



WORLD METEOROLOGICAL ORGANIZATION

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INTERGOVERNMENTAL OCEANOGRAPHIC  
COMMISSION (OF UNESCO)

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# **FOURTH JCOMM MARINE INSTRUMENTATION WORKSHOP FOR THE ASIA PACIFIC REGION**

Weihai, China  
21 – 23 October 2014

**FINAL REPORT**

JCOMM Meeting Report No. 118

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## **NOTES**

### **WMO AND IOC DISCLAIMERS**

#### **WMO Regulation 42**

Recommendations of working groups shall have no status within the Organization until they have been approved by the responsible constituent body. In the case of joint working groups the recommendations must be concurred with by the presidents of the constituent bodies concerned before being submitted to the designated constituent body.

#### **WMO Regulation 43**

In the case of a recommendation made by a working group between sessions of the responsible constituent body, either in a session of a working group or by correspondence, the president of the body may, as an exceptional measure, approve the recommendation on behalf of the constituent body when the matter is, in his opinion, urgent, and does not appear to imply new obligations for Members. He may then submit this recommendation for adoption by the Executive Council or to the President of the Organization for action in accordance with Regulation 9(5).

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# 4<sup>TH</sup> JCOMM Marine Instrument Workshop for the Asia-Pacific Region

Weihai, China Oct. 2014



*Group Photo*

## EXECUTIVE SUMMARY

The fourth JCOMM Marine Instrumentation Workshop for the Asia Pacific Region was held in Weihai, China, from 21 to 23 October 2014 at the kind invitation of the State Oceanic Administration (SOA) and the National Centre of Ocean Standards and Metrology (NCOSM) of China. The workshop was also co-hosted by the Shandong Academy of Science Institute of Oceanographic Instrumentation (SDIOI), and the Weihai Government. About 65 participants from 21 Members/Member States and international Organization attended the workshop.

The workshop recalled the importance of ocean observations to achieve socio-economical benefits at the global, regional, national, and local (e.g. Weihai city) levels by addressing the requirements of WMO and IOC Applications, including the Global Framework for Climate Services (GFCS), and working in the multi-disciplinary frameworks of the IOC-WMO-UNEP-ICSU Global Ocean Observing System (GOOS) and the WMO Integrated Global Observing System (WIGOS).

The participants received training essentially on seawater salinity measurement techniques, calibration, and traceability.

The workshop issued 12 recommendations detailed in [Annex III](#). A workplan for RMIC/AP activities for 2015/2016 will be elaborated by the end of November 2014 on the basis of the workshop's discussions and outcome.

The workshop thanked China, SOA, and the NCOSM for providing such excellent facilities to the countries of the Asia Pacific Region and to their strong commitment to operate the RMIC/AP. They also thanked the SDIOI and the Weihai local government for co-hosting the workshop

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## WORKSHOP REPORT

### 1. Introduction

1.1 The WMO-IOC Regional Marine Instrument Center for the Asia-Pacific Region (RMIC/AP) was established by the World Meteorological Organization (WMO) and the Intergovernmental Oceanographic Commission (IOC) of UNESCO through WMO Congress Resolution 9 (Cg-XVI) and IOC Resolution XXVI-9. The RMIC/AP holds activities in support of the Observation Programme Area (OPA), under the auspices of the Joint WMO-IOC Technical Commission for the Oceanography and Marine Meteorology (JCOMM).

1.2 In accordance with its Terms of Reference (JCOMM-III Recommendation 1), the goals of the RMIC/AP are: (i) to assist WMO Members/IOC Member States within its region in calibrating their national meteorological standards and related oceanographic monitoring instruments according to the RMIC capabilities; (ii) to organize training workshops; and (iii) to organize marine instrument inter-laboratory comparisons. It should be noted that recently, the RMIC/AP has begun to offer calibration services (seawater conductivity/salinity, seawater temperature, seawater depth, tide, wave) to WMO Members/IOC Member States.

1.3 The Third Workshop on Marine Instrumentation for the Asia-Pacific Region was organized by the RMIC/AP and held in Weihai, China, from 21 to 23 October 2014, at the kind invitation of the National Center of Ocean Standards and Metrology (NCOSM), China State Oceanic Administration (SOA). It was also co-hosted by the Shandong Academy of Science Institute of Oceanographic Instrumentation (SDIOI), and the Weihai Government. The First, Second, and Third Workshops on Marine Instrumentation for the Asia-Pacific Region were held at the RMIC/AP in Tianjin, China, in July 2011, December 2012, and July 2013 respectively (see JCOMM Meeting Reports No. 87<sup>1</sup>, 95<sup>2</sup>, and 108<sup>3</sup>) and focused on focused on metrological instrumentation technology, CTD measurements, and wave observations respectively. This Fourth workshop focused on salinity measurements.

1.4 About 65 participants from 21 Members/Member States and international Organization attended the workshop. They included scientists, experts, researchers, engineers and government managers involved in the fields of oceanography and marine meteorology from Member countries of WMO and IOC of the Asia-Pacific region, as well as members of RIMCs. The list of participants is provided in Annex II.

1.5 The objectives of the third Workshop were essentially (i) to provide training on instrument practices, in particular with regard to salinity measurements, and (ii) to provide a networking platform for countries in the Asia Pacific on instrument best practices, and to promote further collaboration and synergies amongst them.

1.6 All information related to the Workshop, including this report, and the presentations delivered during the workshop are available on the JCOMM website<sup>4</sup>.

