

Workshop Review

Sixth Marine Instrumentation Workshop for Asia-Pacific Region

10th Anniversary of RMIC

“Ensure high quality procedure we take, deliver the ocean data we need”

13-17 December 2021

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Day 1 Opening Ceremony

(Chair: Yong YAO)



Dr. ZHANG Zhanhai, Chief Engineer/ Director General of MNR:

"The UN Decade opening a new era...I'm convinced RMIC/AP will keep perfecting the best practices repository and networks of observation quality assurance, strive to promote the development of global ocean standards, metrology, and make positive contributions to the implementation of SDGs and global ocean governance."



Dr. Vladimir Ryabinin, Executive Secretary of IOC& Assistant Director General of UNESCO:

"...UN Decade is capable of and seems to start creating a major positive transformation in ocean science , it is a totally new relationship with the ocean , and creating the network with the breadth of programmes, not only focus on the technology ,and the culture heritage, human empathy and encourage women to participant in ... will make the contribution to Ocean Sustainabilitythanks for RMICs great efforts to the metrology of ocean observation."



Dr. Rea Anthony, the Director of Infrastructure Department of WMO:

"WMO now taking the earth system approach, looking at the atmosphere and ocean as the entire system, also linking to UN Decade...the center of WMO focus is aimed to improve the ability of our members to deliver six services....RMICs is a great example cooperation across the UN system, also cooperation across national agencies and the international....and play a very important role in WMO strategy in quality assurance and traceability"

Day 1 Opening Ceremony

GOOS <i>in situ</i> networks ¹	Implementation	Data & metadata			Best practices ⁶	GOOS delivery areas ⁷		
	Status ²	Real time ³	Archived high quality ⁴	Meta-data ⁵	Operational services	Climate	Ocean health	
Ship based meteorological measurements - SOT/VOS	★★★	★★★	★★★★	★★★	★★★			
Ship based aerological measurements - SOT/ASAP	★★★	★★★	★★★	★★★	★★★			
Ship based oceanographic measurements - SOT/SOOP	★★★	★★★★	★★★★	★★★	★★★			
Sea level gauges - GLOSS	★★★★	★★★	★★★★	★★★	★★★			
Drifting and polar buoys - DBCP	★★★★	★★★	★★★	★★★	★★★			
Moored buoys - DBCP	★★★	★★★★	★★★	★★★	★★★			
Interdisciplinary moorings - OceanSITES	★★★	★★★	★★★	★★★	★★★			
Profiling floats - Argo	★★★★	★★★★	★★★★	★★★★	★★★			
Repeated transects - GO-SHIP	★★★★	★★★	★★★★	★★★	★★★★			
OceanGliders	Emerging	★★★	★★★	★★★	★★★			
HF radars	Emerging	★★★★	★★★★	★★★	★★★★			
Biogeochemistry & Deep floats - Argo	Emerging	★★★★	★★★	★★★★	★★★			
Animal borne ocean sensors - AniBOS	Emerging	★★★★	★★★	★★★	★★★			



5-year Strategy (<https://www.ocean-ops.org/strategy/>)

Vision, Mission

VISION

To be the international hub and center of excellence that provides vital services in monitoring, coordinating, and integrating data and metadata, across an expanding network of global oceanographic and marine meteorological observing communities.



MISSION

To monitor and report on the status of the global ocean observing system and networks, to use its central role to support efficient observing system operations, to ensure the transmission and timely exchange of high quality metadata, and to assist free and unrestricted data delivery to users across, operational services, climate and ocean health.



