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The People's Republic of China

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February 14, 2012

Dear Dr. Wendy Watson-Wright,

**Subject: WMO-IOC Marine-meteorological and Oceanographic  
Climate Data Centre, China**

As the National Focal Point to IOC of China, I have the pleasure to take this opportunity to inform you that State Oceanic Administration of China (SOA) has formally approved the National Marine Data and Information Service (NMDIS), China to act as a WMO-IOC Centre for Marine-meteorological and Oceanographic Climate Data Center (hereinafter referred to as "CMOC"). We believe that the establishment of CMOCs will further strengthen the marine-related cooperation under IOC framework, including information sharing.

NMDIS, as the lead marine information data center in China, has paid great attention to the establishment of CMOCs, and conducted necessary preparation to fulfill functions required in its infrastructure, facilities, staff resources, and etc. Once the proposal is approved, SOA will help to facilitate the establishment and operation of CMOC in China with financial and managerial support based on Terms of References specified by WMO/IOC-JCOMM. We are looking forward to the great cooperation in this regard.

Please find the attached supporting documents required:

1. Statement of compliance and commitment signed by Mr. Xu Sheng,

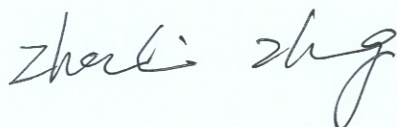
Director-General of NMDIS, China

2. Introduction of CMOC in China and its host center, National Marine Data and Information Service of SOA
3. Proposed domain for the operations of the CMOC (i.e. regional/global, type of data, period) as part of the CMOC China Capabilities and corresponding functions, and relationship to existing activities
4. List of key management and technical personnel

Please allow me to take this opportunity on behalf of SOA to express our sincere thanks for your great support to us.

Best wishes,

Dr. Zhanhai Zhang

A handwritten signature in black ink, appearing to read 'Zhanhai Zhang' in a cursive style.

Director-General

Department of International Cooperation, SOA

## STATEMENT OF COMPLIANCE AND COMMITMENT TO VOLUNTARILY HOST A CENTRE FOR MARINE-METEOROLOGICAL AND OCEANOGRAPHIC CLIMATE DATA (CMOC)

**From:** Dr. Zhang Zhanhai  
Director-General, the Department of International Cooperation  
State Oceanic Administration of P. R. China

**To:** Executive Secretary of IOC

**CC:** WESTPAC Sub Committee of IOC  
Secretary General of WMO  
Co-President of JCOMM

Appendix A: Statement of compliance and commitment for the National Marine Data and Information Service (NMDIS), China to act as a WMO-IOC Centre for Marine-meteorological and Oceanographic Climate Data (hereinafter referred to as "CMOC China")

Appendix B: Introduction to CMOC China and its host center, National Marine Data and Information Service

Appendix C: Proposed domain for the operations of the CMOC (i.e. regional/global, type of data, period) as part of the CMOC China Capabilities and corresponding functions, and relationship to existing activities

Appendix D: List of key management and technical personnel

**Subject:** Establishment of a WMO-IOC Centre for Marine-Meteorological and Oceanographic Climate Data (CMOC) at the National Marine Data and Information Service (NMDIS), China

Dear Dr Watson Wright,

I refer to [Recommendation XXX (JCOMM-IV) of the Fourth Session of the WMO-IOC Joint Technical Commission for Oceanography and Marine Meteorology (JCOMM) (Republic of Korea, May 2012), approved by the IOC Executive Council at its Forty-fifth Session (Paris, France, June 2012) through Resolution XXX, and the WMO Executive Council at its Sixty-Fourth session (Geneva, Switzerland, June 2012) through Resolution XXX (EC-LXIV) establishing WMO-IOC Centre for Marine-meteorological and Oceanographic Climate Data (CMOCs).

I also refer to China's offer made during the workshop for a new Marine Climate Data System (MCDS) which was held at the Deutscher Wetterdienst in Hamburg, Germany, from 28 November to 2 December 2011, to host a CMOC; and to the informal discussions with the WMO and IOC Secretariats to assist in the preparation for the establishment of a CMOC at National Marine Data and Information Service (NMDIS), China. These discussions in particular permitted to fully understand the rationale for establishing a CMOC at NMDIS, and provided an insight of requirements and format for the organization of relevant activities and services.

I would like to reaffirm China's willingness and commitment to establish a CMOC at NMDIS in order to provide assistance to WMO Members/Member States and IOC Member States in accessing high quality marine meteorology and oceanographic historical data and metadata from the world oceans. Appropriate products of the CMOC shall be mirrored with other CMOCs to be established by the IOC and WMO in other places.

We expect that this will permit to address the requirements of WMO and UNESCO/IOC programmes and co-sponsored programmes, including climate monitoring, and the Global

Framework for Climate Services (GFCS), and in turn result in improved final products and services delivered by concerned Members/Member States. I am therefore pleased to offer this CMOC function within the CMOC China, in NMDIS.

In this context, we have reviewed our capabilities and functions with regard to the Terms of Reference of CMOCs, and I am pleased to inform you that we believe that the CMOC China program at NMDIS meets all of the requirements. In the Appendices A, B, C, and D you will find a statement of compliance and commitment for the CMOC capabilities and corresponding functions, as well as the expertise offered in this context.

I would therefore be grateful if you could take appropriate steps through JCOMM in order for the CMOC China at NMDIS to be eventually listed as a CMOC and operate as such on behalf of the WMO and IOC. We look forward to a fruitful cooperation with other CMOCs and components of the Marine Climate Data System (MCDS) through the activities of the future CMOC and JCOMM.

Yours sincerely,

Xu Sheng



Director-General of NMDIS,  
Director of CMOC China

## APPENDIX A

### STATEMENT OF COMPLIANCE AND COMMITMENT FOR THE WMO-IOC CENTRE FOR MARINE-METEOROLOGICAL AND OCEANOGRAPHIC CLIMATE DATA AT NATIONAL MARINE DATA AND INFORMATION SERVICE (NMDIS), CHINA

#### 1. INTRODUCTION

To meet the requirements of Global Climate Observing System (GCOS), Global Framework for Climate Services (GFCS) and Global Ocean Observing System (GOOS), JCOMM is establishing a new Marine Climate Data System (MCDS). The core of the system is the network of WMO-IOC Centres for Marine-meteorological and Oceanographic Climate Data (CMOCs). CMOCs will rescue, collect, process, conduct quality control, archive, share, distribute, and mirror worldwide historical, real-time, delayed mode marine-meteorological and oceanographic data, metadata and products of MCDS component data centres, and appropriate WMO and IOC projects and programs, in accordance with the agreed protocols and formats. It will make data sets, and corresponding metadata, maintained as part of its scope available, and discoverable through the WMO Information System (WIS) and/or the IOC/IODE Ocean Data Portal (ODP). This will greatly improve the quantity, quality, and timeliness of the marine-meteorological and oceanographic data, metadata and products available to end users. The whole system is planning to achieve the fully operation by 2020.