1.7 Opening statements were delivered by (i) Mr. LIANG Fengkui, Deputy-Director of International Cooperation Department of SOA, (ii) Mr. BIAN Mingqiu, Secretary-General of the SOA National Centre of Ocean Standards and Metrology (NCOSM), (iii) Mr. FEI Yu Nan, Weihai Government, (iii) Mr. CHARPENTIER Etienne, Scientific Officer, Observing and Information Systems Department, World Meteorological Organization (WMO), and (iv) Dr GROSS Tom, Programme Officer, Intergovernmental Oceanographic Commission (IOC) of UNESCO. In the opening remarks, the following was noted:

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1 <ftp://ftp.wmo.int/Documents/PublicWeb/amp/mmop/documents/JCOMM-MR/JCOMM-MR-87-Rev2-RMIC2.pdf>

2 <ftp://ftp.wmo.int/Documents/PublicWeb/amp/mmop/documents/JCOMM-MR/JCOMM-MR-95-RMIC-RA-II-2.pdf>

3 <ftp://ftp.wmo.int/Documents/PublicWeb/amp/mmop/documents/JCOMM-MR/JCOMM-MR-108-RMIC-AP3.pdf>

4 [www.jcomm.info/rmic4-ra2](http://www.jcomm.info/rmic4-ra2)

- Met-ocean applications provide the means to prevent, mitigate, and adapt to the impacts of ocean phenomena, weather, and climate on the environment and human activities in coastal regions and beyond. These applications include for example weather forecasting and operational meteorology, the monitoring, understanding and prediction of seasonal-to-interannual climate variability and climate change, marine services activities such as marine forecasting in support of marine transportation and operations in the open and coastal ocean areas, including the safeguard of life and property at sea and response to marine pollution, the protection and sustainable development of the ocean and marine environment, and the efficient management of marine resources.
- While useful to realize socio-economical benefits, Met-ocean applications rely heavily on in situ and satellite meteorological and oceanographic observations. Ocean observations have proved very successful and useful for weather forecasting, maritime safety, and climate related applications. Through the Joint WMO-IOC Technical Commission for Oceanography and Marine Meteorology (JCOMM), the Members of WMO and Member States of IOC are contributing to WMO and IOC Applications by providing the required in situ ocean observations in complement of satellite data. JCOMM also provides an international coordination mechanism for addressing the required standardization, harmonization, and optimization of ocean observation implementation and operations serving the needs of WMO and IOC applications.
- WMO is collaborating with partner organizations, such as the IOC towards harmonization of instrument practices and related standards, and interoperability between data systems. The WMO Integrated Global Observing System (WIGOS), the Global Ocean Observing System (GOOS), but also the Global Framework for Climate Services (GFCS) that is being implemented is increasing the demand for high quality, documented, and traceable observations of known uncertainty, not only for current observations of newly deployed instruments but also for historical data.
- Regional Marine Instrument Centres (RMICs) such as the one for the Asia Pacific region in Tianjin, China, help improving adherence and traceability of ocean observations and associated metadata to high level standards for instruments and methods of observation on a regional basis.
- The RMIC/AP has become an important platform for the exchange of information on marine instrumentation testing technology among WMO Members and IOC Member States in the Asia-Pacific Region. The workshop is a grand gathering in the field of international marine instrumentation testing and effectively promotes learning and experience sharing between participants. It plays an important role in promoting the development of marine standard, metrology and quality control, as well as in fostering excellent marine instrumentation testing technicians.
- International speakers hoped that the participants will enjoy the exceptional hospitality of our hosts from the NCOSM and will have a great Workshop. They were very grateful of the contribution by China, SOA, and the NCOSM to operating and enhancing the activities of the RMIC/AP in the last few years.

## **2. Main Activities of RMIC for the Asia-Pacific Region since its establishment**

2.1 The workshop recognized the excellent achievements of the RMIC/AP since its establishment. It agreed that through its commitments, the RMIC/AP has entirely fulfilled its obligations and functions as outlined in the Terms of Reference of WMO-IOC RMICs. The workshop noted with appreciation that the centre has:

- (i) organized and hosted four marine instrument workshops,
- (ii) organized the first JCOMM inter-comparison of seawater salinity measurement, and
- (iii) provided marine observation instrument calibration and relevant standards.

2.2 The workshop further acknowledged that the activities and services provided by RMIC/AP are aligned with the JCOMM requirements, as well as those of WMO and IOC Members and Member States. These can be regarded as an excellent example for other RMICs to fulfil their mandates and assist Members/Member States in their region of interest. The meeting also agreed that the RMIC/AP was playing a positive and constructive role in normalizing the marine instruments calibration in the region, cultivating talents, promoting global ocean metrology, relevant standards and quality control procedures. It is making a great contribution to the activities of the WMO, and the IOC through JCOMM.

### **3. Training delivered to participants**

3.1 The Workshop was conducted through class sessions, hands-on exercises and discussions.

3.2 The programme for the workshop is provided in Annex I.

3.3 The participants acknowledged the importance of standards and quality management on marine meteorology and oceanographic measurements, and thereby received comprehensive information for realizing the integration of ocean observations in the GOOS and WIGOS frameworks, and achieving the WMO and IOC Applications requirements. The Workshop was conducted through class sessions and discussions. Training was provided on the following aspects:

- ✓ WMO and IOC framework and higher level issues such as GOOS and WIGOS
- ✓ Activities and achievements of the RMIC/AP
- ✓ Overview of the activities of the WMO Technical Commission for Instruments and Methods of Observation (CIMO), in particular with regard to instrument intercomparisons
- ✓ TEOS-10 – Thermodynamic Equation of Seawater – 2010
- ✓ Seawater measurement techniques, and reference materials
- ✓ Instrument intercomparison activities, including regulations and operational procedures in the JCOMM framework, progress with regard to the JCOMM Pilot Project on the intercomparison of seawater salinity measurements
- ✓ National reports

3.5 Training materials and presentations of the workshop are available on the event's website<sup>4</sup>. Abstracts of presentations are provided in Annex IV.

### **4. Workshop recommendations**

4.1 The workshop reviewed and agreed on series of recommendations which are detailed in Annex III. A workplan for RMIC/AP activities for 2015/2016 will be elaborated by the end of November 2014 on the basis of the workshop's discussions and outcome.

4.2 The workshop expressed deep appreciations to the State Oceanic Administration (SOA) of China, the National Centre for Ocean Standards and Metrology of SOA (NCOSM), the Shandong Academy of Science Institute of Oceanographic Instrumentation (SDIOI), and the Weihai Government, for co-hosting and organizing the fourth workshop with such pleasant facilities. It also thanked the NCOSM for their high vision, leadership and strong political and resource support to the RMIC/AP.