Place and meeting name

Date

Day 1 Opening Ceremony

Ocean Standardization: A National Perspective

Science and Technology Development, MNR

LIU Haiyan Dec. 13, 2021

Sixth Marine Instrumentation Workshop for Asia-Pacific Region(2021/12/13)
held by WMO-IOC Regional Marine Instrument Center



TPOS CHINA
FUTURE VISION FOR THE OCEAN

China's Intensifying Participation in GOOS towards Expanding Ocean Observations for Sustainable Development Needs

Supported by Indo-Pacific Ocean Variability and Air-Sea Interaction (IPOVAI), MNR

Feng Zhou

SOED, Second Institute of Oceanography, Ministry of Natural Resources (SIOMNR)
School of Oceanography, Shanghai Jiao Tong University

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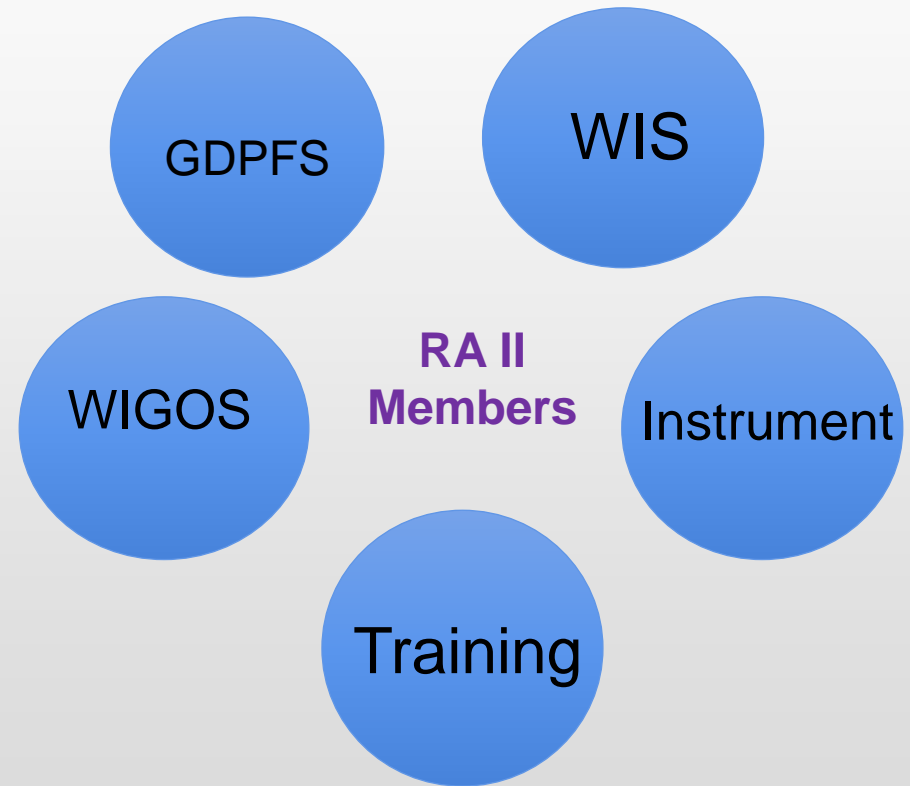
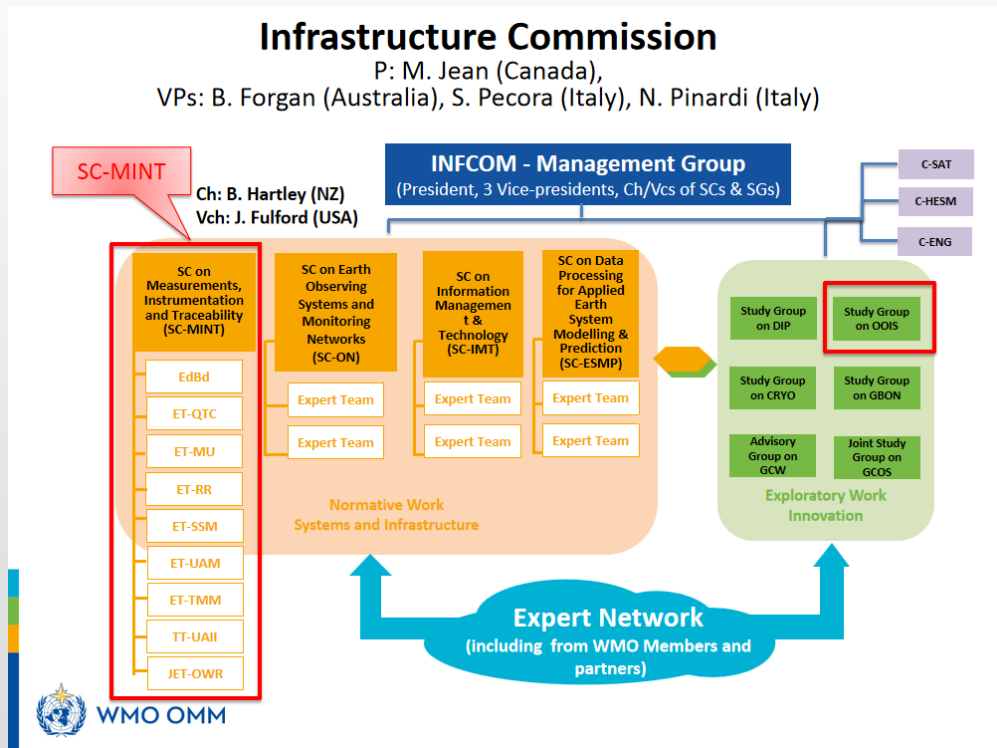
Day 1 Opening Ceremony