The National Marine Data and Information Service of China (NMDIS/China) is applying for becoming a CMOC, which will be responsible for the collection, rescue, processing, quality control, archival, management and sharing of historical, real-time, delayed mode marine-meteorological and oceanographic climate data and metadata from relevant accomplished, on-going, and future WMO and IOC projects/programs and all the data-flow sources in the framework of MCDS. In the meantime, it will actively participate in the research and development of data and metadata products and provide corresponding services.

With the coordination of JCOMM and the support of the Members/Member States and as well as the significant support from Chinese Government, CMOC China will accelerate the process of MCDS development, and contribute to it through the close cooperation with approved international MCDS component centers such as Data Acquisition Centers (DACs), Global Data Assembly Centers (GDACs), and other CMOCs. By 2016, using state of the art technology, it will have capacity of operational near-synchronous services delivered in mirroring mode with other CMOCs. CMOC China will also contribute to MCDS by carrying out some capacity building activities.

Acting as a WMO-IOC Centre for Marine-meteorological and Oceanographic Climate Data (CMOC), the CMOC China is committed to provide the following capabilities on a long term basis and fulfill the following functions.

The main responsibilities of CMOC China are detailed in Appendix B.

#### 1. LIST OF CAPABILITIES

##### Infrastructure (item a<sup>26</sup>)

The infrastructure and facilities in place at CMOC China (See Table 1 in Annex C) permit to perform the functions required for a CMOC, i.e. data rescue, collection and assembly of data from dedicated MCDS centres, long-term processing, quality control (QC), data accessibility, and archival of marine-meteorological and/or oceanographic data and metadata (i.e. metadata concerning instrument/platform, data processing history, and data-set for data discovery purposes), gathered

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<sup>26</sup> Relevant item of the capabilities part of the annex to the CMOC Terms of Reference

under the common requirements of WMO and UNESCO/IOC marine-related programmes and co-sponsored programmes [, as well as the production of statistical products based on those data].

See section 3 below and Appendix C for the domain of operations of the centre.

### **Staff resources (item a<sup>26</sup>)**

Qualified managerial and technical staff with the necessary experience is made available by the CMOC China in order for the CMOC to fulfill its functions.

With regard to employment of staff, its recruitment, qualification, and qualification accreditation, CMOC China will strictly follow the national human resources management regulations of public welfare institutions of China. The technology training for staff has been included in the <ISO 9000 Quality Management System of NMDIS> since 2002 (Appendix E).

NMDIS always adheres to the policy of *strengthening NMDIS with science and technology* and *strengthening NMDIS with talents*. All the administrative personnel and technical staff engaged in the marine data processing and management are graduated from universities with profound professional knowledge of physical oceanography, marine meteorology, marine engineering, marine chemistry, marine biology, marine geology, computer science application, network design and development, etc. A group of engineers and technicians with doctor degrees and master degrees has been the backbone in the marine data collection, processing, quality control, product development, IT environment development and maintenance in CMOC China. A technical team with solid theory, abundant experience and reasonable talents distribution has come into shape.

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

### **Interoperability (item b<sup>26</sup>)**

CMOC China is committed to provide full interoperability with the WMO Information System (WIS) and/or the IOC/IODE Ocean Data Portal (ODP).

### **Quality Management (item c<sup>26</sup>)**

CMOC China is committed to develop and maintain the required data Quality Control procedures and data processing for relevant<sup>27</sup> data, and generating climatological products, as standardized within the CMOC network.

Since 2002, NMDIS has been operating with the authentication of ISO9000 Quality Management System ( Appendix E ). It has developed the quality manual, procedure documents and management documents for data processing, quality control as well as product development. Qualification inspection is carried out by professional agency for each year. The qualification authentication and validation is rechecked every five years. NMDIS, the host center of CMOC China, has gained rich experience on the processing of marine meteorology and marine climate data. It has developed the Standardization Processing and Quality Control System and Metadata Processing and Distribution System for marine meteorology, up air meteorology, air-sea fluxes, ship measurements/ CTD, BT, XBT, ADCP, land-based Radar, coastal stations data.

NMDIS has been responsible for the building, operation and maintenance of JCOMM/ODAS Metadata Service since 2003. It has already developed instrument/platform metadata information extraction, processing, product releasing systems for several international observation projects such as Argo, DBCP and GLOSS.

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<sup>27</sup> Data and products managed within the stated CMOC China scope (Appendix C) are referred as "relevant"

### **[Mirroring with other CMOCs (item d<sup>26</sup>)]**

[CMOC China is committed to develop and maintain the required IT infrastructure, protocols, data services, and human resources to permit the mirroring of its relevant<sup>28</sup> data, metadata (i.e. metadata concerning instrument/platform, data processing history, and data-set for data discovery purposes), products, and processes with other mirroring CMOCs.]

[CMOC China will provide stand-alone hardware and software facilities and physical environment (Table 1 in Annex C), and assemble professional IT and data management and service groups (Annex D). It will contribute through JCOMM to defining standards for formats, protocols, and quality management procedures, for the mirroring of information between CMOCs and for the collection of data from other MCDS components, and strictly follow the agreed standards. It will achieve the synchronized operation of CMOC China with other CMOCs.

### **Verification of capabilities and performances (Item (e<sup>26</sup>))**

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

## **2. CORRESPONDING FUNCTIONS**

### **Contribution to WMO and IOC Applications (item a<sup>28</sup>)**

CMOC China is committed to [rescuing<sup>29</sup>,] [collecting and assembling data from dedicated MCDS centres,] processing, archiving, sharing and distributing worldwide relevant<sup>27</sup> marine-meteorological and/or oceanographic data and metadata (i.e. metadata concerning instrument/platform, data processing history, and data-set for data discovery purposes) according to procedures documented in appropriate WMO and IOC Publications, [and rescuing DBCP historical instrument/platform metadata. ]

### **Advice to other Members/Member States (item b<sup>28</sup>)**

Within the CMOC domain of operations, the CMOC China is committed to devote some resources for rendering the following services to other Members/Member States for capacity building purposes, including reviewing the requests from those countries, and replying favorably on a case by case basis, regarding activities related to marine climatology, e.g.

- Advising on data collection, data processing, quality control, bias correction, data rescue, archiving techniques
- Advising on data formats and data exchange protocols
- Advising on marine climatological products, including climatological summaries, and statistical products.
- Undertaking part of the Capacity Building task and providing technical training and carrying out capacity building activities for the region

Guidance materials will also be developed for possible JCOMM training events. The CMOC will play a pro-active role in producing, reviewing, and updating relevant<sup>27</sup> documentation through JCOMM.