## ANNEX I

**PROGRAMME OF THE FOURTH JCOMM MARINE INSTRUMENTATION WORKSHOP  
FOR THE ASIA-PACIFIC REGION  
(Weihai, China, 21-23 October 2014)**

**21<sup>st</sup> Oct. 2014 (09:00 -17:00):**

**Morning (09:00 -12:00)**

<i>Time</i>	<i>Speakers</i>	<i>Title</i>	<i>Moderator</i>
09:00 (55 min)	Opening of the workshop		WU Aina (RMIC/AP)
	Official of SOA	Opening remarks	
	Leader of Local Government	Welcome remarks	
	Mr Etienne CHARPENTIER (WMO Secretariat)	Opening remarks	
	Mr Thomas GROSS (IOC/UNESCO Secretariat)	Opening remarks	
	Dr BIAN Mingqiu (Secretary-General of NCOSM)	Welcome remarks	
<b>09:55 - Tea break and group photo(35 min)</b>			
10:30 (30 min)	Mr Etienne CHARPENTIER (WMO Secretariat)	WMO Integrated Global Observing System (WIGOS)	Etienne Charpentier (WMO)
11:00 (30 min)	Mr Thomas GROSS (IOC/UNESCO Secretariat)	GOOS and Essential Ocean Variables: A new coordination paradigm for observation systems	
11:30 (30 min)	Prof. SUI Jun (RIMC for Asia-Pacific)	Reports of the Development of RIMC for Asia-Pacific	

**Afternoon (14:00 -17:00)**

<i>Time</i>	<i>Speakers</i>	<i>Title</i>	<i>Moderator</i>
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14:00 (40min)	Prof./Dr LI Bai (China Meteorological Administration)	Overview of Commission of Instruments and the Methods of Observation and 8th International Radiosonde Inter- comparison in 2010.	Etienne Charpentier
14:40 (70 min)	Dr Rainer Erich FEISTEL (SCOR/ IAPSO)	TEOS-10: Thermodynamic Equation Of Seawater - 2010	
<b>15:50 - Tea break (20min)</b>			
16:10 (45min)	Ms LUO Yan (Engineer, NCOSM)	Reference Materials of Seawater Salinity Measurement in China	
16:55 (5 min)	Conclusion		

**22<sup>nd</sup> Oct. 2014 (09:00 -17:00):**

**Morning (09:00 -12:00)**

<b>Time</b>	<b>Lead/speaker</b>	<b>Title</b>	<b>Moderator</b>
09:00 (35 min)	Mr Etienne CHARPENTIER (WMO Secretariat)	Regulations and Operation Procedures of the Pilot Project for the Inter-comparison of Seawater Salinity Measurement	Thomas Gross (IOC)
09:35 (35min)	Prof. PANG Yong Chao (NCOSM)	Stage Progress of the 1 <sup>st</sup> Inter-comparison of Seawater Salinity Measurement	
<b>10:10 - Tea break (20 min)</b>			
10:30 (60 min)	Dr.WU Xiaohuai (Certification and Accreditation Administration of the People's Republic of China(CNCA))	The Organization and Conduct of Inter- laboratory Comparisons and Case Study	

**Afternoon (14:00 -17:00)**

<b>Time</b>	<b>Speakers</b>	<b>Title</b>	<b>Moderator</b>
14:00 (20 min)	Ms Karen Renee GRISSOM (NDBC, USA)	NDBC Salinity Measurements: From Lessons Learned to Best Practices	Thomas Gross
14:20 (45 min)	Dr. HUANG Jing (Guideline Instruments Limited)	Technology & Methods and Measuring Instruments for Seawater Salinity Measurement in Laboratory	

<b>15:05 – Tea break (15 min)</b>		
15:20 (40min)	Dr. FENG Xiaohui (Guideline Instruments Limited)	Technology & Methods and Measuring Instruments for Seawater Salinity Measurement in Laboratory
16:00 (50 min)	National Reports (see below)	
16:55 (5 min)	Conclusion	

**23<sup>rd</sup> Oct. 2014 (09:00 -12:30):**

**Morning (09:00 -12:30)**

<b>Time</b>	<b>Content</b>	<b>Moderator</b>
09:00 (130 min)	National Reports (see below)	Etienne Charpentier
<b>11:10 – Tea break (20 min)</b>		
11:30 (60 min)	Discussion and Summary	

### PROGRAMME OF THE NATIONAL REPORTS

<b>WEDNESDAY 22 OCTOBER 2014</b>				
#	TIME	TOPIC	NATION	PRESENTER / AUTHOR
	16:00 – 16:05	National Report Programme introduction		<i>Thomas Floyd Gross</i>
1	16:05 – 16:15	Salinity :The Practical Points of Views in Water Quality Programme	Cook Islands	<i>Teinakore Tuatai</i>
2	16:15 – 16:25	Malaysian Meteorological Department Contribution To Marine Meteorology and Oceanography	Malaysia	<i>Ramlan Bin Ab Rahman</i>
3	16:25 – 16:35	Numerical Simulation of Storm Surges Associated With Severe Cyclones Landfalling Pakistan Coast during 1999-2010 and Frequency of Tropical Cyclone Formation and their Intensity in the NIO.	Pakistan	<i>Sarfaraz</i>
4	16:35 – 16:45	MARINE FORECAST: TECHNICAL APPLICATION, TOOLS AND COMMUNICATIONS	TOGO	<i>Etse Gatogo</i>
5	16:45 – 16:55	Activities at Ocean Observation Systems , National Institute of Ocean Technology(NIOT) , India	India	<i>Sundar Sebastian Jesuraj</i>
	16:55 – 17:00	Concluding remarks		
<b>THURSDAY 23 OCTOBER 2014</b>				

WEDNESDAY 22 OCTOBER 2014				
#	TIME	TOPIC	NATION	PRESENTER / AUTHOR
6	09:00 – 09:10	Kenya National Report on Marine Observation Instruments	Kenya	<i>Philip Obaigwa Sagero</i>
7	09:10 – 09:20	Potential Stakeholders to NCOSM Services and Collaborations in Saudi Arabia	Saudi Arabia	<i>Assad Ahmed Al-Thukair</i>
8	09:20 – 09:30	Pakistan's coast and its research Institutes engaged in multiple research discipline	Pakistan	<i>Noor Ahmed Kalhoro</i>
9	09:30 – 09:40	Oceanographic Monitoring for the Republic of Panama	Panama	<i>Steven Robert Paton</i>
10	09:40 – 09:50	An Introduction to the Iranian National Institute for Oceanography and Atmospheric Science	Iran	<i>Parvin Ghafarian, Mir Mahmoud Seyedvalizadeh</i>
11	09:50 – 10:00	Country Status on Sea Level Observations and related activities in Kenya	Kenya	<i>Samuel Ndirangu Gachui</i>
12	10:00 – 10:10	RMIC for RA I South Africa's participation and potential contributions	South Africa	<i>Nomvuzo Gongxoza</i>
13	10:10 – 10:20	Instruments in Department of Meteorology and Hydrology ,MYANMAR	Myanmar	<i>Htay Lwin</i>
14	10:20 – 10:30	Installation HF Radar location along the shores of the Gulf of Thailand and the Andaman Sea	Thailand	<i>Wattana Kanbua, Wittaya Rugkid</i>
15	10:30 – 10:40	National marine meteorological observation activities in Oman	Oman	<i>Jamal Abdul Rahman Mohammed Al Kharoosi</i>
16	10:40 – 10:50	Oceanographic Calibration Facility	Australia	<i>Kay Robert Daniel</i>
17	10:50 – 11:00	Presentation of the Department of Marine Protected Areas (DAMCP) in Senegal	Senegal	<i>Ousmane Diankha</i>
	11:20 – 11:30	Tea		
	11:30 – 12:00	Summary and Discussion		

