias	good
	#16	RBR	22	active	good	good
D3	#17	RBR	24	active	systematic bias	good
	#19	RBR	32	active	significant pressure-dependent bias	good
D4	#11	RBR	20	active	good	good
D5	#18	RBR	6	inactive	significant pressure-dependent bias	pressure-dependent bias
	#21	SBE-61	20	active	significant systematic bias	systematic bias
D6	#13	RBR	19	active	good	good
	#14	RBR	3	inactive	good	good

- 2 failed after 3 and 6 cycles;
- 4 bad CTD data with 1 salinity drift (#12), 1 significant systematic bias (#21) and 2 significant pressure-dependent bias (#18, #19);
- The sampling frequency of #12 and #19 have been set to 2-day from Sep 6th, 2021.

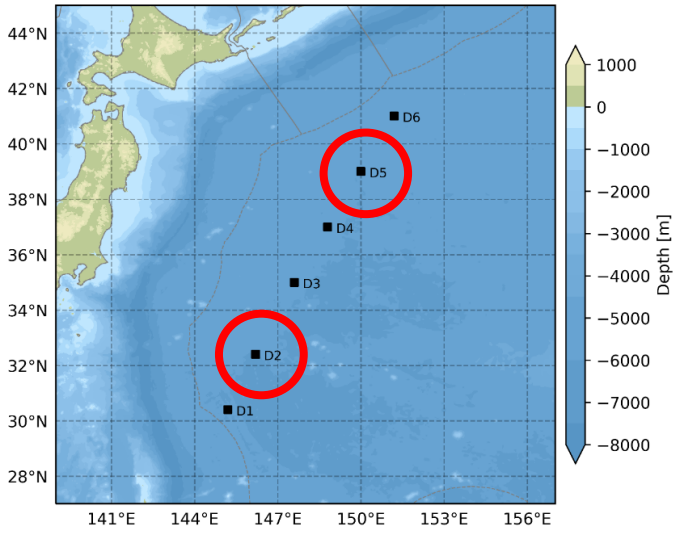


Station	Float	CTD model
D2	#12	RBR
	#16	RBR
D5	#18	RBR
	#21	SBE-61

- #12 and #16: generally consistent with climatology/SBE911-CTD/Salinometer;
- #18 and #21 (SBE61): apparently fresher