### **Interoperability (item c<sup>28</sup>)**

CMOC China will operate (or make necessary developments to operate) as a WIS Data

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<sup>28</sup> Data and products managed within the stated CMOC China scope (Appendix C) are referred as "relevant"

<sup>29</sup> This concerns the rescue of ocean and marine meteorological climate data from the Asia Pacific region from China or other Members/Member States sources. The rescue of data from other Members/Member States will be discussed and negotiated on a case by case basis

Collection or Production Centre (DCPC) for the relevant<sup>27</sup> data sets (see Table 2, 3 and 4 in Appendix C for details). The data-sets will also be discoverable through the IOC Ocean Data Portal (ODP).

#### **Quality Management (item d<sup>28</sup>, e<sup>4</sup>)**

CMOC China is committed to operate agreed upon<sup>30</sup> Quality Control procedures and data processing for relevant<sup>27</sup> data, and to generate climatological products, as standardized by WMO and IOC within the CMOC network.

#### **Cooperation with other CMOCs (item f<sup>28</sup>)**

In accordance with the procedures described in appropriate WMO and IOC Publications, the CMOC China is committed to cooperate with other CMOCs regarding the rescue, exchange, processing, quality control procedures, and archival of relevant<sup>27</sup> marine-meteorological and related oceanographic data and metadata (i.e. metadata concerning instrument/platform, data processing history, and data-set for data discovery purposes); and to coordinate its activities with them in order to [mirror,] maintain, and serve mutually consistent relevant<sup>27</sup> historical data sets (data, metadata, products).

#### **Core functions (item g<sup>28</sup>)**

CMOC China will undertake its core defined functions and replicate data from other centres appropriate to its domain of operations such that the set of data and products offered from the CMOC network is mutually consistent when accessed from any individual centre.

#### **[Mirroring with other centres (item h<sup>28</sup>)]**

[CMOC China will mirror data, metadata (i.e. metadata concerning instrument/platform, data processing history, and data-set for data discovery purposes), products and processes at defined time-scales, with other CMOCs according to methods and procedures agreed upon.]

#### **Versioning (item i<sup>28</sup>)**

CMOC China will undertake stringent version control (e.g. DOI) for all kinds of data, metadata and processes managed within its core functions.

#### **Reporting (item j<sup>28</sup>)**

CMOC China is committed to submit a written report to the JCOMM Management Committee through the Data Management Coordination Group (DMCG) on an annual basis, on the services offered to Members/Member States and the activities carried out.

### **3. SUITE OF DATA MANAGEMENT EXPERTISE OFFERED**

The Domain of the marine-meteorological and oceanographic data and products managed and/or generated by the centre as part of its Capabilities and corresponding functions include the following:

- Data and datasets acquired by the international marine meteorological and ocean observation projects/programmes (e.g. the data, metadata and products of the accomplished, on-going, and future WMO-IOC projects /programmes such as Argo, GTSP, DBCP, OceanSITE, GLOSS,

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<sup>30</sup> To be discussed and agreed upon through JCOMM and with the mirroring CMOCs.



- TOGA, WOCE, VOS, SOOP, NEAR-GOOS), including through MCDS component data centres
- International oceanographic and climatological datasets (e.g. ICOADS, WOD, GTS etc..)
  - Satellite observation data product (e.g. NGSST)
  - Marine meteorology and marine climate statistical products
  - Air-Sea coupled model forecast and reanalysis products (for example, the regional or global reanalysis products)
  - Metadata corresponding to all the above observation platforms/instruments, data processing history, data, and products, and metadata products

#### **4. DATA AND SOFTWARE POLICY REQUIREMENTS**

CMOC China is committed to make all the relevant<sup>27</sup> data, metadata (i.e. metadata concerning instrument/platform, data processing history, and data-set for data discovery purposes), and products freely and openly available to the international research community in a way consistent with WMO Resolution 40 (Cg-XII) and IOC Resolution XXII-6.

CMOC China will make the following software available openly and freely:

- Marine meteorological data quality control software
- Temperature and salinity profiles quality control software
- Part of data statistical and analysis software on the basis of carrying out statistical analysis of the above data/datasets
- Decoding software for data made available through the CMOC China

## APPENDIX B

### INTRODUCTION TO CMOC China

#### Introduction to National Marine Data and Information Service of China

National Marine Data and Information Service (NMDIS), China, is a public service institution under the State Oceanic Administration (SOA). It is responsible for centralized management of national marine resources; providing information, technical support and services to marine economy, marine integration management, and marine environment protection. It also coordinates and guides the tasks of national marine data and information in China.

#### NMDIS's Mission:

Marine Data and information management: collecting, processing, conduct quality control, and management of marine investigations, monitoring and observing data in China, development of corresponding data products and provision of associated services; establishing and maintaining the National Marine Environment and Geographic Information Platform; and hosting the National Marine Archive of China.

Marine informatization: Overall design, construction and management of national marine informatization and its communication network; establishment and maintenance of the digital ocean system.

Marine administration support: carrying out the studies and development of national marine development strategy, planning and functional zoning; undertaking the task of national marine economic statistics and development of the operational system for national marine economic monitoring and assessment; providing information technology support to sea area management and marine environmental protection; building the national sea island monitoring system.

Marine information services: forecasting for tide and tidal current, 3-Dimension temperature, salinity and currents, and emergency oil spill warning and its route; studies on climate change and sea level rising and their prediction and assessment; sharing services of marine data, metadata, and corresponding products; participation in international cooperation related to marine data and information on behalf of China.

The CMOC China applies for being a center of CMOCs network and will be committed to the following tasks:

1. Strengthening and streamlining the development of JCOMM/ODASMS and improve its operational services to achieve direct access to all global marine-meteorological and oceanographic climate data, metadata, and related products via the DACs, GDACs and CMOC network;
2. Actively undertaking the standardization, quality control of MCDS data;
3. Actively participating in the research and development of oceanographic and marine-meteorological products, and their related services;
4. Providing technical training, and carrying out capacity building activities for countries in the region.

For more details see Appendix C.