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## ANNEX II

## LIST OF PARTICIPANTS

## 1. LEADERS, INTERNATIONAL OFFICIALS, AND LECTURERS

<i>Name</i>	<i>Gender</i>	<i>Nation</i>	<i>Organization</i>	<i>E-mail</i>
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## 2. TRAINEES

<i>Name</i>	<i>Gender</i>	<i>Nationality</i>	<i>Organization</i>	<i>Title</i>	<i>E-mail</i>
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<b>Name</b>	<b>Gender</b>	<b>Nationality</b>	<b>Organization</b>	<b>Title</b>	<b>E-mail</b>
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## ANNEX III

### RECOMMENDATIONS FROM THE WORKSHOP

The workshop recognized the excellent achievements of the RMIC/AP since its establishment. It agreed that through its commitments, the RMIC/AP has entirely fulfilled its obligations and functions as outlined in the Terms of Reference of WMO-IOC RMICs. The workshop noted with appreciation that the centre has (i) organized and hosted four marine instrument workshops, (ii) organized the first JCOMM inter-comparison of seawater salinity measurement, and (iii) provided marine observation instrument calibration and relevant standards. The workshop further acknowledged that the activities and services provided by RMIC/AP are aligned with the JCOMM requirements, as well as those of WMO and IOC Members and Member States. These can be regarded as an excellent example for other RMICs to fulfil their mandates and assist Members/Member States in their region of interest. The meeting also agreed that the RMIC/AP was playing a positive and constructive role in normalizing the marine instruments calibration in the region, cultivating talents, promoting global ocean metrology, relevant standards and quality control procedures. It is making a great contribution to the activities of the WMO, and the IOC through JCOMM.

The workshop agreed on the following recommendations:

1. The Recommendations from the first, second, and third JCOMM Marine Instrumentation Workshops for the Asia-Pacific region (Tianjin, China, July 2011, December 2012, and July 2013) are still valid (see Annex V of JCOMM MR No. 87, Rev. 2<sup>1</sup>, Annex III of JCOMM MR No. 95<sup>2</sup>, and Annex III of JCOMM MR No. 108<sup>3</sup>);
2. Facing with the needs and requirements of members/member states for marine instrument calibration and test, the RMIC/AP is requested to actively explore, in coordination with the liaison group, new ways to provide support to the region, and reformat the workshop if necessary in order to further improve its quality and usefulness;
3. Invitation letters for future workshops should include (i) workshop programme, (ii) call for nomination in liaison group, (iii) request for feedback on relevant national activities
4. The RMIC/AP is requested to develop no later than 30 November 2014 a work-plan on the RMIC/AP activities to be organized in 2015 and 2016.
5. Considering that the oceanographic standard TEOS-10 has been adopted by the IOC (2009) and the IUGG (2011) and provides comprehensive and accurate thermodynamic description of humid air, water, and ice, the workshop recommends that WMO (through JCOMM, and CIMO):
  - should consider the implications of the use of TEOS-10 also for use in meteorological and climatological applications, and its introduction in relevant WMO publications
  - investigate the replacement of the current equation for properties of humid air in the WMO Guide for Meteorological Instruments and Methods of Observation (CIMO Guide, WMO No. 8) by more recent ones based on TEOS-10; and
  - consider participating in meetings of the SCOR/IAPSO/IAPWS Joint Committee on Seawater (JCS) for possibly required more detailed discussion on the above two points.
6. Considering that (i) Chinese Standard for Seawater (SSW) is introduced as a primary reference material apart from IAPSO SSW, which is used in the rest of the world; (ii) Chinese SSW from the North Pacific has an isotopic and chemical composition different from IAPSO SSW taken from the North Atlantic; (iii) according to the International Metrology Vocabulary (VIM), traceability of measurements to different primary standards affects the comparability of the measurement results; recommends that (i) the role of two different primary standards in global oceanography should be carefully evaluated from the metrological perspective; and (ii) JCOMM in cooperation with SCOR/IAPSO/IAPWS JCS to discuss the implications regarding the use of separate standards:

7. Future salinity measurement laboratory intercomparison activities should be undertaken by JCOMM in cooperation and coordination with SCOR/IAPSO/IAPWS JCS – contact point: Rich Pawlowicz (Vancouver, Canada);
8. Noting that the report on the outcome of the first seawater measurement inter-comparison pilot project will soon be published (by the Organizing committee through the Secretariat) as mandated by the rules and procedures of such activity, and actively plan and prepare for a second inter-comparison project;
9. While laboratory intercomparisons are useful, the workshop recommended that the RMIC/AP should also promote field intercomparisons for in situ observing systems implemented through JCOMM;
10. RMIC/AP should summarize through its annual report to JCOMM its experiences accumulated since the establishment of RMIC/AP, and share and promote the experiences with other RMICs;
11. The candidate RMICs are invited to learn from the lessons of the development of the RMIC/AP and of its activities; and the Secretariat should provide them with the RMIC/AP feedback;
12. While appreciating the support from the Chinese government for the operation and developments of the RMIC/AP, the workshop agreed that the feedback from the participants on their activities related to marine instrumentation are of significant importance for the RMIC/AP to report to and gain long-term support from the Chinese government. The workshop there requested all national participants to submit a report to RMIC/AP after the workshop (deadline 30 Nov. 2014). Participants are also invited to make a summary and evaluation about the workshop in their reports;
13. Members/Member States in the Asia Pacific region are encouraged to carry out instrument calibration concerning the parameters of seawater temperature, conductivity, pressure, tide and wave by using the calibration services of the RMIC/AP.