Comparison with Coriolis CTD dataset



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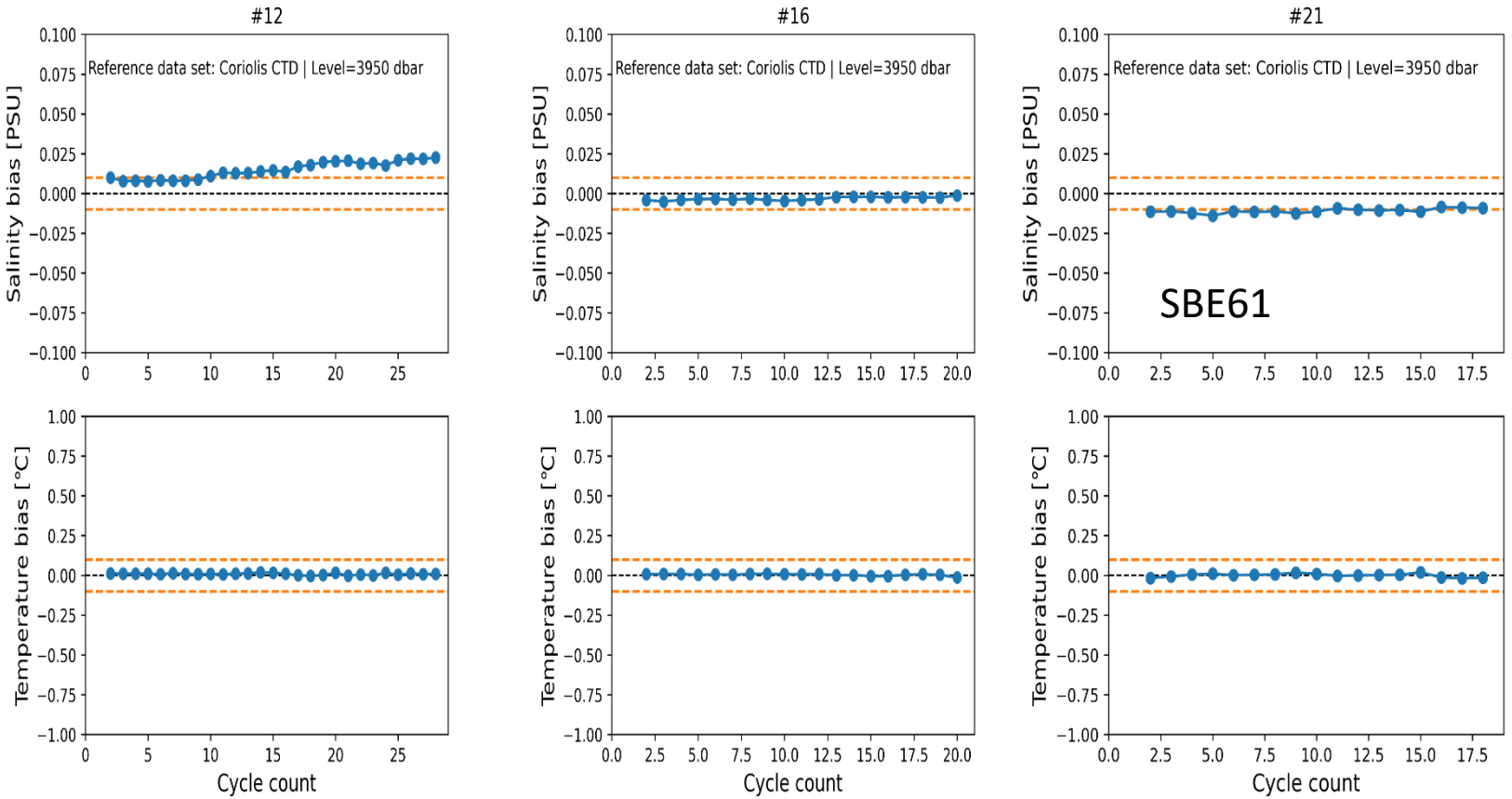