## APPENDIX C

### **Proposed domain for the operations of the CMOC (i.e. regional/global, type of data, period) as part of the CMOC China Capabilities and corresponding functions, and relationship to existing activities**

As part of the CMOC capabilities and corresponding functions, the facilities and infrastructure available at CMOC China permit the generation and provision of the following marine-meteorological and oceanographic data, metadata and products:

The domain of CMOC China operations will cover the activities required for the processing and updating of the real time/near real time, delayed mode and historical global marine meteorological and oceanographic climate data, metadata, and statistic products and reanalysis products. CMOC China will undertake the following four tasks:

(1) Integrating JCOMM/ODAS Metadata Service hosted by the National Marine Data and Information Service (NMDIS/China) into the management of CMOC China to strengthen and stream the management of the ODAS data and metadata from all cooperative programs/projects in the framework of JCOMM and develop associated metadata products. At the end of this process where integrated data and metadata products will be served, the ODASMS as a separate dedicated service for instrument/platform metadata will become obsolete.

CMOC China is committed to rescue, collect the historical metadata information, including the participation in the collection and rescue of historical marine meteorological and oceanographic climate data and associated metadata, and to collect the associated information as much as possible through multi-channels (consultations, literature, etc.), and extract and archive the substantial metadata from these information.

Based on the collection and processing of real-time and delayed mode data and products to be obtained from all the MCDS component data centres, and other appropriate data sources, CMOC China will collect and compile the three levels of metadata that will be used for the development and service of data and metadata information and related products:

- (i) observation platforms/instruments metadata (e.g. instrument siting, height, accuracy, etc.),
- (ii) traceable data processing history metadata (e.g. data versions, encodes, compression, decodes, format conversion, corrections applied to the data, and technical processing of associated real time, delayed mode and historical data), and
- (iii) data discovery metadata (i.e. information on datasets/product sets, e.g. data type, geographical coverage, variables, period, origin, etc.)

The metadata products will have numerical and visualized metadata statistic and analysis products, such as the distribution (site location, track, routes) and the operating conditions of

observation platforms, and the data distribution statistics. Development of metadata products, such as analysis of lifetime, performance and efficiency of observation instruments and comparison of data quality, will be conducted in the field of marine meteorology and oceanographic climate when CMOC China goes into the stable operation and holds substantial metadata at large.

Integrated data products will include the three levels of metadata described above.

CMOC China will offer the online service of data/metadata and metadata products interactively and the navigation service of associated data centers and cooperative programs.

(2) Undertaking the standardized processing and quality control of CMOCs data

Through the MCDS data flow, CMOC China will collect the real time, delayed mode and historical marine-meteorological and oceanographic climate data and associated metadata including marine meteorology, up-air meteorology, air-sea flux, ship measurements, CTD, BT, XBT, XCTD, ADCP, land-based radar, oceanographic stations, to the best of its abilities, and then conduct associated quality control to produce standardized datasets of high quality, including quality control procedures recommended by the WMO and IOC as part of the MCDS. It will also supplement, develop, and improve the associated software system and documents. Detail information is given in Table 2 “Worksheet of Data Processing and Quality Control”, and cooperate with other CMOCs and relevant JCOMM Expert Teams to develop and refine appropriate Quality Control standards for marine meteorological and oceanographic data.

(3) Developing marine meteorological and oceanographic climate data products and providing related services

CMOC China will develop statistical products to meet the various requirements for marine meteorological and ocean data. It will actively participate in the international cooperation projects/programs such as JCOMM/OCEANView in multi-source ocean data assimilation and ocean reanalysis technologies, so as to research and develop regional, global ocean reanalysis products and regional air-sea coupled reanalysis products. It will provide free access service to the end users of WMO and IOC through CMOCs mirrored network. Refer to Table 3 “CMOC China Statistic Products” and Table 4 “CMOC China Reanalysis Products” for details.

(4) Providing capacity building support and technical training for the region

To providing capacity building support and technical training for the region, CMOC China will first fulfill its commitments made in the above statement “the Advice to other Members/Member States (item b<sup>28</sup>)”. CMOC China will also contribute to funding MCDS related technical training courses to be held in China. For example, CMOC China may fund the participation of technicians from the developing countries for the training courses in China, or accept some of technicians from the developing countries to visit CMOC China for short term technical training on historical data rescue, data processing and quality control and so forth.

Meanwhile, CMOC China will send technicians to study abroad and invite foreign experts to conduct training in China so as to strengthen the technical exchange and training with other CMOCs. More specifically, to invite professionals in network mirroring technology, data processing and quality control, metadata technology, satellite remote sensing data processing,

data and information management, and product development to visit CMOC China for technical training, or send technicians from CMOC China to other CMOCs for further study.

The relationship between CMOC China data flow and MCDS data flow, and the general framework of the above tasks is illustrated in Figure 1.