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## ANNEX IV

### ABSTRACTS OF PRESENTATIONS

**1) WMO Integrated Global Observing System (WIGOS)**

*Mr Etienne CHARPENTIER, World Meteorological Organization*

The WMO Integrated Global Observing System (WIGOS) provides a new framework for advancing, integrating and coordinating WMO and co-sponsored observing systems. WIGOS is one of the WMO five strategic priorities, and it lays the foundations for each of the other four, especially the Global Framework for Climate Services, Disaster Risk Reduction and Capacity Development. By strengthening the global monitoring of the Earth's atmosphere, ocean surface and hydrology, WIGOS will greatly improve the information and forecasts available to decision-makers and society as a whole.

The WIGOS Framework Implementation Plan (WIP) details the activities that WMO and its partners will undertake from 2012 to 2015 in order to establish an operational WIGOS by 2016. The plan focuses on integrating governance and management mechanisms, functions and activities among the contributing systems. Goals include improving the quality and availability of data and metadata, developing capacity and improving access to data. The plan also seeks to ensure that WIGOS continues to evolve and improve well into the future.

The Implementation Plan assists system operators to migrate their observing systems into WIGOS through ten key activity areas. It details specific activities for each area and defines deliverables, timelines, responsibilities, costs and risks. It also indicates whether each activity is to be implemented at the global, regional or national levels. The ten key activity areas of the WIGOS Framework Implementation Plan include the following:

1. Management of WIGOS implementation
2. Collaboration with the WMO co-sponsored observing systems and international partner organizations and programmes
3. Design, planning and optimized evolution
4. Integrated observing system operation and maintenance
5. Integrated quality management
6. Standardization, systems interoperability and data compatibility
7. The WIGOS Operational Information Resource (WIR)
8. Data discovery, delivery and archiving
9. Capacity Development
10. Communications and outreach

The WIGOS Framework Implementation Plan will guide how WMO ensures that WIGOS is operational by 2016. History shows that investments such as those described in the plan will be repaid many times over. They will improve the socio-economic conditions and well-being of national populations in myriad ways. They will lead to better weather and climate forecasting and disaster preparedness and response. The active

engagement and participation of WMO Members, Regional Associations and Technical Commissions will ensure that WIGOS is fully implemented and succeeds in delivering these critical benefits.

**2) GOOS and Essential Ocean Variables: A new coordination paradigm for observation systems**

*Dr Thomas Floyd GROSS, Intergovernmental Oceanographic Commission of UNESCO*

The goal of the Global Ocean Observing System (GOOS) has been to provide for sustained ocean observations needed for services supporting our well-being and that of the planet. Mankind has the ability and technology to manage the unsustainable practices and exploitation of the oceans which are damaging oceanic ecosystems and degrading environmental services. But only if we know how the ocean is changing. We cannot manage what we do not measure. Because monitoring the global ocean is too large a task for any one nation, international collaboration is essential. The Global Ocean Observing System provides a platform for national contributions to come together to deliver sustained observations of the global ocean. The GOOS enables ocean observation systems by providing global strategic guidance, advice and best practices for ocean observation systems. GOOS is a collaborative programme that connects communities working in all aspects of ocean observations: marine research, observation platforms, products and data dissemination, and actionable knowledge useful to marine management. The principles and best practices of GOOS are designed to increase uptake and identification of this community as being a part of GOOS, by providing added value through participation in GOOS. An effective objective of GOOS is to assure that GOOS plans and ocean observation goals are taken up by member states as a priority during national planning. The value added by participation in an integrated global observing system is the strongest argument available for increasing national level participation and sustainable support of ocean observations. The new sustainability paradigm for the future GOOS is based upon this promise.

**3) Reports of the Development of RIMC for Asia-Pacific**

*Prof. Jun SUI, RIMC for Asia-Pacific*

This report will focus on the following four sections. Firstly, RIMC/AP was established on the base of NCOSM, I'll give a brief introduction of NCOSM. Secondly, how we established the RIMC/AP. Thirdly, what have we done since RIMC's establishment. Finally, what we will do in the near future.

NCOSM was accredited to ISO/IEC 17025:2005 in Dec. 2007. Now I'll give a detailed description. NCOSM has acquired the quality certification and laboratory accreditation from CNAS in December, 2007, which including 25 kinds of instruments for testing and 12 kinds of instruments for calibration.

To meet the needs of quantity transmission and traceability to SI, China sets up measurement standards and holds an examination of measurement standards every 4 years. RIMCs/AP maintains 34 marine measurement standards covering 13 variables,

and has established the traceability of these variables. RMICs/AP holds more than 100 sets of calibration and test instruments/equipments, and has set up marine metrological methods and regulations.

In November 2009, at the 3rd Session of JCOMM, China offered to establish the RMICs/AP on the base of NCOSM. In July 2010, Mr. Etienne Charpentier, as the observer of JCOMM, came to NCOSM to review the practical capabilities of NCOSM. He insists that NCOSM owns enough competence to play the role of RMICs/AP. On November 1-3, 2010, we delivered the formal report and the offer was agreed. In May and June 2011, Executive Councils of WMO and IOC respectively approved the establishment of RMICs/AP.

We enhance the capacity-building of marine instruments calibration/test, by providing Members/Member States calibration / test services of seawater temperature, conductivity, pressure, tides and waves instruments, and organizing and conducting training courses and workshops. The First JCOMM Marine Instrumentation Workshop for the Asia Pacific Region was held in Tianjin, China, from 11 to 13 July 2011. More than 20 participants received the fully financial assistance from RMICs/AP. The second Workshop was held in December 2012. There are 15 participants received the fully financial assistance from RMICs/AP. The Third Workshop was held in July 2013. There are nearly 30 participants received the fully financial assistance from RMICs/AP. In 2014, RMIC/AP is organizing the JCOMM Inter-comparison Pilot project for seawater salinity measurements .

