THE WMO-IOC NETWORK OF REGIONAL MARINE INSTRUMENT CENTRES (RMICS)

WMO/TD-No. 1564

2010

JCOMM Technical Report No. 53

REVISION 1

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WORLD METEOROLOGICAL ORGANIZATION

INTERGOVERNMENTAL OCEANOGRAPHIC COMMISSION (OF UNESCO)

THE WMO-IOC NETWORK OF REGIONAL MARINE INSTRUMENT CENTRES (RMICS)

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NOTES

WMO DISCLAIMER

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.

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).

Chairperson, Publications Board
World Meteorological Organization (WMO)
7 bis, avenue de la Paix
P.O. Box No. 2300
CH-1211 Geneva 2, Switzerland

Tel.: +41 (0)22 730 84 03
Fax: +41 (0)22 730 80 40
E-mail: Publications@wmo.int

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C O N T E N T S

FOREWORD

As an initial contribution to WIGOS, JCOMM undertook a Pilot Project focused on the integration of marine meteorological and relevant oceanographic data into the WIGOS. This project is now essentially completed, and several spin-off follow-up activities are being implemented. Among these is a global network of Regional Marine Instrument Centres (RMICs), modeled on the existing network of Regional (meteorological) Instrument Centres coordinated through CIMO. It is intended that the RMICs will deliver benefits to national meteorological and oceanographic agencies affiliated to WMO and IOC in a number of ways, including through a more cost-effective implementation and operation of marine observing networks, through making best use of technological innovations, and through enhancing observational data quality.

The formal process for initiating the RMIC network has now been completed, through efforts by JCOMM and its subsidiary bodies, supported by the IODE of IOC and CIMO, with approval being given by the WMO and IOC Executive Bodies. Two RMICs have already been approved, with hopefully more to follow. This present Technical Report consolidates all regulatory and guidance material relevant to the establishment and operation of the RMICs, and as such should prove a valuable source document for national agencies interested either in establishing an RMIC, or in making use of the services of the existing centres.

Peter Dexter
(Australia)

(JCOMM Co-President)

THE WMO-IOC NETWORK OF REGIONAL MARINE INSTRUMENT CENTRES (RMICS)

1. Background

As a response to the initiative by the WMO Fifteenth Congress to enhance the integration of the WMO observing system as a strategic objective of the WMO, and embark in the development of the WMO Integrated Global Observing System (WIGOS), the Joint WMO-IOC Technical Commission for Oceanography and Marine Meteorology has conducted a Pilot Project for the integration of marine meteorological and other appropriate oceanographic observations into WIGOS.

In doing so, JCOMM has promoted the development of a global network of WMO-IOC Regional Marine Instrument Centres (RMICs) as a means to integrate instrument best practices and related standards among the marine meteorological and oceanographic communities.

The Third Session of JCOMM therefore adopted Recommendation 1 (JCOMM-III) – WMO-IOC Regional Marine Instrument Centres, which defines Terms of Reference of an RMIC, including capabilities and corresponding functions, and a mechanism for formal WMO and UNESCO/IOC designation of an RMIC.

JCOMM-III also stressed that a regular review of the RMICs capabilities should be organized by JCOMM. It agreed that the established procedure for designing an RMIC should be included into the *WMO Guide to Meteorological Instruments and Methods of Observations*[1] (WMO-No. 8).

2. Purpose and role of the RMICs

The RMICs are expected to facilitate adherence of observational data, metadata, and processed observational products to higher level standards for instruments and methods of observation, by providing (i) facilities for the calibration and maintenance of marine instruments and the monitoring of instrument performance; and (ii) assistance for instrument intercomparisons, as well as appropriate training facilities complementing what the manufacturers are also providing.

The role of the RMICs with capabilities and corresponding functions is well described in their Terms of Reference listed in Annex 4.A of Part II, Chapter 4 of the WMO No. 8 and reproduced in *Annex I*.

Regular training activities on marine meteorological and oceanographic instruments are organized at the RMICs, as well as instrument intercomparisons.

3. Benefits to Members of RMICs

RMICs are contributing to the integration of marine meteorological and other appropriate oceanographic observations into WIGOS, and Members/Member States are expected to benefit from the network of RMICs in the following ways:

3.1 More cost-effective implementation and operations of the observing networks

RMICs will play a role in ensuring that standard instruments are used throughout national programmes participating in JCOMM. Through the use of standardized ocean observations equipment, and an enhanced cooperation with the manufacturers, it is expected that the manufacturers will be able to reduce the cost of the instruments. The use of standardized

1 : http://www.wmo.int/pages/prog/www/IMOP/IMOP-home.html

equipment, and sharing among WMO-IOC RMICs, can provide substantial savings in terms of instrument calibration, and intercomparisons, in particular for developing countries.

Better integration and cooperation between NMHSs, oceanographic institutes, and other partners will facilitate synergies and the sharing of available resources for the implementation and operations of the observing networks. This can be realized through:

- Sharing of calibration infrastructures;
- Sharing of common observing platforms to serve multiple applications;
- Sharing logistical facilities and platform deployment opportunities;
- Sharing of facilities producing quality information;
- Sharing of resources for post-calibration, instrument evaluation, and investigation of detected problems permitting tuning of the technology;
- Sharing of resources for training and Capacity Building permitting to bring more partners in the system and make savings.

The manufacturers will be expected to provide expertise, and lend hardware for the conduct of instrument intercomparisons as a contribution to the WMO-IOC RMICs. This is expertise and hardware that NMHSs won't have to provide themselves, hence permitting to make savings.

3.2 Technology innovations

Savings in terms of technology innovation can be made through more cost-effective equipment sold by manufacturers, and providing equivalent, or better quality observations. This will be realized by enhancing the cooperation with the manufacturers through the Association of Hydro-Meteorological Equipment Industry (HMEI[2]), and the RMICs.

3.3 Better quality observations for improved applications

The quality of the observations will be enhanced as follows:

- Quality Management, and documentation of processes, in accordance with the WMO Quality Management Framework (QMF), and the eight Quality Management Principles[3] proposed by ISO.
- Better calibrated instruments through the use of facilities offered at the WMO-IOC RMICs.
- Better compliance to proposed standards, improved traceability of standards, better knowledge of the instrument uncertainties, and consistency/coherence of the observations thanks to routine collection of instrument/platform metadata, instrument intercomparison campaigns conducted through the RMICs, and assistance from the manufacturers, in particular through HMEI.
- Better siting of the instruments will be realized through recommendations to Members based on collection of appropriate instrument/platform metadata, and analysis of the information.

In addition, the activities above will permit to know the quality of the observations and to better estimate the uncertainties. This will result in better knowledge of the end-product uncertainties.

4. Impact to Members/Member States of using RMICs

To comply with WIGOS requirements, those in charge of deploying and operating observing platforms at sea will have to do the following in addition to their traditional activities in terms of instrument practices:

[2] : http://www.hydrometeoindustry.org/

[3] : http://www.iso.org/iso/iso9000-14000/understand/qmp.html

- Purchase observing platforms and instruments that comply with the standards and practices recommended by WMO and/or IOC as appropriate. Enhanced cooperation with the manufacturers, through HMEI, will make sure that the manufacturers can provide such equipment.
- Calibrate instruments according to the recommended procedures. Assistance from WMO-IOC RMICs can be obtained if needed.
- When applicable, be familiar with, and use the recommended cost-effective practices regarding satellite data telecommunication.
- Routinely record the instrument/platform metadata and make them available to the wider community using recommended standards and protocols.
- Regularly participate in marine instrument intercomparisons campaigns by providing instruments, RMIC facilities, and/or expertise.
- Provide feedback and input to the JCOMM Expert Teams and Panels regarding instrument standards.
- Where possible, offer RMIC facilities to support developing countries in the regions.

5. Approval process for the RMICs

According to the Terms of Reference of the RMICs (*Annex I*), governance for defining the functions and adoption of RMIC is proposed by JCOMM and endorsed by the WMO and UNESCO/IOC Executive Councils.

The formal process proposed by the Pilot Project for adopting RMICs has been discussed and agreed upon at the eighth Session of the JCOMM Management Committee, Paris, France, 16-19 November 2010. It was later endorsed by the WMO Sixteenth Congress (Resolution 3.1.4/3 – Cg-XVI) and the Twenty-Sixth IOC Assembly (Resolution XXVI-6.2). It is described in detail in *Annex II*.

According to the process, candidate RMICs are required to produce a statement of compliance, list capabilities of the proposed centre, state the suite of instrument expertise offered, state the formal commitment to voluntarily host the centre, and demonstrate capability to JCOMM. A template for the formal statement of commitment to voluntarily host the centre is provided in *Annex III*.

The statement of commitment is to be submitted to the JCOMM Co-Presidents, who will then request the JCOMM Observations Coordination Group (OCG) to asses the functions and capabilities of the candidate RMIC.

Following possible agreement by JCOMM, the WMO and UNESCO/IOC Executive Councils (ECs) will be invited to accept and approve new RMICs. Upon approval by both ECs, the name of the RMIC will be listed in the *WMO Guide to Meteorological Instruments and Methods of Observations* (WMO-No. 8) as well as in a revised version of this JCOMM Technical Report No. 53.