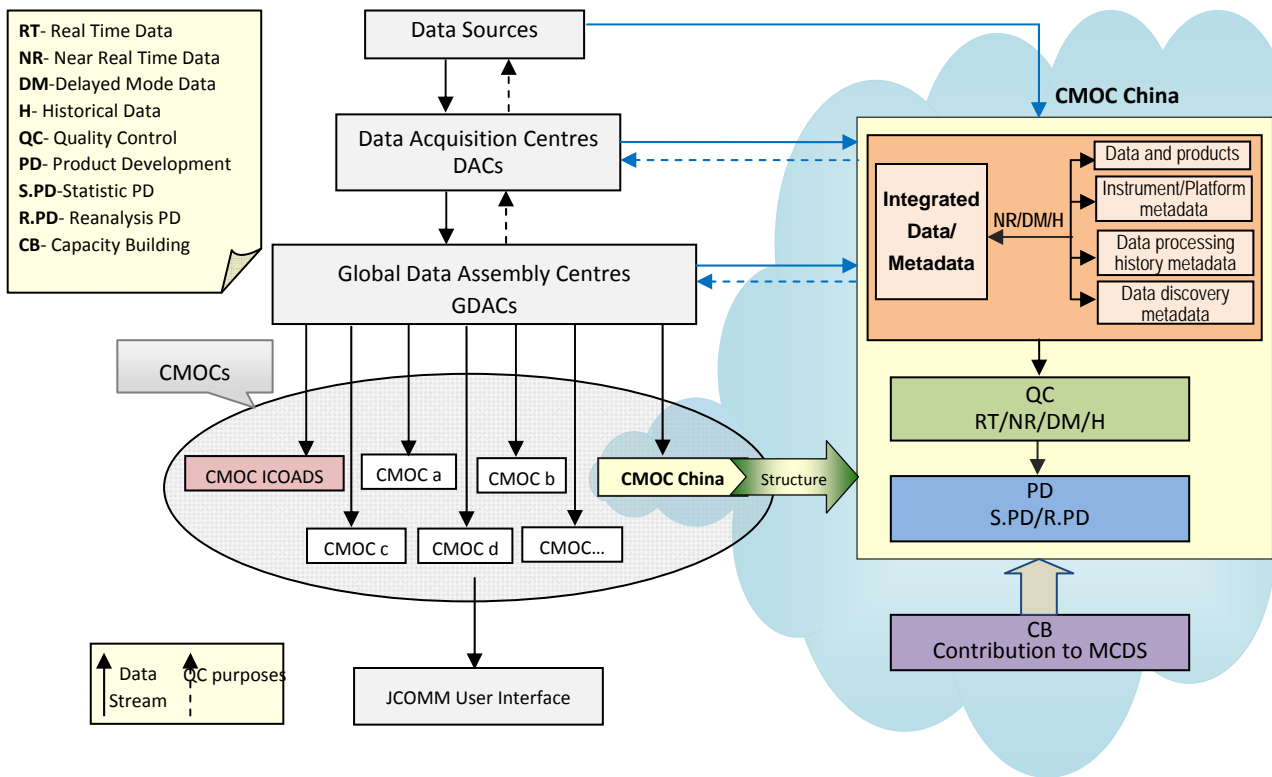


Figure 1. CMOC China Data Flow

NMDIS, the CMOC China host center, was an important component of the Scientific Data Sharing Project initiated by Ministry of Science and Technology of China during 2003 - 2009. It was responsible for the establishment of China Marine Scientific Data Sharing Center and its services. Since 1980s, NMDIS has been actively participating in the international oceanographic data exchange as an IODE national coordinator. In the late 1980s, NMDIS was designated as a World Data Center D for Oceanography (WDC-D, Oceanography). With the development of WDC into World Data System (WDS), NMDIS joined the WDS consequently. In 2002, NMDIS participated in international Argo project and has been hosting the China Argo Data Center since then. JCOMM/ODAS Metadata Service (ODASMS) was established by NMDIS in 2003 and has been operated by NMDIS since then. In October 2010, ODASMS was registered on IODE/ODP as an important data source in the West Pacific region. NMDIS started to process and release service of the GTSPP delayed mode data in 2007 as the China GTSPP Data Center. Moreover, NMDIS has been responsible for the development of the pilot project of IODE/ODINWESTPAC and associated services since 2007 and the construction of NEAR-GOOS delay mode database and associated service from 1996.

The experience and knowledge accumulated from the above international cooperation would

serve as the solid foundation of CMOC China. Meanwhile, we believe that the establishment and operation of CMOC China would in turn promote the future cooperation.

**Table 1. CMOE China hardware and software facilities**

No	Name of Facility	Model	Purpose	Specifications	Amount	Year of purchase	Remarks
1	Web Server	SUN T4-2	Web Services Application	2 SPARC Processors,16GB Memory, six 300 GB SAS disks, Four PCIe I/O slots, Three rack units	2	2012	Website Building
						2013	
2	Database Server	SUN M4000	Database System Application	2 SPARC64 VII Processors,32GB Memory, two 300 GB SAS disks, Four PCIe I/O slots, Six rack units	2	2012	Install Oracle Database
						2013	
3	Database Backup Server	SUN M4000	Database System Cluster	2 SPARC64 VII Processors,32GB Memory, two 300 GB SAS disks, Four PCIe I/O slots, Six rack units	2	2012	Establish Oracle Database RAC
						2013	
4	Cable Rent	China Unicom/China Telecom	Optical Fiber Line	Bandwidth 40M/s	1	2012	Exclusive Bandwidth, Access Speed Guarantee
5	Rack Cabinets	SUN 42Units Rack	IT Infrastructure	42U Capacity Compact PDUs with metering features	2	2013	For running all the servers and storages
6	Data Processing Server	IBM X3650M3	Data Processing	2 Intel Xeon Processors, 24GB Memory, six 300 GB SAS disks, Two PCIe I/O slots, Two rack units	2	2013	Processing Oceanography Data
7	Website Mirror Software	Site Mirror Software	Website Mirror Application	Mirror website and Site Copy	1	2013	Build the Mirror of Website
8	Database Software	Oracle 11g	Database Application	With Oracle Real Application Clusters	1	2013	For Oracle Database Application
9	Graphics workstation	DELL T7500	Graphics Processing	2 Intel Xeon X5675 / 6x2GECC / 2x600G SAS Disk/ Quadro 5000 / Rambo / Win7 64bit	4	2014	Processing Graphic Data and Image Data
10	Desktops	ThinkCentre 8300t	Daily Work	Intel Corei7 2600/Intel Q67 Chipset/4G DDRIII SDRAM /1T SATA hard drive/ DVD RW//NVIDIA G405 1G Graphics Card/	6/15	2014	We need 15 desktops for our staff's everyday work, and we already had 9 PCs, so we have purchase 6 more PCs
11	Website Publishing	Oracle WebLogic	Website Publishing	Build and Support Publishing Web Services	1	2014	Establish and release Professional Website

No .	Name of Facility	Model	Purpose	Specifications	Amount	Year of purchase	Remarks
	Software	Server	Application				
12	Disk Storage	SUN S6180-SATA	Data Storage	Dual FC RAID controller cards,8GB data cache, RAID 5,72 1TB SATA Drives(60T),Ten rack units	1	2014	Store large mounts of data files
13	Customized Software Development		Developing Software for specific uses	Data Processing Software, Products Publishing Software, Web Services Management	1	2014 2015	Data Processing, Quality Control, Data Management & Data Products Services
14	Operating Environment	100 m <sup>2</sup>	Hardware Placement	Machine Room Configuration	1	2014 2015	For Operating all the hardware and software



**Table 2. Worksheet of data processing and quality control**

No	Project/ Data type	Source and means of acquisition	Data processing	Quality control procedures	Products to be provided	Service	Target date for operational running
1	Argo	Argo real time data: Argos satellite. Argo near real time and delayed mode data: French Argo data center (ftp://ftp.ifremer.fr)	1. Data real time receive, sort and store by data type 2. Data processing, delete data those with significant error, upgrade the database list 3. Quality control and manpower visual check 4. Distribute Netcdf format data to French FTP site and ASCII format data to China Argo Data Center website	Deepest pressure test, platform identification test, impossible date and location test, position on land test, impossible speed test, global/regional range test, pressure increasing test, spike test, gradient test, digit rollover test, stuck value test, density inversion, salinity sensor drift, frozen profile test, visual QC, ect. Based on routine quality control, we will carry out comparison study of climate fields/results of assimilation models with observation data, and invite experts to examine and verify the results.	1. Standardized temperature and salinity datasets 2. Trajectory datasets 3. Global current maps derived from trajectory 4. Metadata sets	1. Online access 2. Data disc on request 3. Mirroring access	2012: Data download, decompression and transform to standard format, quality control, datasets and metadata sets production, online access and data disc service, mirroring
2	GTSP	Real time data: received from Canadian MEDS Delayed mode data: downloaded from US FTP (ftp://ftp.nodc. noaa.gov.)	1. Data real time receive, sort and store by data type 2. Data processing, delete data those with significant error, upgrade the database list 3. Quality control and manpower visual check 4. Eliminate duplicate casts 5. Produce standardized datasets	Impossible date and location test, position on land test, impossible speed test, global/regional range test, pressure increasing test, spike test, gradient test, digit rollover test, stuck value test, density inversion, visual QC, remove the exactly identical data, ect. Base on routine quality control, we will carry out comparison study of climate filed and the result of assimilation models with observation data, and invite experts to examine and verify the results.	1. Standardized temperature and salinity datasets 2. Metadata sets	1. Online access 2. Data disc on request 3. Mirroring access	2013: Data download, decompression and transform to standard format, quality control, datasets and metadata sets production, online access 2014: Remove duplicate casts
3	DBCP	Online access buoy data in webpage form	1. Data download and decode 2. Standardization	Illegal code check, range test, extreme value test, correlation test, spike test, position on land test,	1. Standardized datasets 2. Metadata sets	Realize the connection to DBCP/DAC,	2014: Data download, decompression and transform to standard