Recommendations (draft):

- 1 Encourage Members to establish the broader communications with regional measurement-related centres (in particular, RMICs and RICs).
- 2 Suggest IOC to launch the workshop/training courses to guide the Members to know more about OBPS as active participants.

Day 2 Regional Measurement-related Centres

(Chair: Lingling YUAN)



Day 2 Regional Measurement-related Centres

Regional Marine Instrument Centre

Regional Instrument Centre-Beijing

Regional Instrument Centre-Tsukuba

Regional Radiation Centre-Tokyo

Regional WIGOS Centre-Beijing

Regional WIGOS Centre-Tokyo

processes, activates, outcomes

Capacity Building

Day 2 Regional Measurement-related Centres

Region	Country	Quantity							
		Temperature	Relative humidity	Atmospheric pressure	Wind	Precipitation	Solar radiation	Other (air quality)	Other (electrical)
RA I	Algeria								
	Egypt								
	Kenya								
	Botswana	N/A							
	Morocco								
RA II	China								
	Japan								
RA III	Argentina								
RA IV	Barbados								
RA V	Australia								
	Philippines								
RA VI	France								
	Germany								
	Slovakia								
	Slovenia								
	Turkey								

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29

Calibration capability without ISO/IEC 17025 accreditation
 Calibration capability with ISO/IEC 17025 accreditation

https://community.wmo.int/activity-areas/imop/Regional_Instrument_Centres

Day 3 Ocean Best Practices-Instrument Calibration

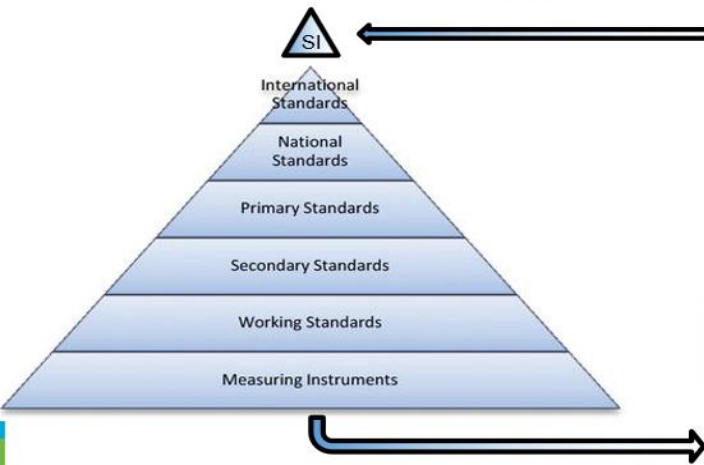
(Chair: Jianqing YU)