6. The current network of RMICs

6.1 Existing RMICs

To date the following centres are acting as RMIC:

- RMIC for the Regional Association IV: The National Data Buoy Centre (NDBC[4]) of the National Oceanic and Atmospheric Administration (NOAA), Bay St. Louis, Mississippi, USA.

  The statement of compliance of the RMIC for Regional Association IV is provided in *Annex IV*.

4 : http://www.ndbc.noaa.gov/

A successful JCOMM training workshop on marine instrumentation for the WMO Regional Association IV took place at NDBC from 13 to 15 April 2010 to prove the concept. The feedback received from the participants has been excellent, demonstrating the demand that existed in developing countries for more training on instrument practices and standards, quality assurance, marine observing programme management and operational aspects, and data exchange. The workshop permitted to initiate new collaborations with a view to improve availability of ocean observations from the Region, as well as the quality and traceability to standards of the corresponding data.

- RMIC for the Asia Pacific Region (and WMO Regional Association II): The National Centre of Ocean Standards and Metrology (NCOSM[5]) of the State Oceanic Administration (SOA), Tianjin, China.

  The statement of compliance of the RMIC for the Asia Pacific Region is provided in *Annex V*.

  A successful JCOMM training workshop on marine instrumentation for the Asia Pacific Region took place at the NCOSM from 11 to 13 July 2011.

6.2 Candidate RMICs

At JCOMM-III Morocco expressed interest in eventually offering RMIC facilities at the National Meteorological Service[6] (Morocco) for WMO Regional Association I.

Members in other regions are invited to offer RMIC facilities. Members in regions where RMICs already exist and willing to offer RMIC facilities are also invited to seek cooperation with other RMICs in order to avoid duplication of efforts and share responsibility (e.g. offering expertise for complementary suites of instruments).

5 : http://www.ncosm.gov.cn/
6 : http://www.marocmeteo.ma/

ANNEX I

TERMS OF REFERENCE OF WMO-IOC REGIONAL MARINE INSTRUMENT CENTRES (RMIC)

RECOMMENDATION

Rec. 1 (JCOMM-III) — ESTABLISHMENT OF WMO-IOC REGIONAL MARINE INSTRUMENT CENTRES (RMIC)

THE JOINT WMO-IOC TECHNICAL COMMISSION FOR OCEANOGRAPHY AND MARINE METEOROLOGY,

Noting:

(1) The JCOMM Terms of Reference, especially in relation to: (i) the development of observing networks; (ii) the provision of capacity building to Member States; and (iii) assistance in the documentation and management of the data in international systems,

(2) Resolution 30 (Cg-XV) – Towards Enhanced Integration between WMO Observing Systems,

(3) The final report of the First and Second Sessions of the WMO Executive Council Working Group on WIGOS and WIS,

(4) The final report of the *ad hoc* planning meeting for the JCOMM Pilot Project for WIGOS (JCOMM/MR-No. 57),

(5) The final report of the meeting of the joint Steering Group for the UNESCO/IOC-IODE Ocean Data Portal (ODP) and the WIGOS Pilot Project for JCOMM (JCOMM/MR-No. 59),

(6) The final report of the Twenty-fourth Session of the Data Buoy Cooperation Panel (JCOMM/MR-No. 61),

(7) The final report of the First Session of the Sub-Group of the WMO Executive Council Working Group on WIGOS and WIS,

(8) The final report of the Seventh Session of the JCOMM Management Committee (JCOMM/MR-No. 62),

(9) The final report of the Fifth Session of the JCOMM Ship Observations Team (SOT) (JCOMM/MR-No. 63),

Noting further:

(1) The WIGOS Concept of Operations (CONOPS) as adopted by WMO EC-LXI,

(2) The WIGOS Development and Implementation Plan (WDIP) as adopted by WMO EC-LXI,

(3) The Project Plan of the WIGOS Pilot Project for JCOMM,

(4) The overarching Implementation Plan for the UNESCO/IOC-IODE Ocean Data Portal (ODP) and WIGOS Pilot Project for JCOMM,

(5) The proposal from the US to run a RMIC on a trial basis at the NOAA National Data Buoy Centre (NDBC),

Having considered:

(1) Members/Member States need for high quality marine meteorology and oceanographic measurements from the world oceans to address the requirements of WMO and UNESCO/IOC programmes and co-sponsored programmes,

(2) The need for facilities for the regular calibration and maintenance of marine instruments and the monitoring of instrument performance, on a regional basis in order to address adherence of ocean observations and associated metadata to high level standards for instruments and methods of observation,

(3) The need for documenting methods of measurements, for understanding biases introduced by each type of instrumentation, and for developing methods to correct such biases, in order to achieve delivery and use of coherent data sets,

(4) That RMICs would facilitate fulfilling these requirements,

(5) The role that RMICs could play with regard to instrument comparisons and evaluations, as well as for the training of marine meteorology and oceanography instrument experts;

Recognizing:

(1) The experience gained by the WMO Commission for Instruments and Methods of Observation (CIMO) regarding establishment and operations of Regional Instrument Centres (RIC) and World and Regional Radiation Centres (WRC and RRC),

(2) The necessity of close coordination with CIMO on establishing the network of RMIC to take into account the experience of establishing and operating the RICs and to avoid potential duplication of activities between RMICs and RICs,

(3) Expertise of Members/Member States with regard to marine meteorology and oceanography instrument best practices, as well as the dedicated facilities they operate,

(4) The excellent facilities and long experience of the National Data Buoy Centre (NDBC) regarding ocean instrument calibration, evaluation, and deployment,

Recommends:

(1) To establish a network of Regional Marine Instrument Centres (RMIC) and a mechanism for formal WMO and UNESCO/IOC designation of RMIC where:

   (a) Governance for defining the functions and adoption of RMIC is proposed by JCOMM and endorsed by the WMO and UNESCO/IOC Executive Councils;

   (b) Candidate RMIC will be required to produce a statement of compliance, list capabilities of the proposed centre, state the suite of instrument expertise offered, state the formal commitment to voluntarily host the centre, and demonstrate capability to JCOMM;

   (c) Following possible agreement by JCOMM, the WMO and UNESCO/IOC Executive Councils will be invited to accept and approve new RMICs;

   (d) Terms of Reference of RMIC will become part of the *WMO Guide to Meteorological Instruments and Methods of Observations* (WMO-No. 8);

(2) That the Terms of Reference of RMIC, including capabilities, and corresponding functions should be as given in the Annex to this recommendation;

(3) That the National Data Buoy Centre (NDBC) of the US undertakes the functions of a RMIC on a trial basis and reports on the results to JCOMM with a view to eventually become a RMIC under the mechanism defined above;

Invites:

(1) Members/Member States to consider taking advantage of the RMIC resources offered by the NDBC on a trial basis as appropriate;

(2) Members/Member States to consider proposing new RMICs as they see fit;

Requests the Secretary-General of WMO and the Executive Secretary of UNESCO/IOC to facilitate implementation of this recommendation and provide appropriate technical advisory assistance to Members/Member States concerned as required, in the operations of RMICs.

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Annex to draft Recommendation 1 (JCOMM-III)

TERMS OF REFERENCE FOR A WMO-IOC REGIONAL MARINE INSTRUMENT CENTRE

WMO-IOC Regional Marine Instrument Centres (RMIC) should have the following capabilities to carry out their corresponding functions:

Capabilities:

(a) A RMIC must have, or have access to, the necessary facilities and laboratory equipment to perform the functions necessary for the calibration of meteorological and related oceanographic instruments deployed to address the common requirements of WMO and UNESCO/IOC marine-related programmes and co-sponsored programmes[7];

(b) A RMIC must maintain a set of meteorological and oceanographic standard instruments or references and establish the traceability of its own measurement standards and measuring instruments to the International System of Units (SI);

(c) A RMIC must have qualified managerial and technical staff with the necessary experience to fulfil its functions;

(d) A RMIC must develop its individual technical procedures for the calibration of meteorological and related oceanographic instruments using calibration equipment employed by the RMIC;

(e) A RMIC must develop its individual quality assurance procedures;

(f) A RMIC must participate in, or organize, inter-laboratory comparisons of standard calibration instruments and methods;

(g) A RMIC must utilize the resources and capabilities of its region of interest according to the region's best interests, when appropriate;

(h) A RMIC must apply international standards applicable for calibration laboratories, such as ISO/IEC 17025, to the extent possible;

(i) A recognized authority[8] must assess a RMIC, at least every five years, to verify its capabilities and performance.

Corresponding functions:

(a) A RMIC must assist Members/Member States of its region in calibrating their national meteorological standards and related oceanographic monitoring instruments according to the RMIC capabilities;

(b) A RMIC must participate in, or organize, JCOMM and/or regional instrument intercomparisons, following relevant JCOMM recommendations;

(c) A RMIC must make a positive contribution to Members/Member States regarding the quality of measurements;

(d) A RMIC must advise Members/Member States on enquiries regarding instrument performance, maintenance and the availability of relevant guidance materials;

7: Basically in situ geo-physical instruments deployed in the surface marine environment or sub-surface
8: JCOMM will be the body that formally proposes new RMICs and proposes any authority to do evaluations

(e) A RMIC must actively participate, or assist, in the organization of regional workshops on meteorological and related oceanographic instruments and measurements;

(f) The RMIC must cooperate with other RMICs in the standardization of meteorological and related oceanographic measurements and sensors;

(g) A RMIC must regularly inform Members/Member States and report, on an annual basis, to the JCOMM Management Committee on the services offered to Members/Member States and the activities carried out. JCOMM in turn should keep the Executive Councils of the WMO and the UNESCO/IOC informed on the status and activities of the RMICs, and propose changes, as required.