No	Project/ Data type	Source and means of acquisition	Data processing	Quality control procedures	Products to be provided	Service	Target date for operational running
		(www.ndbc.noaa.gov)	3. database archival and management 4. Quality control	gradient test, geographic location check, climatology value test, temperature-salinity relationship test, manpower visual inspection Base on routine quality control, we will carry out comparison study of climate filed and the result of assimilation models with observation data, and invite experts to examine and verify the results.		obtain data in both realtime and delayed mode, implement QCs, and release online.	format  2015: Quality control 2016: Module integration, test run, operational run
4	GLOSS	Online access: ftp://ilikai.soest.hawaii.edu	1. Data download and decode 2. Standardization 3. Quality control	Illegal code check, range test, extreme value test, correlation test, probability distribution test, and invite experts to examine and verify the results.	1. Standardized datasets 2. Metadata sets	Online access	2013: Data download, decompression and transform to standard format  2014: Quality control, module integration, test run, operational run
5	NEAR-G OOS	Access Korean and Japanese NEAR-GOOS data through internet (http://www.khoa.go.kr)(http://near.go.s1.jodc.go.jp)	1. Data download and decode 2. Standardization 3. Quality control	Illegal code check, range test, extreme value test, correlation test, probability distribution test Base on routine quality control, we will carry out comparison study of climate filed and the result of assimilation models with observation data, and invite experts to examine and verify the results.	1. Standardized datasets 2. Metadata sets	Online access	2012: Data download, decompression and transform to standard format, quality control, and operational run
6	WOD	FTP download: ftp://ftp.nodc.noaa.gov	1. Data download, sort and store by data type 2. Data processing, format transform 3. Quality control and	Temperature and salinity data QC Impossible date and location test, global/regional range test, pressure increasing test, spike test, gradient test, digit rollover test, stuck value	1. Standardized WOD temperature and salinity datasets 2. Metadata sets	1. FTP online access 2. Data disc on request	2013: Data download, decompression and transform to standard format

No	Project/ Data type	Source and means of acquisition	Data processing	Quality control procedures	Products to be provided	Service	Target date for operational running
			manpower visual check 4. Produce standardized datasets	test, density inversion, visual QC Biology data QC: format transform, extreme value check, correlation test, Latin spell check, code test, etc. Chemistry data QC: data format check, value range test, correlation test, statistical test Base on routine quality control, we will carry out comparison study of climate filed and the result of assimilation models with observation data, and invite experts to examine and verify the results.			2014: Quality control, remove duplicate casts, standard datasets production, and mirroring distribution
7	ICOADS Mirror download (metadata collection, Product R&D)	Online access: <a href="http://datamirror.csdb.cn/doc.htm?url=ds540.0">http://datamirror.csdb.cn/doc.htm?url=ds540.0</a>	1. Data download, classify and flag 2. Data pre-processing, format transform 3. Quality control and manpower visual check 4. Produce standardized datasets	Format check, illegal code check, stability test, location test, value range test, climatology value test, variation range test, internal consistency test, temporal consistency test, spatial consistency test Base on routine quality control, we will carry out comparison study between climate filed and the result of assimilation models (NGSST, SODA, NECP, etc.) with observation data, and invite experts to examine and verify the results.	1. Standardized datasets 2. Metadata sets	1. Online access 2. Data disc on request	2013: Data download, decompression and transform to standard format  2014: Quality control 2015: Module integration, test run, operational run
8	VOS	Online access: <a href="http://www1.ncdc.noaa.gov/pub/data/vosclim/2010/">http://www1.ncdc.noaa.gov/pub/data/vosclim/2010/</a>	1. Data download, classify and flag 2. Data pre-processing, format transform 3. Quality control and	Format check, location test, value range test, climatology boundary test, variation range test, internal consistency test, temporal consistency test, spatial consistency	1. Standardized VOS datasets 2. Metadata sets	1. Online access 2. Data disc on request	2013: Data download, decompression and transform to standard format

No	Project/ Data type	Source and means of acquisition	Data processing	Quality control procedures	Products to be provided	Service	Target date for operational running
			manpower visual check 4. Produce standardized datasets	test Base on routine quality control, we will carry out comparison study of climate filed and the result of assimilation models (e.g. NGSST, SODA, NECP, etc.) with observation data, and invite experts to examine and verify the results.			2014: Quality control 2015: Module integration, test run, operational run
9	SOOP	Online access: ftp://ftp.nodc.noaa. gov/pub/data.nodc/ gtspp/	1. Data download, classify and flag 2. Data pre-processing, format transform 3. Quality control and manpower visual check 4. Produce standardized datasets	Format check, location test, value range test, climatology boundary test, variation range test, internal consistency test, temporal consistency test, spatial consistency test Base on routine quality control, we will carry out comparison study of climate filed and the result of assimilation models (e.g. NGSST, SODA, NECP, etc.) with observation data, and invite experts to examine and verify the results.	1. Standardized SOOP datasets 2. Metadata sets	1. Online access 2. Data disc on request	2015: Data download, decompression and transform to standard format  2016: Quality control 2017: Module integration, test run, operational run
10	GTS	Receive data, develop and improve data processing and quality control	1. Data download and flag 2. Data pre-processing, format transform 3. Quality control and manpower visual check 4. Produce standardized datasets.	1. Ground meteorological data Match test, temporal consistency test, value range test, correlation test, spatial consistency test, statistical range test, visual test 2. Marine meteorological data Format check, location test, value range test, climatology boundary test, value range test, internal consistency test, temporal consistency test, spatial consistency test 3. Upper air meteorology data Standard Format check, empirical	1. Standardized GTS datasets 2. Metadata sets	1. Online access 2. Data disc on request	2014: Data download, decompression and transform to standard format  2015: Quality control 2016: Module integration, test run, operational run