Traceability



Quantum temperature sensing

Fundamental Metrology



Applied Metrology



The precise measurement physical quantity of NV center is determined by its Hamiltonian (H) :

$$H = DS_z^2 + E(S_x^2 - S_y^2) + g_s\mu_B B \cdot S$$

The spin - spin interaction between the unpaired electrons caused by the zero field splitting D

Temperature

The influence of energy level change caused by stress (E) and electric field

Stress, electric field

The effect of external magnetic field (B)

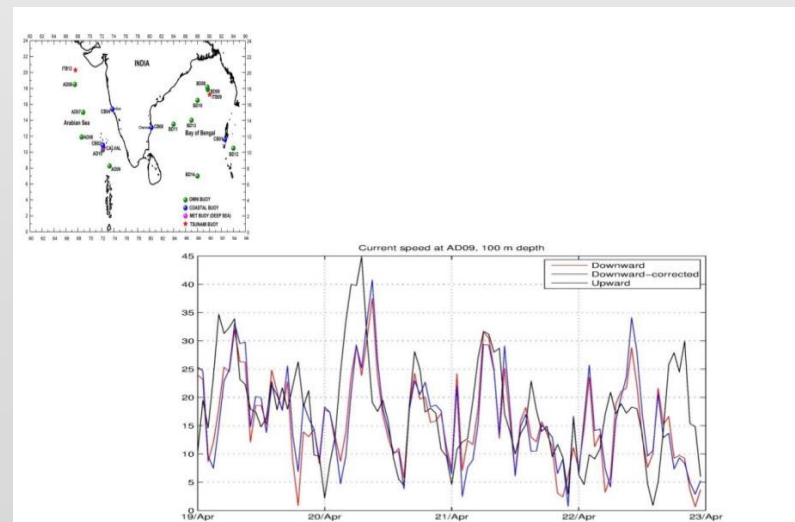
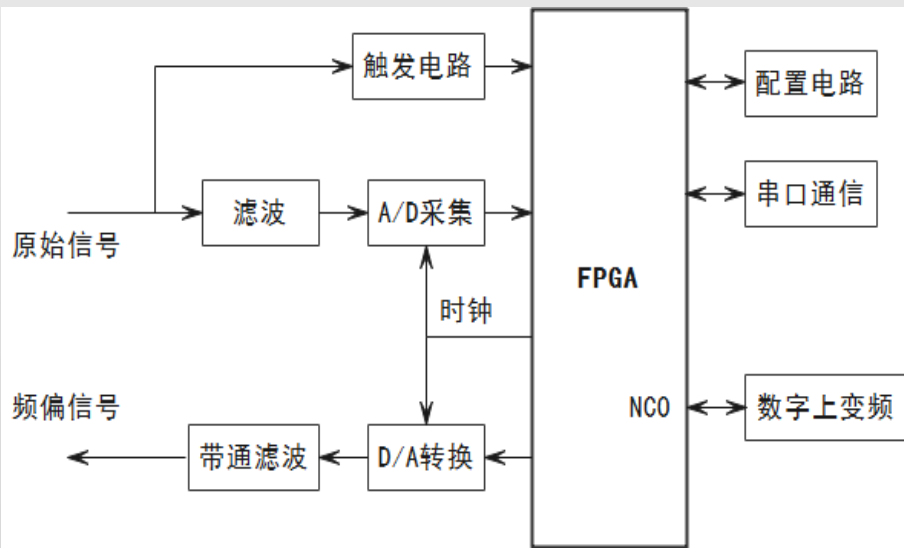
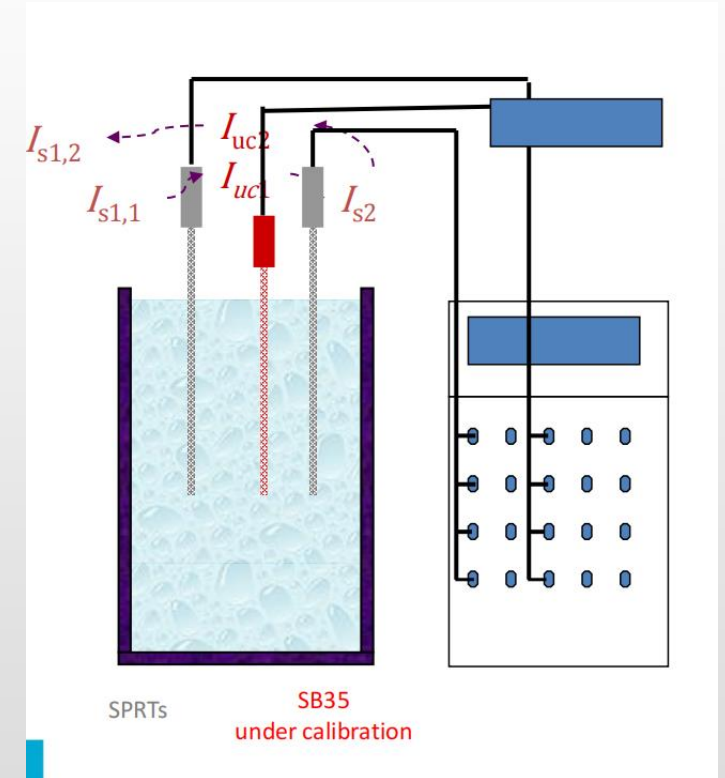
Magnetic field