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ANNEX II

FORMAL ADOPTION OF THE RMIC

(as approved by the Eighth Session of the JCOMM Management Committee, 16-19 November 2010, Paris, France, with some changes proposed by the JCOMM Co-President in April 2011 per feedback received from Members according to the letter No. 11578-11/OBS/OSD/MAR/RMIC dated and 12 January 2011)

According to the Terms of Reference of a WMO-IOC Regional Marine Instrument Centre (RMIC), the mechanism for formal WMO and UNESCO/IOC designation of RMICs implies the following:

(a) Governance for defining the functions and adoption of an RMIC is proposed by JCOMM and endorsed by the WMO and UNESCO/IOC Executive Councils;
(b) A candidate RMIC is required to produce a statement of compliance, list capabilities of the proposed centre, state the suite of instrument expertise offered, state the formal commitment to voluntarily host the centre, and demonstrate capability to JCOMM.

The approach proposed by JCOMM is the following:

- The RMIC evaluates the extent to which it will be addressing the RMIC requirement in terms of capabilities and functions as described in the RMIC Terms of Reference.
- Once the candidate RMIC believes that it meets the requirements to a sufficient extent, its Director writes to the JCOMM Co-President to formally state the host commitment to voluntarily run and operate the RMIC on behalf of the WMO and IOC, and to request that the RMIC be listed in the list of RMICs through appropriate channels. In doing so, the candidate RMIC also provides for a statement of compliance in terms of RMIC capabilities and corresponding functions as described in the Annex of the RMIC Terms of Reference. The list of variables measured by specific instruments for which expertise will be offered as part of the RMIC activities is also provided. According to the ToR, an RMIC must apply international standards applicable for calibration laboratories, such as ISO/IEC 17025, to the extent possible. The Candidate RMIC will indicate to what extent it will meet these requirements. The letter should be copied to the Permanent Representative of the host country with the WMO, the IOC Action Addressee for the host country, the Secretary General of WMO, the Executive Secretary of IOC, and the President of the WMO Regional Association where the RMIC is located.
- Capability is also demonstrated by means of a training workshop on Marine instrumentation to be organized within 12 months of the request; resources should be committed by the host country for providing financial assistance to participants of developing countries in the region.
- As the JCOMM Observations Coordination Group (OCG) will be the primary advisory body for JCOMM regarding the RMICs, the JCOMM Co-President requests the OCG to evaluate and verify the capabilities of the proposed Centre.
- The OCG evaluates the request and advises whether the candidate RMIC should be endorsed. The OCG may wish to delegate this work to individuals and/or groups acting on its behalf (e.g. one of the component teams, depending on the nature of the proposed centre), but any advice and proposal to JCOMM should still be assessed by and come through the OCG. OCG will also conduct reviews of performance and capabilities at the required intervals.
- If endorsed by the OCG, and depending on timing, the latter makes an informed recommendation to the JCOMM Management Committee (MAN) or the JCOMM Co-Presidents (acting on behalf of the Commission) and invites them to provide further advice to the next JCOMM Session.
- If endorsed by MAN or the JCOMM Co-Presidents as appropriate, a recommendation is passed to the next JCOMM Session, or depending on timing directly to the WMO and IOC Executive Councils.

- If endorsed by the JCOMM Session or the JCOMM Co-Presidents as appropriate, a recommendation is passed to the WMO and IOC Executive Councils for including the candidate in the list of RMICs.
- If the JCOMM recommendations is approved by both the WMO and IOC Executive Councils, the candidate RMIC is listed in the WMO Publication No. 8 (CIMO Guide) and becomes a WMO-IOC RMIC;

It is expected that this process, from submission of the RMIC proposal to the JCOMM Co-President, to formal approval by either of both the WMO/IOC Executive Councils, may take from 6 to 12 months.

These procedures were formally approved by the WMO Congress through Resolution 3.1.4/3 (Cg-XVI), and the IOC Assembly through Resolution XXVI-6.2.

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ANNEX III

TEMPLATE FOR THE FORMAL STATEMENT OF COMMITMENT TO VOLUNTARILY HOST THE CENTRE[9]

From : Director of the centre hosting the candidate RMIC
To: Co-Presidents of JCOMM
CC: Executive Secretary of IOC
Secretary General of WMO
IOC Action Addressees for the host country
Permanent Representative of the host country with the WMO
President of the WMO Regional Association where the host country is located

Appendix A: Statement of compliance for the WMO-IOC Regional Marine Instrument Centre in <City>
Appendix B: Introduction to <Centre_Name>
Appendix C: Variables, and corresponding instruments covered as part of the <Centre_Name> Capabilities and corresponding functions
Appendix D: List of key management and technical personnel

Subject: Establishment of the Regional Marine Instrument Centre in <City>, <Country>

Dear <JCOMM Co-Presidents>,

I refer to Recommendation 1 (JCOMM-III) of the Third Session of the WMO-IOC Joint Technical Commission for Oceanography and Marine Meteorology (JCOMM) (Marrakech, Morocco, 4 - 11 November 2009), approved by the WMO Executive Council at its Sixty-Second session (Geneva, Switzerland, 8-18 June 2010) through Resolution 2.5/4 (EC-LXII) establishing WMO-IOC Regional Marine Instrument Centres (RMIC).

I also refer to <Country>'s offer made during <Event> to host an RMIC for the <Region>; and to the informal discussions with the WMO and IOC Secretariats to assist in the preparation for the establishment of an RMIC in <City>, <Country>; as well as with the organization of a first dedicated Workshop for the <Region> in <Year_workshop>. These discussions in particular permitted to fully understand the rationale for establishing an RMIC in <City>, and provided an insight of requirements and format for the organization of relevant activities, services, and workshops.

I would like to reaffirm <Country>'s willingness and commitment to establish an RMIC in <City> in order to provide assistance to WMO Members and IOC Member States from the <Region> and the WMO Regional Association <WMO_RA> in improving the quality, consistency, and traceability to SI units, of the ocean observations made available to end users in the region, including National Meteorological and Hydrological Services (NMHSs) and oceanographic institutes. We expect that this will in turn result in improved final products and services delivered, in the region, by concerned Members/Member States. I am therefore pleased to offer this RMIC function within the <Centre_Name>, in <Citty>. Furthermore, we are now planning organizing a Training Workshop for the <Region> and WMO Regional Association <WMO_RA>, to be held at the <Centre_Name> in <Year_workshop>.

In this context, we have reviewed our capabilities and functions with regard to the Terms of Reference of RMICs, and I am pleased to inform you that we believe that the <Centre_Name> in <City> meets all of the requirements. I would also like to draw your attention that in <Date_Assesment>, <Centre_Name> has been assessed by the <Certifying_Authority> which

[9] : Parts highlighted in yellow have to be completed/replaced by the Director of the candidate RMIC.

certified that <Centre_Name> met the requirements for ISO/IEC 17025 and delivered <Certificate_Name>. In the Appendices A, B, C, and D you will find a statement of compliance for the RMIC capabilities and corresponding functions, as well as the suite of instrument expertise offered in this context.

I would therefore be grateful if you could take appropriate steps through JCOMM in order for the <Centre_Name> in <City> to be eventually listed as a RMIC for the <Region> and operate as such on behalf of the WMO and IOC. We look forward to a fruitful cooperation with other countries in the <Region> through the activities of the future RMIC and JCOMM.

Yours sincerely,

<Director_Name>
Director, <Centre_Name>

Explanation of fields (for information, not part of the letter):

Field	Meaning
<JCOMM Co-Presidents>	Names of JCOMM Co-Presidents
<Country>	Name of the country offering to host the RMIC
<Event>	Name of the event where the host country made an offer to host an RMIC
<Region>	Name of the region where the RMIC will be offering assistance
<City>	Name of the city where the candidate host is located
<Year_workshop>	Year of the first marine instrumentation workshop hosted by the candidate RMIC
<WMO_RA>	Name of the WMO Regional Association where the candidate RMIC is located (e.g. RA-I for Africa)
<Centre_Name>	Name of the centre that is offering hosting the RMIC
<Date_Assesment>	Date when the centre offering hosting the RMIC has been assessed for ISO/IEC 17025 (or similar)
<Certifying_Authority>	Name of the authority that assessed the centre for ISO/IEC 17025 (or similar)
<Certificate_Name>	Name of the certificate delivered by the certifying authority
<Director_Name>	Name of the director of the centre offering hosting the RMIC
<Variable_1>	Name of variable for which the RMIC will be providing expertise as part of its mandate
<Variable_2>	Name of variable for which the RMIC will be providing expertise as part of its mandate
<Variable_n>	Name of variable for which the RMIC will be providing expertise as part of its mandate

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APPENDIX A

STATEMENT OF COMPLIANCE FOR THE WMO-IOC REGIONAL MARINE INSTRUMENT CENTRE IN <CITY>

1. Introduction

Include here a short description of the <Centre_Name> and its mission.

The <Centre_Name> is committed to provide for the following capabilities and undertake the following functions in order to act as a WMO-IOC Regional Marine Instrument Centre (RMIC) for the <Region> and WMO Regional Association <WMO_RA>.