No	Project/ Data type	Source and means of acquisition	Data processing	Quality control procedures	Products to be provided	Service	Target date for operational running
				value test, climatology value test, temporal consistency test, confidence test, standard floor correlation variable test, correlation of variable test on different standard floors, rationality test on characteristic floor, combination test			
11	WOCE	WOCE website: <a href="http://woce.nodc.noaa.gov/wdiu">http://woce.nodc.noaa.gov/wdiu</a>	1. Data download, sort and store by data type 2. Data pre-processing, format transform 3. Quality control and manpower visual check 4. Produce standardized datasets	1. Temperature and salinity data QC Impossible date and location test, position on land test, global/regional range test, pressure increasing test, spike test, gradient test, digit rollover test, stuck value test, density inversion, visual QC, 2. Current data QC Correlation test, illegal code test, reasonable value test, range test, ADCP current percent good check, spike test, gradient test Base on routine quality control, we will carry out comparison study of climate filed and the result of assimilation models with observation data, and invite experts to examine and verify the results.	1. Standardized temperature and salinity datasets 2. Standardized current datasets 3. Metadata sets	Online access (depends on the construction progress of CMOC China website)	2013: Data download, decompression and transform to standard format  2014: Quality control, standard datasets and metadata sets production, and mirroring distribution
12	TOGA	TOGA COARE data information system: <a href="http://www.ncdc.noaa.gov/oa/coare/index.html">http://www.ncdc.noaa.gov/oa/coare/index.html</a>	1. Data download, sort and store by data type 2. Data pre-processing, format transform 3. Quality control and manpower visual check 4. Produce standardized datasets	1. Temperature and salinity data QC Impossible date and location test, position on land test, global/regional range test, pressure increasing test, spike test, gradient test, digit rollover test, stuck value test, density inversion, visual QC, 2. Current data QC Match test, illegal code test,	1. Standardized temperature and salinity datasets 2. Standardized Current dataset 3. Metadata sets	Online access (depends on the construction progress of CMOC China website)	2013: Data download, decompression and transform to standard format  2014: Quality control, standard datasets and metadata sets production,

No	Project/ Data type	Source and means of acquisition	Data processing	Quality control procedures	Products to be provided	Service	Target date for operational running
				reasonable value test, range test, ADCP current percent good check, spike test, gradient test Base on routine quality control, we will carry out comparison study of climate filed and the result of assimilation models with observation data, and invite experts to examine and verify the results.			2015: Mirroring distribution
13	NGSST	Online access: <a href="ftp://www.ocean.caos.tohoku.ac.jp/pub/mergedsst_binary/">ftp://www.ocean.caos.tohoku.ac.jp/pub/mergedsst_binary/</a>	1. Routine Download 2. Produce standardized datasets and metadata sets	Compare the merged datasets with field observations, invite experts to examine and verify the results.	1. Standardized NGSST datasets 2. Metadata sets	1. Online access 2. Data disc on request	2015: Data download, and transform to standard format 2016: Metadata extraction and datasets production 2018: Operation run, and mirroring distribution

**Table 3. CMOC China Statistic Products**

No.	Data Product Name	Data Sources	DP Methods	Temporal Resolution	Spatial Resolution	Spatial Coverage	Product type	Update Frequency	Service	Operation Time
1	Average Sea Level Pressure	ICOADS, GTS, VOS, DBCP	Data Fusion, Mathematical Statistics, Objective analysis	Month	1 Degree	Global	Gridded data files	Monthly	Online access	2013
							Figures/maps			
2	Average Wind Speed	ICOADS, GTS, VOS, DBCP	Data Fusion, Mathematical Statistics, Objective analysis	Month	1 Degree	Global	Gridded data files	Monthly	Online access	2013
							Figures/maps			
3	Average Wave Height	ICOADS, GTS, VOS, DBCP	Data Fusion, Mathematical Statistics, Objective analysis	Month	1 Degree	Global	Gridded data files	Monthly	Online access	2013
							Figures/maps			
4	Average Wave Period	ICOADS, GTS, VOS, DBCP	Data Fusion, Mathematical Statistics, Objective analysis	Month	1 Degree	Global	Gridded data files	Monthly	Online access	2013
							Figures/maps			
5	Average Swell Height	ICOADS, GTS, VOS, DBCP	Data Fusion, Mathematical Statistics, Objective analysis	Month	1 Degree	Global	Gridded data files	Monthly	Online access	2013
							Figures/maps			
6	Average Swell Period	ICOADS, GTS, VOS, DBCP	Data Fusion, Mathematical Statistics, Objective analysis	Month	1 Degree	Global	Gridded data files	Monthly	Online access	2013
							Figures/maps			
7	Wind Rose	ICOADS, GTS, VOS, DBCP	Mathematical Statistics	Month	10 Degree	Global	Gridded data files	Monthly	Online access	2013
							Figures/maps			
8	Frequency of wind force scale $\geq 6$	ICOADS, GTS, VOS, DBCP	Mathematical Statistics	Month	1 Degree	Global	Gridded data files	Monthly	Online access	2013
							Figures/maps			
9	Frequency of wind force scale $\geq 8$	ICOADS, GTS, VOS, DBCP	Mathematical Statistics	Month	1 Degree	Global	Gridded data files	Monthly	Online access	2013
							Figures/maps			