**4) Overview of Commission of Instruments and the Methods of Observation and 8th International Radiosonde Inter-comparison in 2010**

*Dr. Bai LI, China Meteorological Administration*

[Abstract not available at the time of finalizing this report]

**5) TEOS-10: Thermodynamic Equation Of Seawater – 2010**

*Dr. Rainer Erich FEISTEL, SCOR/ IAPSO*

*Leibniz-Institut für Ostseeforschung Universität Rostock*

*D-18119 Warnemünde, Germany*

The “Thermodynamic Equation Of Seawater- 2010”, TEOS-10, available from the internet at [www.teos-10.org](http://www.teos-10.org), was endorsed as an international oceanographic standard by the UNESCO/IOC in Paris in 2009, and for marine scientists by the International Union for Geodesy and Geophysics (IUGG) in Melbourne in 2011. It is the most recent standard in a sequence that commenced in 1901 in Stockholm at the conference of the International Council for the Exploration of the Seas (ICES). TEOS-10 replaces the International Equation of Seawater 1980 (EOS-80) and adds the 2008 Reference-Composition Salinity Scale consistently to the Practical Salinity Scale of 1978 (PSS-78). TEOS-10 provides the first salinity standard that includes a chemical model of sea salt and supports the investigation of seawater composition anomalies. Thermodynamic properties of seawater, liquid water, water vapour, ice and humid air are described within TEOS-10 in a perfectly consistent, axiomatic way, supported by extensive, open-access source-code libraries developed by the SCOR/IAPSO Working Group 127 (WG127) in cooperation with the International Association for the Properties



of Water and Steam (IAPWS). As a successor of WG127, the SCOR/IAPSO/IAPWS Joint Committee on Seawater (JCS) in cooperation with the International Bureau of Weights and Measures (BIPM) continues the work toward new standards and definitions of salinity, seawater pH and atmospheric relative humidity, to be based for the first time on the International System of Units (SI), a long-pending and increasingly urgent task in the context of global climate change.

**6) Reference Materials of Seawater Salinity Measurement in China**  
*Mr Yan LUO, Engineer, NCOSM*

This presentation gives brief introduction of the classification, management and relevant laws and regulations of China Reference Materials. It introduces the revolution of the definition of salinity and emphasizes the importance of salinity reference material. It sets focus on the introduction of China Seawater Salinity Reference Material, including the development of China Standard Seawater, preparation technique, quality control approaches, classification as well as the usage method.

Authorized by General Administration of Quality Supervision, Inspection and Quarantine of the People's Republic of China(AQSIQ), National Center of Ocean Standards and Metrology (NCOSM) is responsible for the production of China Primary Standard Seawater and China Series Standard Seawater. The main techniques include water collected, evaporation, filtration, sterilization, salinity adjustment, Bottling and Calibration. Quality control is realized through uniformity test, stability test, uncertainty assessment as well as the regular comparison with IAPSO Standard Seawater.

**7) Regulations and Operation Procedures of the Pilot Project for the Inter-comparison of Seawater Salinity Measurement**  
*Mr Etienne CHARPENTIER, World Meteorological Organization*

The presentation will start with an overview of the framework in which the Pilot Project for the inter-comparison of seawater salinity measurements is made. This includes some words on the World Meteorological Organization, and its collaboration with partner Organizations such as the Intergovernmental Oceanographic Commission (IOC) of UNESCO in particular through the Joint WMO-IOC Technical Commission for Oceanography and Marine Meteorology (JCOMM). An overview of the activities of JCOMM with regard to the implementation of marine meteorological and oceanographic observing systems will be provided, including implementation goals, and current status. One of the issues for JCOMM to address with regard to ocean observations is particularly to identify and improve data quality in three areas (i) uncertainty of the measurements, (ii) their traceability to IS units, and (iii) their timeliness to reach the end users.

The existing mechanisms promoted by JCOMM to address instrument issues will be presented, including the network of WMO-IOC Regional Marine Instrument Centres (RMICs), which are meant to play a key role with regard to instrument intercomparisons. The need for regularly undertaking such intercomparisons will be presented since together with agreed QC procedures, intercomparisons are essential

for the establishment of compatible data-sets and should be organized regularly. Comparison of sensors, instruments and equipment, which are operationally applied for measuring marine meteorological and oceanographic variables, are important means of determining their performance characteristics under in-situ (field) conditions. Intercomparisons are also be carried out in the laboratory to assure traceability of the observations to the International System of units (SI) and observations made available to the end users have to be of known quality.

JCOMM intercomparison activities include (i) field intercomparisons (e.g. Pilot Project on wave measurement evaluation and test from moored and drifting buoys (PP-WET)), (ii) laboratory intercomparisons (e.g. the Pilot Project for the Intercomparison of Seawater Salinity Measurements), and other activities such as looking at the XBT Fall Rate Equation.

The guidelines, rules, and procedures for the Intercomparison of marine meteorological and oceanographic instruments were proposed by the fifth session of the JCOMM Observations Coordination Group (OCG) meeting (Silver Spring, USA, Sept. 2013). They relate to the intercomparison of instruments and metrological laboratories, and are meant to improve traceability of marine meteorological and ocean measurements to international standards. These rules and procedures are based on existing experience (WMO/CIMO, BIPM), and all intercomparisons should be planned and carried out carefully. The goal is to have compatible data-sets. The rules and guidelines are intended to make JCOMM intercomparisons more effective, more assured, and legitimate. They are supplemented by specific working rules for each intercomparison. The reports at any level should be made known and available to the Meteorological and Oceanographic communities at large. After the proposed rules and procedures are reviewed and approved by JCOMM, the comparison will be recognized as JCOMM Intercomparison.

Comparisons or evaluations may be organized and carried out as different levels: (i) global, in which participants from all interested countries may attend in response to a general invitation; (ii) regional, whereby a certain region (WMO regional associations or GOOS Regional Alliance may attend in response for a general invitation); (iii) multilateral and bilateral, where two or more countries may agree to attend without a general invitation; (iv) national for a single country; or (v) at the project level, whereby the members of the project may attend in response to a general invitation.

The rules and procedures are reviewed by JCOMM in consultation with CIMO. In addition, guidelines complement the rules & procedures. According to the rules and procedures, the JCOMM Co-President should regularly inquire about the willingness of Members/Member States to undertake intercomparison activities. The JCOMM activity leader on intercomparisons is tasked to compile and summarize information on intercomparison activities, and make proposal to JCOMM Co-President(s) through the OCG. Decision on an intercomparison activity is made by the JCOMM Co-President(s) after consultation with the OCG, and identification of appropriate resources. The JCOMM Co-President(s) then set up an Organizing Committee, and the host of the

intercomparison activity nominates a project leader responsible for data analysis, and preparing the project report. The WMO and IOC Secretariats then invite participants in the activity. Upon completion, a Project report is published as a JCOMM Technical Report (or within the CIMO Observing Methods Report series). The role of Organizing Committee is to agree on the organization of the activity, including objectives, dates, place, duration, conditions for participating, data acquisition, processing and analysis methodology, plans for publication of results, intercomparison rules, responsibilities of the host(s) and participants. The Organizing Committee also approves the results and the project report. It makes proposals for utilization of results.