The main responsibilities of <Centre_Name> are detailed in Appendix B.

1. List of capabilities

Laboratory equipment (item a[10])

The facilities and laboratory equipment available at <Centre_Name> permit the calibration of the instruments measuring the variables of interest to WMO and IOC Programmes as listed in section 3 below and detailed in Appendix C.

Set of standard instruments or references (item b[10])

<Centre_Name> is maintaining a set of meteorological and oceanographic standard instruments or references for measuring the variables listed in section 3 below, and for which traceability to the International System of Units (SI) is ensured.

See Appendix C for the list of meteorological and oceanographic standard instruments or references <Centre_Name> is maintaining to support the RMIC function, and for which traceability to the International System of Units (SI) is ensured.

Staff resources (item c[10])

Qualified managerial and technical staff with the necessary experience is made available by the <Centre_Name> in order for the RMIC to fulfill its functions.

Include here a statement about <Centre_Name> policy with regard to employed staff, its recruitment, qualification, and qualification accreditation

A list of key management and technical personnel is provided in Appendix D.

Calibration procedures (item d[10])

Relevant individual technical procedures for the calibration of meteorological and related oceanographic instruments developed by <Centre_Name> using its own calibration equipment, and intended to be used as part of the RMIC function are detailed in Appendix C.

Quality assurance procedures (item e[10])

Provide details here about established quality assurance procedures at <Centre_Name>, i.e. quality management systems and ISO Standards being implemented, including ISO 9001[11] and ISO/IEC 17025[12], certification, accreditation, audit, and management review.

[10] : Relevant item of the capabilities part of the annex to the RMIC Terms of Reference
[11] : Quality management systems -- Requirements

Inter-laboratory comparisons (item f[10])

<Centre_Name> will provide support for regularly organizing inter-laboratory comparisons of standard calibration instruments and methods in <City>.

Include here a statement about <Centre_Name> policy with regard to inter-comparison of laboratory instruments and methods, and related activities and outcomes.

Include here a statement about the <Centre_Name> plans to actively participate in the inter-laboratory comparison of calibration standards and methods organized by other RMICs, and organize relevant inter-laboratory comparisons at regular intervals.

Capabilities of the region (item g[10])

<Centre_Name> will cooperate with other countries in the <Region> in the view to ascertain the capabilities of the region in terms of instrument calibration, testing, inter-comparison, and training, and make recommendations through JCOMM on how those capabilities could be used in a synergetic way in the best interest of those countries.

Include details here regarding how <Centre_Name> will strengthen the cooperation and communication with other countries in its region on the calibration of ocean and marine meteorological instruments, e.g.

International standards for calibration laboratories (item h[10])

Provide details here regarding certification of the <Centre_Name> for ISO/IEC 17025 (or similar), and indicate certifying authority, the name of the certificate delivered, and its date. Indicate also the frequency of assessments.

Verification of capabilities and performances (item i[10])

<Centre_Name> will allow an authority designated by JCOMM to assess the RMIC and verify its capabilities and performance at least every five years.

2. Corresponding functions

Cooperation with other Asia-pacific countries for the calibration of instruments (item a[13])

The <Centre_Name> is planning to provide assistance to other countries in the <Region> in the following way (i) upon request, calibrating, testing, and monitoring ocean instruments that fall within the scope of the RMIC stated capabilities and suite of instrument expertise offered; (ii) organizing, coordinating, or hosting instrument inter-comparisons; and (iii) organizing training events at the RMIC.

Organization of marine instrument inter-comparisons (item b[13])

<Centre_Name> is committed to regularly organize marine instrument inter-comparisons as promoted by JCOMM. This will be done in close relationship with the instrument manufacturers through the HMEI, which will assist in obtaining the necessary equipment to evaluate.

Improved data quality in the region (item c[13])

Through the activities of the RMIC, and assuming that some countries in the <Region> will take advantage of the RMIC facilities, through participation in RMIC training events, and instrument

12 : General requirements for the competence of testing and calibration laboratories
13 : Relevant item of the corresponding functions part of the annex to the RMIC Terms of Reference

inter-comparisons, its is expected that the capacities of those countries in terms of ocean measurements will be enhanced, the measurements performed by those countries will become more coherent and better traceable to SI units, and the quality of their measurements will improve and become better known.

Advice to other countries (item d[13])

The <Centre_Name> is committed to devote some limited resources for rendering the following services to developing countries in the <Region>, including reviewing the requests from those countries, and replying favorably on a case by case basis, i.e.

(i.) evaluation of the performance of instruments shipped by developing countries to the RMIC, and returned to them with an evaluation sheet; and
(ii.) calibration of instruments shipped by developing countries to the RMIC, and returned to them with a calibration sheet with all required traceability information.

Guidance materials will also be developed for training events and instrument inter-comparisons at the RMIC. The RMIC will play a pro-active role in producing, reviewing, and updating relevant documentation through JCOMM.

Organization of training workshops (item e[13])

<Centre_Name> is committed to organize training workshops at least every four years in <City>, and contribute to funding the participation of some ocean instrument experts from developing countries at those events.

Cooperation with other RMICs (item f[13])

The <Centre_Name> is committed to cooperate with other established RMICs in this regard as necessary.

Report to JCOMM Management Committee (item g[13])

The <Centre_Name> is committed to submit a written report to the JCOMM Management Committee on an annual basis through the WMO and IOC Secretariats, on the services offered to Members/Member States and the activities carried out.

3. Suite of instrument expertise offered

The instrument measuring the following variables are part of the expertise offered:

- <Variable_1>
- <Variable_2>
- …
- <Variable_n>

APPENDIX B

INTRODUCTION TO <CENTRE_NAME>

Provide here information about the centre, its affiliation, and mission.

_____

APPENDIX C

VARIABLES, AND CORRESPONDING INSTRUMENTS COVERED AS PART OF THE <CENTRE_NAME> CAPABILITIES AND CORRESPONDING FUNCTIONS

As part of the RMIC capabilities and corresponding functions, the facilities and laboratory equipment available at <Centre_Name> permit the calibration of the instruments measuring the variables listed in the table below. The meteorological and oceanographic standard instruments or references <Centre_Name> is maintaining to support the RMIC function, and for which traceability to the International System of Units (SI) is ensured is also indicated in this table, as well as the relevant individual technical procedures for the calibration of meteorological and related oceanographic instruments developed by <Centre_Name> using its own calibration equipment.

Variables	Primary Standard	<Centre_Name> Highest Standard	Traceability	Technical Procedures for Calibration
<Variable 1>				
<Variable 2>				
<Variable 3>				
<Variable 4>				
⋮				
<Variable n>				

_____

APPENDIX D

LIST OF KEY MANAGEMENT AND TECHNICAL PERSONNEL

No	Name	Gender	Age	Title	Education	Major	Department	Seniority
1								
2								
3								
n								

ANNEX IV

STATEMENT OF COMPLIANCE OF THE RMIC FOR THE WMO REGIONAL ASSOCIATION IV

(NOAA National Data Buoy Center, Bay St. Louis, Mississippi, USA)

The Statement of compliance of the RMIC for the WMO Regional Association IV included in Appendices A to D of this Annex was submitted by the Director of the NOAA National Data Buoy Center (NDBC), Mr Helmut H. Portmann to the JCOMM Co-Presidents on 4 February 2011, who reaffirmed the US's willingness and commitment to establish an RMIC in Stennis Space Center in order to provide assistance to WMO Members and IOC Member States from the North/Central America-Caribbean region and the WMO Regional Association IV for North America, Central America, and the Caribbean in improving the quality, consistency, and traceability to SI units, of the ocean observations made available to end users in the region, including National Meteorological and Hydrological Services (NMHSs) and oceanographic institutes.

FORMAL STATEMENT OF COMMITMENT TO VOLUNTARILY HOST THE CENTRE

From : Director of the National Data Buoy Center, Mr. Helmut H. Portmann
To: Co-Presidents of JCOMM, Dr. Peter Dexter and Dr. Alexander Frolov
CC: Executive Secretary of IOC, Dr. Wendy Watson-Wright
Secretary General of WMO, Mr. Michel Jarraud
IOC Action Addressees for the USA, Mr. John H. Dunnigan and Mrs. Elizabeth J. Tirpak
Permanent Representative of the USA with the WMO, Dr. John L. Hayes
President of the WMO Regional Association IV, Mr. Arthur W. Rolle

Appendix A: Statement of compliance for the WMO-IOC Regional Marine Instrument Centre in Stennis Space Center, Mississippi, U.S.
Appendix B: Introduction to the National Data Buoy Center
Appendix C: Variables, and corresponding instruments covered as part of the National Data Buoy Center Capabilities and corresponding functions
Appendix D: List of key management and technical personnel

Subject: Establishment of the Regional Marine Instrument Centre in Stennis Space Center, Mississippi, U.S.

Dear Dr. Dexter and Dr. Frolov,

I refer to Recommendation 1 (JCOMM-III) of the Third Session of the WMO-IOC Joint Technical Commission for Oceanography and Marine Meteorology (JCOMM) (Marrakech, Morocco, 4 - 11 November 2009), approved by the WMO Executive Council at its Sixty-Second session (Geneva, Switzerland, 8-18 June 2010) through Resolution 2.5/4 (EC-LXII) establishing WMO-IOC Regional Marine Instrument Centres (RMIC).