In 1997, Wrachtup's research group in Germany first used confocal system to study a single NV center of diamond, and obtained **optically detected magnetic resonance(ODMR)** signal of a single NV center **at room temperature**.

S is the spin angular momentum, S_x, S_y, S_z is its component in x, y and z axes. g_s is the Lande factor, and μ_B is the Bohr magneton.

Day 3 Ocean Best Practices-Instrument Calibration

(Chair: Jianqing YU)



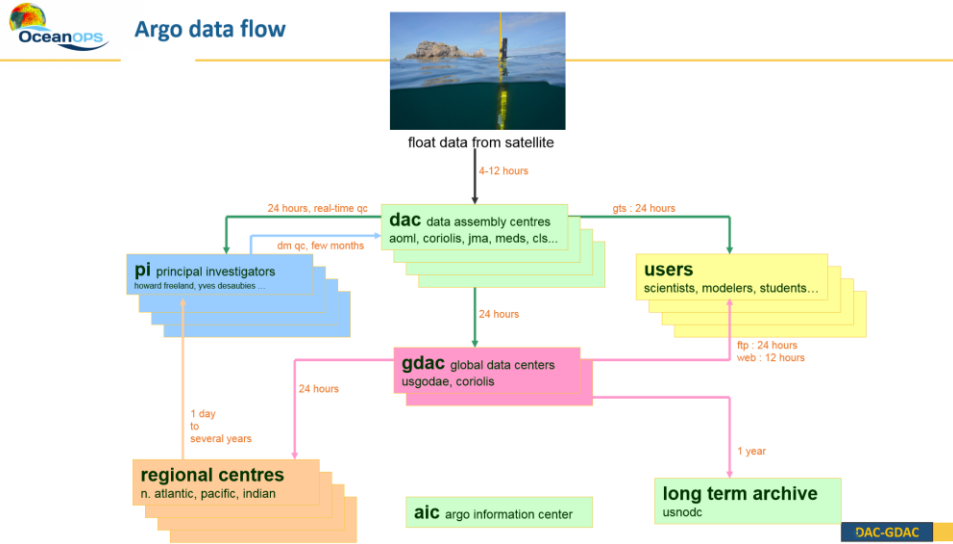
Day 3 Ocean Best Practices-Instrument Calibration

Recommendations (draft):

1. Ecology observation is an important component of GOOS, RMIC/AP is glad to provide reference materials to ensure data traceability.
2. Metrology achievements are intimately connected with global measurements and observations. Encourage institutions to enhance the study of observing sensors and calibration methods, as well as the emerging technology such as Quantum mechanics, new SI system.