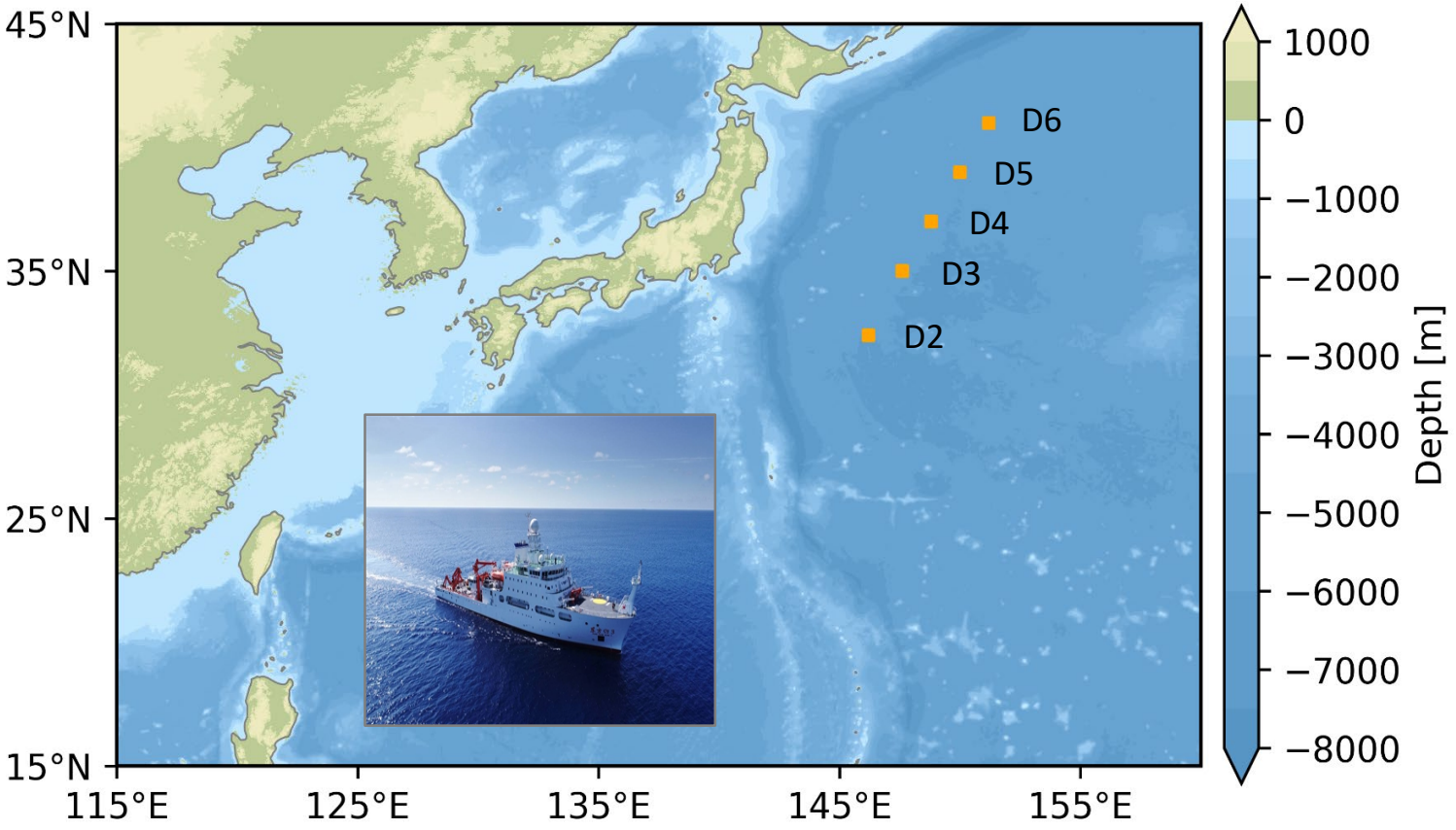
- #12: salinity drift after 10 cycles;
- #16: good
- #21: systematic bias in salinity compared with climatology.

Technical issues

- HM4000 #14 float was lost after 3 successful profiles.
- HM4000 #18 float was lost after 24 successful profiles (6 profiles with good data).
- Parking depth changes greatly. The parking depth adjustment control strategy will be developed.
- RBRargo CTD generally shows a good performance in some of the floats, however a validation in a longer time is needed.
- There is systematic bias of SBE61 CTD, but can be corrected.
- The expected lifetime of the floats cannot be verified at the current stage.

Plan of deployment in 2022

- 5 Deep Profiling floats to be deployed in the 2022 cruise
- 4 HM6000 and 1 HM4000 are now being tested and assembled.
- HM deep profiling floats are all expected to profile 6000m (HM6000) from 2022.
- Apply for funds of 20 floats deployment every year from 2023 to 2025



Thank you for your attention!

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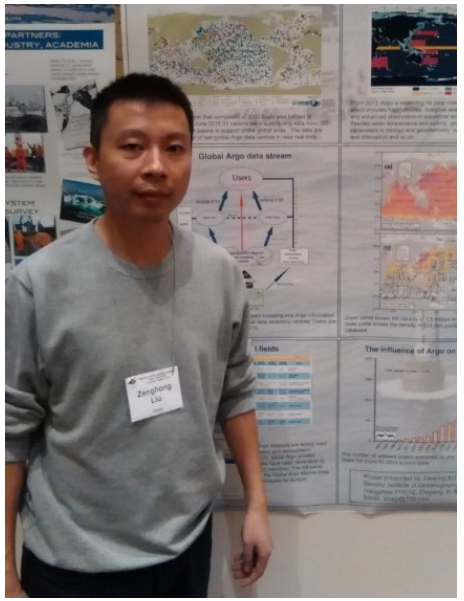

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