I also refer to the U.S.'s offer made during the third session of the JCOMM Data Management Coordination Group (March 2008) to host an RMIC for the North/Central America-Caribbean region; and to the informal discussions with the WMO and IOC Secretariats to assist in the preparation for the establishment of an RMIC in Stennis Space Center, U.S.; as well as with the organization of a first dedicated Workshop for the North/Central America-Caribbean region in April 2010. These discussions in particular permitted to fully understand the rationale for establishing an RMIC in Stennis Space Center, and provided an insight of requirements and format for the organization of relevant activities, services, and workshops. At the JCOMM-III, the National Data Buoy Center (NDBC) of the U.S. was approved to undertake the functions of an RMIC on a trial basis and report on the results to JCOMM with a goal of eventually becoming an RMIC. The NDBC was pleased to host the first ever RMIC Training Workshop in Stennis Space Center, Mississippi from April 13-15, 2010.

I would like to reaffirm the U.S.'s willingness and commitment to establish an RMIC in Stennis Space Center in order to provide assistance to WMO Members and IOC Member States from the North/Central America-Caribbean region and the WMO Regional Association IV for North America, Central America, and the Caribbean in improving the quality, consistency, and traceability to SI units, of the ocean observations made available to end users in the region, including National Meteorological and Hydrological Services (NMHSs) and oceanographic institutes. We expect that this will, in turn, result in improved final products and services delivered, in the region, by concerned Members/Member States. I am therefore pleased to offer this RMIC function within the National Data Buoy Center, in Stennis Space Center. Furthermore, we are now planning to periodically organize and hold Training Workshops for the North/Central America-Caribbean region and WMO Regional Association IV at the National Data Buoy Center.

In this context, we have reviewed our capabilities and functions with regard to the Terms of Reference of RMICs, and I am pleased to inform you that we believe that the National Data Buoy Center in Stennis Space Center meets all of the requirements. The National Data Buoy Center is

aligning the organization to execute a quality management system that applies International Organization for Standardization (ISO) 9001:2008 and Capability Maturity Model Integration (CMMI) Level 3 best practices and methodologies. In the future, the National Data Buoy Center will apply for formal certification of these standards. In the Appendices A, B, C, and D you will find a statement of compliance for the RMIC capabilities and corresponding functions, as well as the suite of instrument expertise offered in this context.

I would therefore be grateful if you could take appropriate steps through JCOMM in order for the National Data Buoy Center in Stennis Space Center to be eventually listed as a RMIC for the North/Central America-Caribbean Region IV and operate as such on behalf of the WMO and IOC. We look forward to a fruitful cooperation with other countries in the North/Central America-Caribbean region through the activities of the future RMIC and JCOMM.

Yours sincerely,

Helmut H. Portmann
Director, National Data Buoy Center

APPENDIX A OF ANNEX IV

STATEMENT OF COMPLIANCE FOR THE WMO-IOC REGIONAL MARINE INSTRUMENT CENTRE IN STENNIS SPACE CENTER, U.S.

1. Introduction

The U.S. National Data Buoy Center (NDBC) is a unit of U.S. National Weather Service's (NWS) Office of Operational Systems (OOS) in the National Oceanic and Atmospheric Administration (NOAA). NDBC manages the development, operations, and maintenance of the USA National Data Buoy Network. It serves as the NOAA focal point for data buoy and associated meteorological and oceanographic monitoring technology. It provides high quality marine meteorological/oceanographic data in real time from automated observing systems. NDBC has three major real-time ocean observing networks/programs: (1) Weather and Ocean Platform (WxOP) Program (with 116 moored buoys and 53 land-based Coastal-Marine Automated Network (C-MAN) sites collecting meteorological and ocean data), (2) Tropical Atmosphere Ocean (TAO) Climate Observation Program (with 55 surface buoys/moorings and 4 subsurface moorings collecting ocean climatic data), and (3) Deep-ocean Assessment and Reporting of Tsunami (DART) Tsunami Program (with 39 buoys/moorings collecting and reporting water column height data to monitor open ocean tsunamis). In general, WxOP buoys are located around U.S. coastal waters (i.e., U.S. East coast, West coast, Gulf of Mexico, and Hawaii Islands) and Great Lakes. The TAO buoys are located along the Pacific equatorial region (from 165E to 95W) while the Tsunameter buoys are located predominately in the Pacific Ocean with some in the Atlantic Ocean and Gulf of Mexico. In addition, the NDBC manages the Volunteer Observing Ship (VOS) program to acquire additional meteorological and oceanographic observations supporting NWS mission requirements. Further, NDBC maintains the capability to support operational and research programs of NOAA and other national and international organizations.

The NDBC mission is to provide comprehensive, reliable systems and marine observations to support the missions of the NWS and NOAA, promote public safety, and satisfy the future needs of our customers.

The National Data Buoy Center is committed to provide for the following capabilities and undertake the following functions in order to act as a WMO-IOC Regional Marine Instrument Centre (RMIC) for the North/Central America-Caribbean region and WMO Regional Association IV.

The main responsibilities of National Data Buoy Center are detailed in Appendix B.

1. List of capabilities

Laboratory equipment (item a[14])

The facilities and laboratory equipment available at the National Data Buoy Center permit the calibration of the instruments measuring the variables of interest to WMO and IOC Programmes as listed in section 3 below and detailed in Appendix C.

Set of standard instruments or references (item b[1])

The National Data Buoy Center is maintaining a set of meteorological and oceanographic standard instruments or references for measuring the variables listed in section 3 below, and for which traceability to the International System of Units (SI) is ensured.
See Appendix C for the list of meteorological and oceanographic standard instruments or references the National Data Buoy Center is maintaining to support the RMIC function, and for which traceability to the International System of Units (SI) is ensured.

Staff resources (item c[1])

Qualified managerial and technical staff with the necessary experience is made available by the National Data Buoy Center in order for the RMIC to fulfill its functions.

The National Data Buoy Center's Calibration and Testing Laboratories' day-to-day functions are carried out by a technical staff of 15 technicians with the minimum educational background of an associate's degree. These technicians bring well over 100 years of experience in testing meteorological and oceanographic sensors. The calibration and testing laboratories are supported by 25 engineers, scientists, oceanographers, and meteorologists with a mixture of bachelor, master, and doctorate degrees. The quality of the laboratories is audited by a team of quality assurance inspectors that review the application of procedures, recorded data, and the physical instruments being tested. Each test procedure performed in the NDBC Calibration and Test Laboratories is documented and regularly reviewed. Procedures are continually improved by a rigorously reviewed Engineering Change Process.

A list of key management and technical personnel is provided in Appendix D.

Calibration procedures (item d[1])

Relevant individual technical procedures for the calibration of meteorological and related oceanographic instruments developed by the National Data Buoy Center using its own calibration equipment, and intended to be used as part of the RMIC function are detailed in Appendix C.

Quality assurance procedures (item e[1])

The National Data Buoy Center has maintained its own quality management plan for over 20 years. In 2009, NDBC began to align the organization to execute a quality management system that applies International Organization of Standardization (ISO) 9001:2008 and the Capability Maturity Model Integration (CMMI) Level 3 best practices and standard methodologies. NDBC continues to improve through periodic internal and external audits and will apply for ISO accreditation in the future. As a U.S. Government entity, NDBC is periodically audited by the U.S. Government Accountability Office and the U.S. Department of Commerce Office of the Inspector General to improve our performance and ensure that our management processes provide a benefit to the American people. NDBC successfully completed a NOAA Tier 1 Safety and Environmental Compliance audit in August 2010 to ensure that all our work environments and procedures comply with U.S. safety and environmental compliance laws and regulations.

Inter-laboratory comparisons (item f[1])

The National Data Buoy Center will provide support for regularly organizing inter-laboratory comparisons of standard calibration instruments and methods in Stennis Space Center, Mississippi, U.S.

The National Data Buoy Center participates in inter-comparison of laboratory instruments, sensors, and methods. All of NDBC's reference equipment used in the calibration of sensors is tested at external independent laboratories for National Institute of Standards and Technology traceability. NDBC regularly sponsors and participates in regional, national, and international industry workshops including the Quality Assurance of Real-Time Ocean Data (QARTOD), Marine Technology Society (MTS), Alliance for Coastal Technologies, Integrated Ocean Observing System (IOOS), Consortium for Ocean Leadership, International Association for the Physical Sciences of the Oceans (IAPSO), and the Scientific Committee on Oceanic Research (SCOR). NDBC has also participated in the development of ISO procedures and standards. NDBC participation in these events is intended to, not only strengthen and improve NDBC's processes, but to improve the quality of marine observations.

The National Data Buoy Center will actively participate in the inter-laboratory comparison of calibration standards and methods organized by other RMICs, and organize relevant inter-laboratory comparisons at regular intervals.

Capabilities of the region (item g[1])

The National Data Buoy Center will cooperate with other countries in the North/Central America-Caribbean region in the view to ascertain the capabilities of the region in terms of instrument calibration, testing, inter-comparison, and training, and make recommendations through JCOMM on how those capabilities could be used in a synergetic way in the best interest of those countries.

The National Data Buoy Center will strengthen the cooperation and communication with other countries in its region on the calibration of ocean and marine meteorological instruments through:

- Organizing periodic training workshops.
- Organizing and participating in inter-laboratory comparisons.
- Actively participating in the development of regional/international standards for marine observations, instruments, and processes.
- Providing calibration and test services of marine instruments to WMO Region IV members.