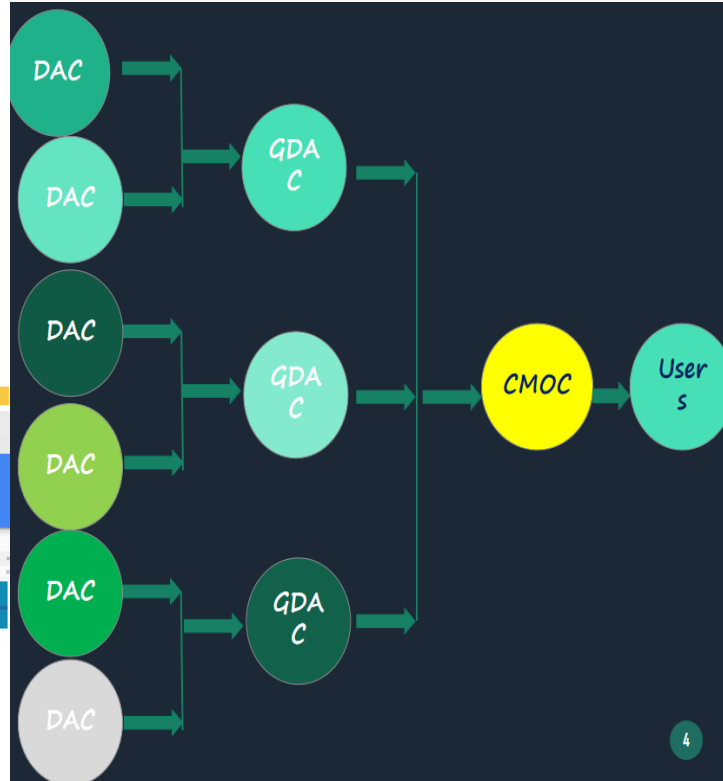
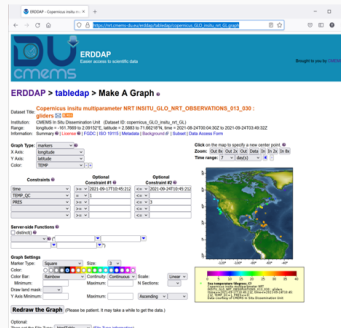
Day 4 Quality Control and Quality Assurance of Networks

(Chair: Qiu Jiang)



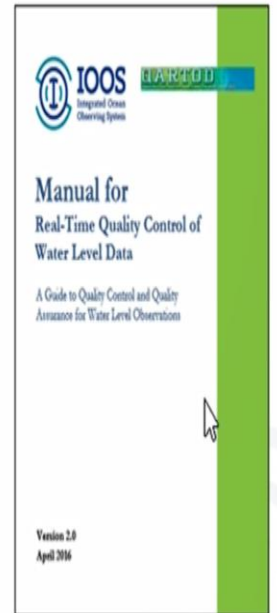
OceanGliders GDAC prototype

- A prototype for OceanGliders GDAC (Global Data Assembly Centre) available at:
 - <https://nrt.cmems-du.eu/erddap>
 - <http://www.ifremer.fr/co/ego/ego/v2>
- A directory per glider, a sub-directory per deployment
- Each deployment contains
 - The NetCDF trajectory data and metadata file
 - The deployment JSON file (used for data processing)
 - A directory of all vertical profiles
 - One NetCDF file per profile, extracted from NetCDF data file (descending and ascending phases)