An outline of the Guidelines for Organizing JCOMM Intercomparisons of Marine Meteorological and Oceanographic Instruments will also be presented.

Finally, the presentation will provide information on the JCOMM Pilot Project for the intercomparison of seawater measurements. This activity was also proposed by the OCG at its fifth Session, noting that Seawater salinity is a basic and important variable for oceanography and climate applications. The accuracy, traceability, and compatibility of salinity measurements is indeed essential to the data quality control of JCOMM marine observations, and to WMO & IOC Applications. The Pilot Project is targeting laboratories involved in JCOMM global marine/ocean observation programmes, and is undertaken according to the rules, procedures & guidelines for JCOMM intercomparisons. The purpose of the Pilot Project is to ascertain the overall proficiency of participants for measuring seawater salinity. Experiences obtained from this activity will be useful for establishing common JCOMM marine/ocean observation standards in the future, to identify differences, and make recommendations, and to building experience for such activities within JCOMM.

The Terms of Reference and membership of the Organizing Committee for the pilot project will be presented together with its current planning, and status.

**8) Stage Progress of the 1st Inter-comparison of Seawater Salinity Measurement**  
*Prof. Yong Chao PANG, NCOSM*

Seawater salinity is one of the key parameters in marine meteorological and oceanographic community, while substantial salinity measurement proficiency differences exist among the calibration laboratories in the world.

In addition, JCOMM global marine observing programmes require involvement and cooperation of many countries.

Under this circumstance, RMIC/AP proposed (in OCG-5, Sept. 2013, USA) to establish a pilot intercomparison project for seawater salinity measurements, which is an effective method for assuring reliable metrological comparability amongst the different salinity measuring systems. This proposal was approved by JCOMM, and an Organizing Committee was founded. RMIC/AP, designated as the designer and

coordinator by JCOMM, was responsible for the practical implementation of this project. After substantial preparation, this project was officially started up in March this year. OC sent invitations to member states of WMO and IOC; eventually, 25 labs from 17 countries were approved by OC to take part in this activity. Per the Implementation Scheme, RMIC/AP designed and prepared the seawater samples; after necessary testing, samples were distributed to participants in robust package. Participants received intact samples and submitted their measurement results. RMIC/AP collected and assessed the results, on the base of adequate communication with participants. Preliminary conclusions are given, and official final reports will come out in two months.

**9) The Organization and Conduct of Inter-laboratory Comparisons and Case Study**

*Dr. Wu Xiaohuai, Certification and Accreditation Administration of the People's Republic of China (CNCA)*

International trade requires conformity assessment and accreditation. Laboratory accreditation is highly regarded nationally and internationally as a reliable indicator of technical competence. "Test once, accepted everywhere". The ILAC mutual recognition arrangement (MRA) supports international trade by removing technical barriers and promoting international confidence and acceptance of accredited laboratory data. Participation in interlaboratory comparison scheme is a premise for laboratory to get accredited. Interlaboratory comparison (or proficiency testing) provides an independent tool to evaluate the performance of laboratory for specific tests or measurements.

**10) Overviews of the RMIC for Regional Association IV operations at NDBC**

*Ms Karen Renee GRISSOM, NDBC, USA*

The National Data Buoy Center (NDBC), as part of NOAA's National Weather Service, operates and manages three ocean observation programs, the Deep-ocean Assessment and Reporting of Tsunamis (DART®), the Tropical Atmosphere Ocean (TAO) array and the Weather-Buoy Program. The success of these programs is based in large part on identifying and adopting effective in-situ instrumentation. As the efforts of these programs matured and expanded, a need was identified to develop a method within NDBC to effectively manage the marine instrumentation to ensure: 1) the technological readiness of various types of sensors, 2) maintenance and operational requirements are satisfied, 3) engineering and production procedures are documented, and 4) sensor and data management is compatible with established information technology procedures. One of the first steps in this process was to educate ourselves about the science behind the instruments and from there we were able to recognize and document past mistakes. The development of a set of standard operating principles, resources required and organizational infrastructure to cover all phases of NDBC salinity sensor life from instrument selection to deployment, to data handling and calibration is explained as well as problems encountered and lesson learned.

**11) Technology & Methods and Measuring Instruments for Seawater Salinity Measurement in Laboratory**

*Dr. Jing HUANG Guideline Inc*

Part1:

Salinity Background and Definitions

- Why Measure
- Salinity Definitions
- History
- Chemical Composition
- Standard Seawater

Salinity Measurements

- Measurement Techniques
- Salinity Calculations
- Impact of Temperature on Measurement
- Storage and Handling of Seawater Samples and Standards
- Salinometer Maintenance and Cleaning
- Salinity Conductivity Measurement Techniques
- Summary of Best Practices

Part2:

Oceanography Products Overview

- 8400B and 8410A Salinometers
  - 5600 Series Fluid/Oil Baths
  - 503x Series of Air Baths
  - 6622T Temperature Bridge
  - 3210 Thermometry Adaptor / Scanner
  - Resistance Standards
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**ACRONYM LIST**