International standards for calibration laboratories (item h[1])

The National Data Buoy Center began aligning its total quality management system to ISO 9001:2008 and CMMI Level 3 methodologies in 2009. The last internal audit for compliance was completed in March 2010. NDBC is still addressing issues coming from this audit to bring NDBC into full compliance.

Verification of capabilities and performances (item i[1])

The National Data Buoy Center will allow an authority designated by JCOMM to assess the RMIC and verify its capabilities and performance at least every five years.

2. Corresponding functions

Cooperation with other Asia-pacific countries for the calibration of instruments (item a[2])

The National Data Buoy Center is planning to provide assistance to other countries in the North/Central America- Caribbean region in the following way (i) upon request, calibrating, testing, and monitoring ocean instruments that fall within the scope of the RMIC stated capabilities and suite of instrument expertise offered; (ii) organizing, coordinating, or hosting instrument inter-comparisons; and (iii) organizing training events at the RMIC.

Organization of marine instrument inter-comparisons (item b[2])

The National Data Buoy Center is committed to regularly organize marine instrument inter-comparisons as promoted by JCOMM. This will be done in close relationship with the instrument manufacturers through the Hydro-Meteorological Equipment Industry (HMEI), which will assist in obtaining the necessary equipment to evaluate.

Improved data quality in the region (item c[2])

Through the activities of the RMIC, and assuming that some countries in the North/Central America- Caribbean region will take advantage of the RMIC facilities, through participation in RMIC training events, and instrument inter-comparisons, it is expected that the capacities of those countries in terms of ocean measurements will be enhanced, the measurements performed by those countries will become more coherent and better traceable to SI units, and the quality of their measurements will improve and become better known.

Advice to other countries (item d[2])

The National Data Buoy Center is committed to devote some limited resources for rendering the following services to developing countries in the North/Central America- Caribbean region, including reviewing the requests from those countries, and replying favorably on a case by case basis, i.e.

(iii.) evaluation of the performance of instruments shipped by developing countries to the RMIC, and returned to them with an evaluation sheet; and
(iv.) calibration of instruments shipped by developing countries to the RMIC, and returned to them with a calibration sheet with all required traceability information.

Guidance materials will also be developed for training events and instrument inter-comparisons at the RMIC. The RMIC will play a pro-active role in producing, reviewing, and updating relevant documentation through JCOMM.

Organization of training workshops (item e[2])

The National Data Buoy Center is committed to organize training workshops at least every four years in Stennis Space Center, Mississippi, U.S. and contribute to funding the participation of some ocean instrument experts from developing countries at those events.

Cooperation with other RMICs (item f[2])

The National Data Buoy Center is committed to cooperate with other established RMICs in this regard as necessary.

Report to JCOMM Management Committee (item g[2])

The National Data Buoy Center is committed to submit a written report to the JCOMM Management Committee on an annual basis through the WMO and IOC Secretariats, on the services offered to Members/Member States and the activities carried out.

3. Suite of instrument expertise offered

The instruments measuring the following variables are part of the expertise offered:

- Wind speed and direction
- Barometric pressure
- Relative humidity
- Air, sea surface, and sub-surface temperature
- Wave height and period

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[1] : Relevant item of the capabilities part of the annex to the RMIC Terms of Reference
[2]: Relevant item of the capabilities part of the annex to the RMIC Terms of Reference

APPENDIX B OF ANNEX IV

INTRODUCTION TO THE NATIONAL DATA BUOY CENTER

The National Data Buoy Center (NDBC) is an agency within the National Weather Service (NWS) of the National Oceanic and Atmospheric Administration (NOAA) under the U.S. Department of Commerce. NDBC designs, develops, operates, and maintains a network of data collecting buoys and coastal stations. NDBC provides hourly observations from a network of about 116 weather and ocean buoys, 53 Coastal-Marine Automated Network (C-MAN) stations, 55 Tropical Atmosphere Ocean (TAO) climate buoys, and 39 Deep-ocean Assessment and Reporting of Tsunami (DART) detection buoys to help forecasters in their preparation of forecasts, warnings, and models. NDBC also serves as a world class Data Assembly Center (DAC) for receiving, quality controlling, and disseminating measurement data from NDBC stations and other stations owned and maintained by non-federal regional, national, and international ocean observing systems. These high-quality observations are distributed on the Global Telecommunication Network (GTS) and used by national and international forecasters and modelers around the world.

To support the extensive NDBC networks and other engineering/data collection projects, NDBC employs engineers, meteorologists, oceanographers, computer scientists, and other professionals. U.S. Coast Guard (USCG) and NOAA Corp members serve on the government staff to provide unique skills and interface for transportation support. An NDBC Technical Services Contractor (NTSC) supports NDBC with a staff of approximately 140 employees.

NDBC's main office is located in southern Mississippi at Stennis Space Center, a National Aeronautics and Space Administration (NASA) facility. This site was chosen because it contains an excellent pre-existing industrial facility which is adjacent to a canal with deep-water access to the Gulf of Mexico.

The NDBC Charter is to manage the development, operations, and maintenance of the National Data Buoy Network. It serves as the NOAA focal point for data buoy and associated meteorological and oceanographic monitoring technology. It provides high-quality marine meteorological/environmental data in real time from automated observing systems that include buoys and coastal monitoring stations in the open ocean and coastal zone surrounding the United States. It provides engineering support, including applications development, and manages data buoy deployment and operations, and installation and operation of automated observing systems installed on fixed platforms. It manages the Volunteer Observing Ship (VOS) program to acquire additional meteorological and oceanographic observations supporting NWS mission requirements. It maintains the capability to support operational and research programs of NOAA and other national and international organizations.

The NDBC mission is to provide comprehensive, reliable systems and marine observations to support the missions of the NWS and NOAA, promote public safety, and satisfy the future needs of our customers.

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APPENDIX C OF ANNEX IV

VARIABLES, AND CORRESPONDING INSTRUMENTS COVERED AS PART OF THE NATIONAL DATA BUOY CENTER CAPABILITIES AND CORRESPONDING FUNCTIONS

As part of the RMIC capabilities and corresponding functions, the facilities and laboratory equipment available at the National Data Buoy Center permit the calibration of the instruments measuring the variables listed in the table below. The meteorological and oceanographic standard instruments or references the National Data Buoy Center is maintaining to support the RMIC function, and for which traceability to the International System of Units (SI) is ensured is also indicated in this table, as well as the relevant individual technical procedures for the calibration of meteorological and related oceanographic instruments developed by the National Data Buoy Center using its own calibration equipment.

Variables	Primary Standard	Traceability	Technical Procedures for Calibration
Wind Speed (m/s)	Wind Tunnel w/calcuated wind speed corrected for air denisty. The wind tunnel also includes a turn table for dynamic wind direction testing.	Sensors used to collect parameters for calculation of wind speed are NIST traceable. The NDBC wind tunnel participates in the wind tunnel round-robin testing performed by Meteorological Standards Institute.	NDBC-1135 Calibration of Anemometers
Wind Direction (degrees)	Tilt table w/reference inclinometer and compass rose	NIST Traceable	Anemometers: NDBC-1135 Calibration of Anemometers Compass: NDBC-1111 Electronic Compass Calibration
Relative Humidity (%)	Thunder Scientific Humidity Generator and salt solution	NIST Traceable	NDBC-1138 Calibration of Relative Humidity Sensors
Temperature (°C)	Primary :Triple Point of Water, Gallium Melt Point Cell Secondary: Platinum Resistance Thermometers	NIST Traceable	NDBC-1179 Calibration of PRTs NDBC-1105 Calibration of Air and Ocean Temperature Sensors
Barometric Pressure (hPa)	Ruska Deadweight Tester Haas Mercury Manometer	NIST Traceable	NDBC-8112 Calibration of Pressure Transfer Standard NDBC-1134 & NDBC-1180 Calibration of Barometers
Waves Height (m) & Period (s)	Orbital wave motion facility	NIST Traceable	NDBC-8044 Calibration of Heave, Pitch, & Acceleration sensor

APPENDIX D OF ANNEX IV

LIST OF KEY MANAGEMENT AND TECHNICAL PERSONNEL

No	Name	Title	Department
1	Helmut H. Portman	Director of National Data Buoy Center	
2	Chung-Chu Teng, Ph.D.	Chief of Observing Systems	
3	Regina Moore	Engineering Manager	Observing Systems
4	Peter Lessing	Senior Engineer	Observing Systems
5	Rodney Riley	Engineer	Observing Systems
6	Bill Hansen	Engineer	Observing Systems
7	William Burnett, Ph.D.	Chief of Data Management and Communication (DMAC)	
8	Richard Crout, Ph.D.	Data Quality Program Manager	DMAC
9	Richard Bouchard	Senior Physical Scientist	DMAC
10	Rex Hervey	Chief Meteorologist	DMAC
11	Mike Burdette	Lead of Safety, Reliability, and Quality Assurance SRQA)	

ANNEX V

STATEMENT OF COMPLIANCE OF THE RMIC FOR THE ASIA PACIFIC REGION

(SOA National Centre of Ocean Standards and Metrology, Tianjin, China)

The Statement of compliance of the RMIC for the Asia Pacific Region (including the WMO Regional Association II) included in Appendix A of this Annex was submitted by the Director of the SOA National Centre of Ocean Standards and Meteology (NCOSM), Dr Aina WU to the JCOMM Co-Presidents on 15 November 2010, who reaffirmed the China's willingness and commitment to establish an RMIC in Tianjin in order to provide assistance to WMO Members and IOC Member States from the Asia-Pacific region and the WMO Regional Association II in improving the quality, consistency, and traceability to SI units, of the ocean observations made available to end users in the region, including National Meteorological and Hydrological Services (NMHSs) and oceanographic institutes.