13 QARTOD QC Manuals

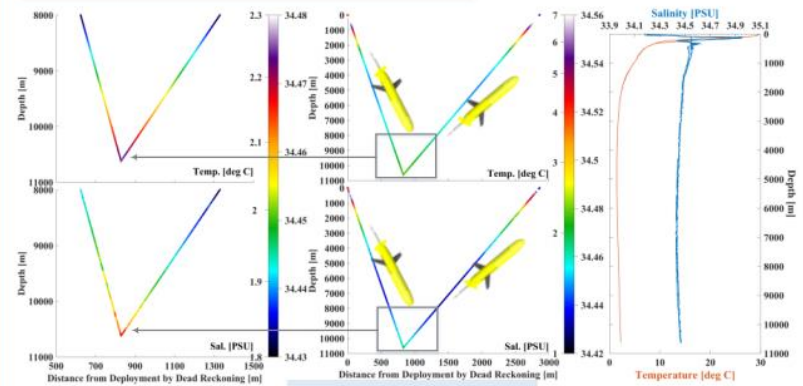
- Dissolved Oxygen
- In-Situ Currents
- In-Situ Surface Waves
- Temperature and Salinity
- Water Level
- Winds
- Ocean Optics
- Dissolved Nutrients
- High Frequency Radar Surface Currents
- Phytoplankton
- Passive Acoustics
- Streamflow
- pH



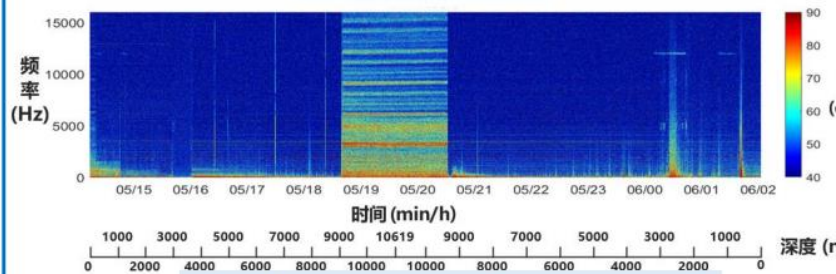
Day 4 Quality Control and Quality Assurance of Networks

(Chair: Qiu Jiang)

The DRAM



CTD data



Underwater environmental noise measurement



WMO-IOC, Sixth Marine Instrumentation Workshop for Asia-Pacific Region

Intercomparisons at sea

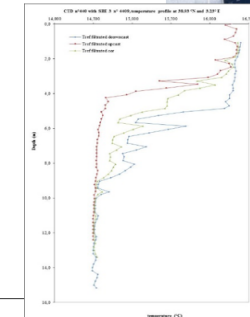
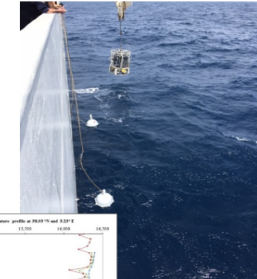
During an oceanographic cruise, two buoys have been compared to a CTD profiler and a reference thermometer SBE 35.

These instruments make measurements to about 1 m under the surface.

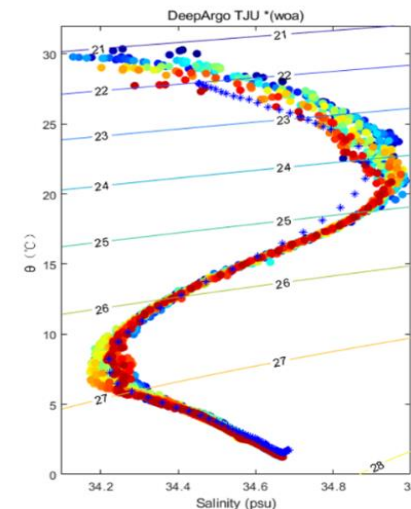
	Value transmitted	sst corrected	Ttrans - Tctd :	Ttrans - Tsbe35	SSTcor - Tsbe35
SST58002 :	16,35	16,382	-0,048	-0,047	-0,014
SST 58019 :	16,35	16,389	-0,048	-0,047	-0,008
HRSST 58002 :	16,391		-0,007	-0,006	
HRSST 58019 :	16,398		0,000	0,001	

The comparison results show that without any correction, HRSST values are in the standard dispersion range of the SBE 35 and the deviations compared to the CTD and the SBE 35 are inferior to 0.01 °C.