9DOF	Nine degree of freedom
AIC	Argo Information Center
AP	Air Pressure
AQSIQ	General Administration of Quality Supervision, Inspection, and Quarantine (China)
Argo	Argo International Profiling Float Programme
AS	Andaman Sea
AST	Argo Steering Team
ATLAS	Autonomous Temperature Line Acquisition System
BoB	Bay of Bengal
BUFR	FM 94 BUFR GTS format: Binary Universal Form for Representation of meteorological data
BUOY	FM 18 BUOY GTS format: Report of a buoy observation
CB	Capacity-Building
CBS	Commission for Basic Systems (WMO)
Cg	Congress (WMO)
CIMO	Commission on Instruments and Methods of Observation (WMO)
CONOPS	WIGOS Concept of Operations
CTD	Conductivity, Temperature, and Depth measurement
DAR	Data Discovery, Access and Retrieval service (WMO WIS)
DB	Data Buoy
DBCP	Data Buoy Co-operation Panel (WMO-IOC)
DCPC	Data Collection and Production Centres (WMO WIS)
DMCG	Data Management Coordination Group (JCOMM)
DMPA	Data Management Programme Area (JCOMM)
DO	Dissolved Oxygen
EC	Executive Council
ET/DRC	CBS Expert Team on Data Representation and Codes (WMO)
ETDMP	Expert Team on Data Management Practices (JCOMM)
ETMC	Expert Team on Marine Climatology (JCOMM)
ETWS	Expert Team on Wind Waves and Storm Surge (JCOMM)
FG	First Guess Field
GCC	Global Collecting Centre (of MCSS)
GCOS	Global Climate Observing System (WMO, IOC, UNEP, ICSU)
GDAC	Global Data Assembly / Acquisition Centre
GDP	Global Drifter Programme
GEO	Group on Earth Observations
GEOSS	Global Earth Observation System of Systems
GFCS	Global Framework for Climate Services
GHRSSST	Group for High-Resolution SST
GISC	Global Information System Centres (WMO WIS)
GLOSS	Global Sea-level Observing System (JCOMM)
GOOS	Global Ocean Observing System (IOC, WMO, UNEP, ICSU)
GOS	Global Observing System (WMO)
GPS	Global Positioning System
GRA	GOOS Regional Alliance
GTS	Global Telecommunication System (WWW)
GUM	Guide to the Expression of Uncertainty Measurement
HF	High Frequency
HFSWR	HF Surface Wave Radar
HMEI	Association of Hydro-Meteorological Equipment Industry
ICG-WIGOS	Inter Commission Coordination Group on WGOS
ICOADS	International Comprehensive Ocean-Atmosphere Data Set (USA)
ICSU	International Council for Science
I-GOOS	Intergovernmental IOC-WMO-UNEP Committee for GOOS
InaGOOS	Indonesian Global Ocean Observing System

IndOOS	Indian Ocean Observing System
IOC	Intergovernmental Oceanographic Commission (of UNESCO)
IOCCP	International Ocean Carbon Coordination Project
IOCINDIO	IOC Regional Committee for the Central Indian Ocean
IODE	International Oceanographic Data and Information Exchange (IOC)
IOGOOS	Indian Ocean GOOS
ISDM	Integrated Science Data Management (formerly MEDS, Canada)
ISO	International Organization for Standardization
JAMSTEC	Japan Agency for Marine-Earth Science and Technology
JCOMM	Joint WMO-IOC Technical Commission for Oceanography and Marine Meteorology
JCOMMOPS	JCOMM <i>in situ</i> Observations Programme Support Centre
LGMI/AP	Liaison Group for Marine Instrumentation in the Asia Pacific region
MAN	JCOMM Management Committee
MCSS	Marine Climatological Summaries Scheme
MDCS	Marine Climate Data System
MEMS	Microelectromechanical systems
MOMSEI	Monsoon Onset Monitoring and its Social & Ecosystem Impacts
NC	National Centres (WMO WIS)
NCOSM	National Centre of Ocean Standards and Metrology (China)
NDBC	NOAA National Data Buoy Center (USA)
NEAR-GOOS	North East Asian Regional GOOS
NMDIS	National Marine Data and Information Service (China)
NOAA	National Oceanic and Atmospheric Administration (USA)
NOTC	Ocean Technology Center (China)
NWP	Numerical Weather Prediction
OceanSITES	OCEAN Sustained Interdisciplinary Timeseries Environment observation System
OCG	Observations Coordination Group (JCOMM)
ODAS	Ocean Data Acquisition Systems
ODASMS	ODAS Metadata Service (operated by China on behalf of JCOMM)
ODP	Ocean Data Portal (IODE)
OOPC	Ocean Observations Panel for Climate (GCOS-GOOS-WCRP)
OPA	Observations Programme Area (JCOMM)
PA	Programme Area (JCOMM)
PANGEA	Partnerships for New GEOSS Applications
PI-GOOS	Pacific Islands GOOS GRA
PMO	Port Meteorological Officer
PP-WET	DBCP-ETWS Pilot Project on Wave measurement Evaluation and Test from moored buoys
QA	Quality Assurance
QC	Quality Control
QMF	WMO Quality Management Framework
QMS	Quality Management Systems
RAMA	Indian Ocean Research Moored Array for African-Asian-Australian Monsoon Analysis and Prediction
RMIC	IOC-WMO Regional Marine Instrument Centre
RMIC/AP	RMIC for the Asia Pacific region
RNODC	Responsible Oceanographic Data Centre (IODE)
RNODC/DB	RNODC for Drifting Buoys
RRR	WMO Rolling Review of Requirements
RTMC	VOSclim Real-Time Monitoring Centre
SAC	Standardization Administration (China)
SAMS	Scottish Association for Marine Science
SCG	Services Coordination Group (JCOMM)
SeaDataNET	Pan-European infrastructure for Ocean & Marine Data Management
SEA-GOOS	South East Asian Regional GOOS



SFSPA	JCOMM Services and Forecasting Systems Programme Area
SLP	Sea Level Pressure
SOA	State Oceanic Administration (China)
SOC	Specialized Oceanographic Centre (JCOMM)
SOOP	Ship-Of-Opportunity Programme
SOOPIP	SOOP Implementation Panel (JCOMM)
SOT	Ship Observations Team (JCOMM)
SPA	JCOMM Services Programme Area (now SFSPA)
SST	Sea-Surface Temperature
TAO	Tropical Atmosphere Ocean Array
TC	Technical Committee
TD	Technical Document
TIP	Tropical Moored Buoys Implementation Panel
TT	Task Team
UN	United Nations
UNEP	United Nations Environment Programme
UNESCO	UN Educational, Scientific and Cultural Organization
UNFCCC	United Nations Framework Convention on Climate Change
USA	United States of America
VOS	Voluntary Observing Ship scheme (JCOMM)
VOSclim	VOS Climate class ship of the VOS fleet
WCRP	World Climate Research Programme
WCC-3	World Climate Conference 3
WDIP	WIGOS Test of Concept Development and Implementation Plan
WDIS	WIGOS Development and Implementation Strategy
WESTPAC	IOC Sub-Commission for the Western Pacific
WIGOS	WMO Integrated Global Observing System
WIS	WMO Information System
WMO	World Meteorological Organization (UN)
WTO	World Trade Organization
WWW	World Weather Watch (WMO)
XBT	Expendable BathyThermograph

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