FORMAL STATEMENT OF COMMITMENT TO VOLUNTARILY HOST AN RMIC AT NCOSM, TIANJIN, CHINA

Date: 15 Nobember 2010
From : Director of the centre hosting the candidate RMIC
To: Dr Peter Dexter, Co-President of JCOMM
Dr Alexander Frolov, Co-President of JCOMM
CC: Dr Wendy WATSON WRIGHT, Executive Secretary of IOC
Mr Michel JARRAUD, Secretary General of WMO
Dr Guoguang ZHENG, Permanent Representative of China with the WMO
Prof. Victor E. CHUB, President of WMO Regional Association II
IOC Action Addressees for China
Co-Chairpersons of the joint Steering Group for the IODE Ocean Data Portal and the JCOMM Pilot Project for WIGOS

Subject: Establishment of the Regional Marine Instrument Centre in Tianjin

Dear Dr Dexter and Dr Frolov,

I refer to Recommendation 1 (JCOMM-III) of the Third Session of the WMO-IOC Joint Technical Commission for Oceanography and Marine Meteorology (JCOMM) (Marrakech, Morocco, 4 - 11 November 2009), approved by the WMO Executive Council at its Sixty-Second session (Geneva, Switzerland, 8-18 June 2010) through Resolution 2.5/4 (EC-LXII) establishing WMO-IOC Regional Marine Instrument Centres (RMIC).

I also refer to China's offer made during the JCOMM-III session to host an RMIC for the Asia-Pacific region; and to the recent and successful visit of the WMO Secretariat representative in Tianjin to assist in the preparation for the establishment of an RMIC in Tianjin, China; as well as with the organization of a first dedicated Workshop for the Asia-Pacific region in 2011. This visit in particular permitted to fully understand the rationale for establishing an RMIC in Tianjin, and provided an insight of requirements and format for the organization of relevant activities, services, and workshops.

Following the successful JCOMM workshop on Marine Instrument for the WMO Regional Association IV that was held at the US National Data Buoy Centre in Bay St Louis, USA from 13 to 15 April, and noting that the workshop permitted to prove the RMIC concept, I would like to reaffirm China's willingness and commitment to establish an RMIC in Tianjin in order to provide assistance to WMO Members and IOC Member States from the Asia-Pacific region and the WMO Regional Association II in improving the quality, consistency, and traceability to SI units, of the ocean observations made available to end users in the region, including National Meteorological and Hydrological Services (NMHSs) and oceanographic institutes. We expect that this will in turn result in improved final products and services delivered, in the region, by concerned Members/Member States. I am therefore pleased to offer this RMIC function within the National Center of Ocean Standards and Metrology (NCOSM) of the State Oceanic Administration (SOA), in Tianjin. Furthermore, we are now planning organizing a Training Workshop for the Asia-Pacific region and WMO Regional Association II, to be held at the NCOSM in early 2011.

We have reviewed our capabilities and functions with regard to the Terms of Reference of RMICs, and I am pleased to inform you that we believe that the NCOSM in Tianjin meets all of the requirements. I would also like to draw your attention that in December 2007, NCOSM has been assessed by the China National Accreditation Service for Conformity Assessment (CNAS) which certified that NCOSM met the requirements for ISO/IEC 17025 and delivered a Metrology Accreditation Certificate, a China Authorization Certificate, and a Laboratory -+Accreditation Certificate. In the Appendix you will find a statement of compliance for the RMIC capabilities and corresponding functions, as well as the suite of instrument expertise offered in this context.

I would therefore be grateful if you could take appropriate steps through JCOMM in order for the NCOSM in Tianjin to be eventually listed as a RMIC for the Asia-Pacific region and operate as such on behalf of the WMO and IOC. We look forward to a fruitful cooperation with other countries in the Asia-Pacific region through the activities of the future RMIC and JCOMM.

Yours sincerely,

Aina Wu
Director, NCOSM

APPENDIX A

STATEMENT OF COMPLIANCE FOR THE WMO-IOC REGIONAL MARINE INSTRUMENT CENTRE IN TIANJIN

The National Centre of Ocean Standards and Metrology (NCOSM) is committed to provide for the following capabilities and undertake the following functions in order to act as a WMO-IOC Regional Marine Instrument Centre (RMIC) for the Asia-Pacific region and WMO Regional Association II.

1. List of capabilities

Laboratory equipment (item a[15])

The facilities and laboratory equipment available at NCOSM permit the calibration of the instruments measuring the variables listed in section 3 below.

Set of standard instruments or references (item b[15])

NCOSM is maintaining a set of meteorological and oceanographic standard instruments or references for measuring the variables listed in section 3 below, and for which traceability to the International System of Units (SI) is ensured.

Staff resources (item c[15])

NCOSM always adheres to the policy of *strengthening the calibration with science and technology* and *strengthening calibration with talents*. All the technical staff carrying out the calibration has passed the qualification accreditation organized by AQSIQ. A group of engineers and technicians with doctor degrees and post-graduate degrees become the backbone of the marine calibration, test and verification in NCOSM. A technical team with solid theory, abundant experience and reasonable talents distribution has come into shape.

Calibration procedures (item d[15])

Relevant individual technical procedures for the calibration of meteorological and related oceanographic instruments developed by NCOSM using its own calibration equipment, and intended to be used as part of the RMIC function are listed in section 3 below.

Quality assurance procedures (item e[15])

NCOSM has implemented TQM (Total Quality Management) since 1985, and established quality system management referring to the relevant international and national laboratory management standards. After 20 years of continuous improvement, NCOSM has already had a sound management model. The existing management system in strict accordance with the requirements of ISO / IEC 17025 *General Requirements for the Competence of Testing and Calibration Laboratories* , JJF1069 *Rules for the Examination of the Service of Legal Metrological Verification* and other accreditation regulations. This system has been improved and perfected continuously through regular internal audit and management review.

Inter-laboratory comparisons (item f[15])

NCOSM actively participated in the inter-comparison of laboratory instruments and methods and carried out the comparison between China Primary Standard Seawater and IAPSO Standard Seawater at regular intervals. The results showed that China Primary Standard Seawater achieved the same level as that of IAPSO Standard Seawater. NCOSM has organized the verification for 63 metrology accreditation agencies which have obtained the certificates in marine industry. All these

[15] : Relevant item of the capabilities part of the annex to the RMIC Terms of Reference

activities are aimed to strengthen the quality awareness of marine industry, to ensure the testing proficiency of marine monitoring /testing laboratories and to basically meet the needs of RMIC capability. NCOSM will actively participate in the inter-laboratory comparison of calibration standards and methods organized by other RMICs, and organize relevant inter-laboratory comparisons at regular intervals.

Capabilities of the region (item g[15])

NCOSM will strengthen the cooperation and communication with other countries in the Asia-Pacific region on the calibration of marine instruments and marine meteorological instruments.
NCSOM will make suggestions to JCOMM including:

- Organize inter-laboratory comparisons;
- Formulate International/ regional standards of marine instruments and observation methods;
- Establish the regional Quality Control System of marine observation data;
- Establish access system for international use of marine instruments;
- Provide Services for members on calibration of marine instruments.

International standards for calibration laboratories (item h[15])

NCOSM apply ISO/IEC 17025, and passed the assessment of metrology accreditation, laboratory accreditation, CNCA and China National Accreditation Service for Conformity Assessment (CNAS) in Dec. 2007, and obtained *Metrology Accreditation Certificate*, *China Authorization Certificate* and *Laboratory Accreditation Certificate* , which organized every three years. NCOSM passed the assessment which is organized every 1.5 years in Aug. 2009.NCOSM is being evaluated again for accreditation in December 2010; and then every 3 years.

Verification of capabilities and performances (item i[15])

NCOSM will allow an authority designated by JCOMM to assess the RMIC and verify its capabilities and performance at least every five years.

2. Corresponding functions

Cooperation with other Asia-pacific countries for the calibration of instruments (item a[16])
The NCOSM is planning to provide assistance to other countries in the Asia-Pacific region in the following way:

- Upon request, calibrating, testing the ocean instruments that fall within the scope of the RMIC stated capabilities and suite of instrument expertise offered;
- Organizing, coordinating, or hosting instrument inter- laboratory comparisons (see paragraph 4.2 below);
- Organizing training events about test/calibrate at the RMIC for Members/Member States of the Asia-Pacific region or WMO Regional Association II.