Without corrections, SST deviations are close to - 0.05 °C and with calibration corrections, they are in the calibration expanded uncertainties of these sensors.



10/17/2004



The temperature is basically consistent with WOA2018, and the salinity is within 0.01PSU compared with WOA2018. The data quality is good and meets the observation requirements of the international Argo plan, which verifies the performance of the buoy in real sea conditions.

Day 4 Quality Control and Quality Assurance of Networks

Recommendations (draft):

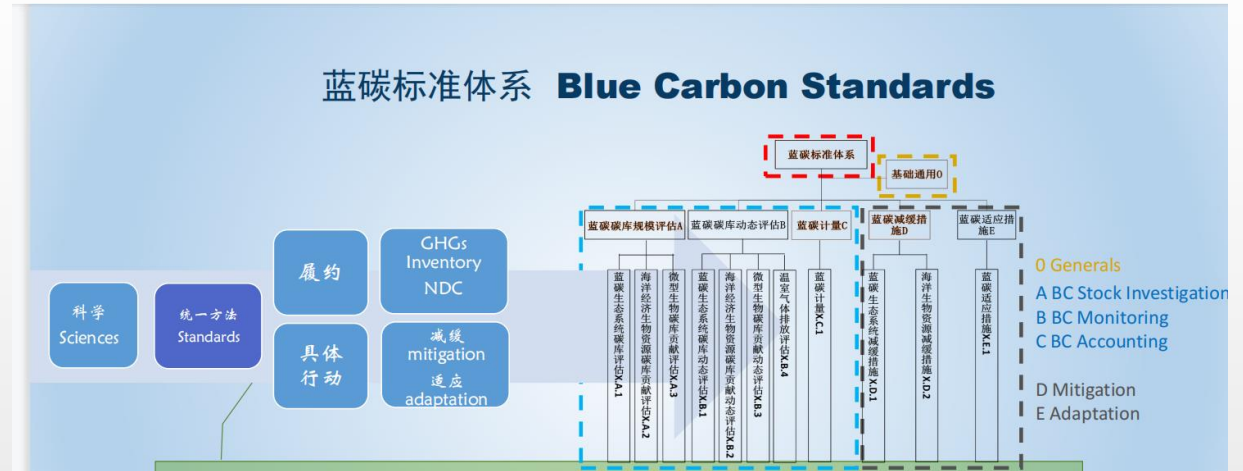
1. Encourage RMICs and RICs to make the contributions to collect the best practices of in-situ quality assurance, enhance the relevant research through organizing inter-comparisons (such as Argo vs CTD/ Salinometer, Glider VS Argo, innovative network of buoys...)
2. Encourage Tianjin University to share their best practices of hadal glider to Ocean Gliders, also upload the data of FUXING to Argo GDAC.

Day 5 Ocean Best Practices-Interdisciplinary Contributions

(Chair: Hairong Tang)

ISO 23040
Marine environment impact assessment (MEIA) – Specification for marine sediments in seabed areas – Survey of interstitial biota

- the first ISO international standard in the field of Marine surveys developed by China and jointly formulated by eight countries
- an important breakthrough in the internationalization of China's Marine survey technical standards.



Ocean Water Sampling

Neuston net

Manta trawl

Schindler-Patalas plankton trap

Catamaran

Bongo net

Rosetta Sampler

Submersible pump, Li, et al., 2020)

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Day 5 Ocean Best Practices-Interdisciplinary Contributions

Recommendations (draft):

- 1.Highlight the inter linkage between National Standards, Best Practices and international standards, and encourage all stakeholders on aboard to foster the development of international standards, regional standards and best practices.
- 2.Discover the potential interesting areas with ISO, IEEE, OBPS and Regional Centers, for further information sharing, cooperating and mutual recognition.