Organization of marine instrument inter-comparisons (item b[16])

Information on why and how inter- laboratory comparisons should be organized is stated in the CIMO Guide (WMO-No. 8, Chapter III.4). However, the scope of marine instrument inter-laboratory comparisons has not been documented yet. NCOSM is willing to contribute to defining such a scope through organizing and participating at instrument inter-laboratory comparisons promoted by JCOMM. This will be done in close relationship with the instrument manufacturers through the HMEI, which will assist in obtaining the necessary equipment to evaluate. Thanks to these activities, NCOSM will be able to assist JCOMM in defining or adjusting guidelines for marine

[16] : Relevant item of the corresponding functions part of the annex to the RMIC Terms of Reference

instrument inter-laboratory comparisons for inclusion in the CIMO Guide. Specific inter-laboratory comparison for a given ocean variable might be organized initially to prove concept and help define guidelines (e.g. setting up a small committee with participation from NCOSM, HMEI, JCOMM). Once those guidelines are fully developed and formally approved, NCOSM will be in a position to fully assist in this regard by participating in, or organizing, JCOMM and/or regional instrument inter-laboratory comparisons.

Improved data quality in the region (item c[16])

Through the activities of the RMIC, and assuming that some countries in the Asia-Pacific region will take advantage of the RMIC facilities, through participation in RMIC training events, and instrument inter-comparisons, its is expected that the capacities of those countries in terms of ocean measurements will be enhanced, the measurements performed by those countries will become more coherent and better traceable to SI units, and the quality of their measurements will improve and become better known. The overall improvement of ocean observations in terms of quality, consistency, and traceability from the region, and made available to end users, should facilitate improving final products and services delivered by all within the region and achieve socio-economical benefits.

Advice to other countries (item d[16])

The NCOSM is committed to devote some limited resources for rendering the following services to other countries in the Asia-Pacific region, including reviewing the requests from those countries, and replying favorably on a case by case basis:

Evaluation of the performance of instruments shipped by other countries to the NCOSM, and returned to them with an evaluation sheet;
Calibration of instruments shipped by developing countries to the NCOSM, and returned to them with a calibration sheet with all required traceability information;

Note: The cost of shipping the instruments to the NCOSM can be negotiated directly with the relevant countries on a case by case basis.
In addition, the organization of training events and instrument inter-laboratory comparisons at the RMIC/Tianjin, and the collaboration with other established RMICs, will be opportunities to develop appropriate guidance materials. The RMIC/Tianjin will play a pro-active role in producing, reviewing, and updating relevant documentation through JCOMM.

Organization of training workshops (item e[16])

NCOSM is committed to organize training workshops at least every four years in Tianjin, and contribute to funding the participation of some ocean instrument experts from developing countries at those events. The level of funding will depend on funding available from other sources, and will be negotiated with the WMO and IOC Secretariats. The selection of participants from developing countries to receive financial assistance will be discussed through an organizing committee set up by JCOMM where the NCOSM will be represented.

Cooperation with other RMICs (item f[16])

The NCOSM is committed to cooperate with other established RMICs in this regard as necessary. This cooperation will for example address the following:

- Sharing of information on standards being used (primary, secondary) for types of instruments managed by both RMICs;
- Sharing of information on calibration methods;
- Sharing and review/updating of training materials in the view to harmonize them;
- Cooperation with regard to instrument inter-comparisons;

Report to JCOMM Management Committee (item g[16])

The NCOSM is committed to submit such a written report to the JCOMM Management Committee on an annual basis through the WMO and IOC Secretariats, including details on:

- A short summary of the RMIC capabilities, including the list of instruments for which assistance is offered.
- List of countries that received assistance.
- Statistics on number of instruments evaluated and/or calibrated
- Workshops organized at the RMIC during the past calendar year with details about the participating countries, the programmes of the workshops, and their outcomes.
- Instrument inter-laboratory comparisons organized by the RMIC during the past calendar year with details about the types of instrumentation evaluated, and the results.
- Type of cooperation established with other RMICs.
- The list of training materials available at the RMIC.
- Some recommendations to JCOMM on how to improve the RMIC network as appropriate.

3. Suite of instrument expertise offered

VARIABLES, AND CORRESPONDING INSTRUMENTS COVERED AS PART OF THE RMIC/TIANJIN CAPABILITY AND CORRESPONDING FUNCTION

As part of the RMIC capability and corresponding functions, the facilities and laboratory equipment available at NCOSM permit the calibration of the instruments measuring the variables listed in the table below. The meteorological and oceanographic standard instruments or references NCOSM is maintaining to support the RMIC function, and for which traceability to the International System of Units (SI) is ensured is also indicated in this table, as well as the relevant individual technical procedures for the calibration of meteorological and related oceanographic instruments developed by NCOSM using its own calibration equipment.

Variables	Primary Standard	NCOSM Highest Standard	Traceability	Technical Procedures for Calibration
Water Conductivity /Practical Salinity /Standard Seawater	Tianjin Institute of Metrological Supervision Testing (TIMST), E_1 Standard Weight：U=0.003mg	NCOSM CEMS Certificate 57110007 April 2010	Standard instruments of measurement such as weight and balance are sent to TIMST to be calibrated at required intervals; salinometer is calibrated using weight dilution by NCOSM.	Calibration procedures: set value for the salinometer using the standard seawater with the salinity of 35, and then use the salinometer to measure the salinity of other standard seawater with different salinity. Compare the measured value with the standard value. Capability：MEP:0.001; Environmental condition：temperature:（20±5）℃, relative humidity≤70%
Water Temperature	National Institute of Metrology P.R.China, Secondary Standard Device of D.C Resistance:U=2×10^{-8}； Standard Device of	NCOSM Calibrating Apparatus of Marine Temperature Instruments	Standard instruments of measurement such as electric bridge and platinum resistance thermometer are sent to National Institute of Metrology P.R.China to be calibrated at required intervals.	Calibration procedures: Put the platinum resistance and the calibrated instrument into the thermostatic water bath, set a calibrating point every 5□ from 0□ to 35□.After the water temperature falls to the calibrating points, let both the platinum resistance and the instrument record the data at the same time, and take the D-value as the error of the instrument. Capability: MPE：±0.003□

	Platinum Resistance Thermometer: U=（0.1~2.8）mK			Environmental conditions: Temperature:（20±2）℃;relative humidity≤70%
Water Pressure	National Institute of Metrology P.R.China Pressure Standard Device: (0.1~10）MPa U=0.002%	Calibrating apparatus of marine depth instruments held by NCOSM	Standard piston gauge is sent to National Institute of Metrology P.R.China to be calibrated at required intervals.	Calibration procedures: Put the calibrated instrument on the operating platform of standard piston gauge, link the standard piston gauge and the calibrated instrument with the specially made connecting tube, then slowly pressing; Record at least 10 groups of pressure data with 3 minutes after the pressure stabilizes. Capability：U=0.005% Environmental conditions：temperature:（20±1）℃; relative humidity≤70%
Sea Level and Tide	National Institute of Metrology P.R.China, 26m Standard Device of Dynamic Calibrator $U=0.5\mu m+5\times10^{-7}L$	NCOSM Calibrating Apparatus of Tide Gauge	Invar tape is sent to National Institute of Metrology P.R.China to be calibrated at required intervals.	Calibration procedures: Put the tide gauge into the water tower, set calibrating points every 1m from 0m to 8m, carry out calibrations respectively when the water level ascend and descend. When the water level stabilizes to a certain point, let the CCD camera and the instrument record the data at the same time, the D-value is the error of the instrument. Capability: MPE:±2cm Environmental conditions: temperature:（5~35）℃; relative humidity≤85%
Waves (Height, Period)	TIMST Time Calibrator：MPE:$\pm2\times10^{-7}$	NCOSM Wave Buoy Calibration Device	Steel tape and stopwatch are sent to TIMST to be calibrated at	Calibration procedures: Set 1m, 3m and 6m as the calibrating points of wave height. within the period range of the calibrated device, according to the principle of equidistribution frequency points, select 7 wave period values at every calibrating points of wave height；fix the calibrated instrument on the simulating device of wave buoy and then

	Standard Steel Tape: MPE:±(0.03+0.03)Lmm		required intervals.	adjust balance and start the simulating device. Start measuring when the uniform motion stabilizes. Capability: wave height MPE±0.2%FS.wave period MPE±0.2s Environmental conditions: temperature:（5~35）℃; relative humidity≤85%

LIST OF ACRONYMS

Cg	Congress (WMO)
CIMO	Commission on Instruments and Methods of Observation (WMO)
CONOPS	WIGOS Concept of Operations
HMEI	Association of Hydro-Meteorological Equipment Industry
IEC	International Electrotechnical Commission
IOC	Intergovernmental Oceanographic Commission of UNESCO
IODE	International Oceanographic Data and Information Exchange (IOC)
ISO	International Organization for Standardization
JCOMM	Joint WMO-IOC Technical Commission for Oceanography and Marine Meteorology
NCOSM	SOA National Centre of Ocean Standards and Metrology (China)
NDBC	National Data Buoy Centre (of NOAA, USA)
NMHS	National Meteorological and Hydrological Service
NOAA	National Oceanic and Atmospheric Administration (USA)
OCG	Observations Coordination Group (JCOMM)
ODP	Ocean Data Portal (IODE)
QMF	WMO Quality Management Framework
RA	WMO Regional Association
RIC	Regional Instrument Centres
RMIC	WMO-IOC Regional Marine Instrument Centre
RRC	Regional Radiation Centre
SOT	Ship Observations Team (JCOMM)
UNESCO	United National Educational, Scientific and Cultural Organization
WDIP	WIGOS Test of Concept Development and Implementation Plan
WIGOS	WMO Integrated Global Observing System
WIS	WMO Information System
WMO	World Meteorological Organization (UN)
WRC	World Radiation Centre

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