No.	Data Product Name	Data Sources	DP Methods	Temporal Resolution	Spatial Resolution	Spatial Coverage	Product type	Update Frequency	Service	Operation Time
10	Wave Rose	ICOADS , GTS , VOS , DBCP	Mathematical Statistics	Month	10 Degree	Global	Gridded data files	Monthly	Online access	2013
							Figures/maps			
11	Swell Rose	ICOADS, GTS , VOS , DBCP	Mathematical Statistics	Month	10 Degree	Global	Gridded data files	Monthly	Online access	2013
							Figures/maps			
12	Average Sea Surface Air Temperature	ICOADS, GTS , VOS , DBCP	Data Fusion, Mathematical Statistics, Objective analysis	Month	1 Degree	Global	Gridded data files	Monthly	Online access	2013
							Figures/maps			
13	Average Relative Humidity	ICOADS, GTS , VOS , DBCP	Data Fusion, Mathematical Statistics, Objective analysis	Month	1 Degree	Global	Gridded data files	Monthly	Online access	2013
							Figures/maps			
14	Average Total Cloud Cover	ICOADS, GTS, VOS, DBCP	Data Fusion, Mathematical Statistics, Objective analysis	Month	1 Degree	Global	Gridded data files	Monthly	Online access	2013
							Figures/maps			
15	Frequency of Total Cloudiness $\leq 3/10$	ICOADS, GTS , VOS, DBCP	Data Fusion, Mathematical Statistics, Objective analysis	Season	1 Degree	Global	Gridded data files	Seasonal	Online access	2013
							Figures/maps			
16	Frequency of Total Cloudiness $\geq 9/10$	ICOADS, GTS, VOS , DBCP	Data Fusion, Mathematical Statistics, Objective analysis	Season	1 Degree	Global	Gridded data files	Seasonal	Online access	2013
							Figures/maps			
17	Frequency of Lower Cloudiness $\leq 3/10$	ICOAD, GTS, VOS, DBCP	Data Fusion, Mathematical Statistics, Objective analysis	Season	1 Degree	Global	Gridded data files	Seasonal	Online access	2013
							Figures/maps			
18	Frequency of Lower Cloudiness $\geq 9/10$	ICOADS, GTS, VOS, , DBCP	Data Fusion, Mathematical Statistics, Objective analysis	Season	1 Degree	Global	Gridded data files	Seasonal	Online access	2013
							Figures/maps			
19	Air-sea Heat	ICOADS, GTS,	Data Fusion,	Month	1 Degree	Global	Gridded data files	Monthly	Online	2013



No.	Data Product Name	Data Sources	DP Methods	Temporal Resolution	Spatial Resolution	Spatial Coverage	Product type	Update Frequency	Service	Operation Time
	Fluxes	VOS, , DBCP	Mathematical Statistics, Objective analysis				Figures/maps		access	
20	Average Sea Surface Temperature	ICOADS, Argo , GTSP, DBCP, WOD	Data Fusion, Mathematical Statistics, Objective analysis	Month	1 Degree	Global	Gridded data files	Monthly	Online access	2013
							Figures/maps			
21	Temperature at 10m, 20m, 50m, 100m, 200m, 300m, 500m depth	Argo, GTSP, DBCP, WOD	Data Fusion, Mathematical Statistics, Objective analysis	Month	2 Degree	Global	Gridded data files	Monthly	Online access	2013
							Figures/maps			
22	Salinity at 10m, 20m, 50m, 100m, 200m, 300m, 500m depth	Argo, GTSP, DBCP, WOD	Data Fusion, Mathematical Statistics, Objective analysis	Month	2 Degree	Global	Gridded data files	Monthly	Online access	2013
							Figures/maps			
23	Temperature section	GTSP, DBCP, WOD	Data Fusion, Mathematical Statistics, Objective analysis	Month			Gridded data files	Monthly	Online access	2013
							Figures/maps			
24	Salinity section	GTSP, DBCP, WOD	Data Fusion, Mathematical Statistics, Objective analysis	Month			Gridded data files	Monthly	Online access	2013
							Figures/maps			
25	Surface Current	Argo, GTSP, Drifting Buoy, DBCP, WOD	Data Fusion, Mathematical Statistics, Objective analysis	Month	2 Degree	Global	Gridded data files	Monthly	Online access	2013
							Figures/maps			

**Table 4. CMOC China Reanalysis Products**

No.	Product name	Observation data source and access channel	DP methods	Time resolution	Spatial resolution	Spatial and temporal coverage	Product type	Update frequency	Service	Operation time
1	Regional ocean reanalysis dataset (SSH, T, S, U, V)	Temperature and salinity profiles and Satellite remote sensing SST; SSHa from altimeter; obtained from multichannel, mainly CMOCs.	Based on POMgcs (Princeton Ocean Model with generalized coordinate system) and a sequential three-dimensional variational (3D-Var) analysis scheme, develop regional ocean reanalysis data.	Monthly	Horizontal resolution of 0.5° and 35 vertical levels	Spatial coverage: 99°E~150°E, 10°S~52°N; temporal coverage: Jan. 1986 –Dec. 2008	NetCDF files and figures	About yearly, according to the observational data update frequency	1. Online access 2. Data disc on request	2013
2	Global ocean reanalysis dataset (SSH, T, S, U, V)	Temperature and salinity profiles and Satellite remote sensing SST; SSHa from altimeter; obtained from multichannel, mainly CMOCs.	Based on MITgcm (MIT general circulation model) and a sequential 3D-Var analysis scheme, develop global ocean reanalysis datasets.	Monthly	Horizontal resolution of 0.5° and 35 vertical levels	Spatial coverage: 0°E~360°E, 74.25°S~84.75°N; temporal coverage: Jan. 1986 –Dec. 2008	NetCDF files and figures	About yearly, according to the observational data update frequency	1. Online access 2. Data disc on request	2015
3	Ocean-atmosphere coupling Reanalysis Data (SSH, T, S, U, V)	Ocean observation data: Sea temperature and salinity profiles, Satellite remote sensing SST, SSHa from altimeter; Meteorology observation data: air temperature, air pressure, humidity, wind; obtained from multichannel, mainly CMOCs.	1. Based on existing ocean and atmosphere models and their coupler, develop an ocean-atmosphere coupling model. 2. With the data assimilation technology of advanced variational method and ensemble filter, R&D the coupling assimilation technology. 3. Produce ocean-atmosphere coupling reanalysis data.	Monthly	Horizontal resolution of 0.5° and 35 vertical levels	Spatial coverage: 99°E~150°E, 10°S~52°N; temporal coverage: Jan. 1986 –Dec. 2008	NetCDF files and figures	About yearly, according to the observational data update frequency	1. Online access 2. Data disc on request	2020

## APPENDIX D

### LIST OF KEY MANAGEMENT AND TECHNICAL PERSONNEL

	NO.	Name	Title/Role	Education	Expertise	Department
<b>Head</b>						
Head	1	Xu Sheng	Director-General	Bachelor	Physical Oceanography	NMDIS
	2	Li Dongxu	Deputy Director-General	PHD	Marine Resource	NMDIS
	3	He Guangshun	Deputy Director-General	PHD	Environmental Science	NMDIS
	4	Shi Suixiang	Deputy Director-General	PHD	Computer Science and Technology	NMDIS
	5	Lin Shaohua	Honorable Director-General	Master	Information Management	NMDIS
<b>Administrative Team</b>						
Director and Chief	1	Xiang Wenxi	Chief/Professor	Bachelor	Physical Oceanography	Division of Science and Technology Planning and Management
	2	Cui Xiaojian	Deputy Chief	Bachelor	Marine Chemistry	Division of Science and Technology Planning and Management
	3	Wang Haibo	Deputy Chief	Bachelor	Marine Science	Division of Science and Technology Planning and Management
	4	Dong Jie	Chief	Bachelor	Archives	Administrative Office
	5	Wang Shifu	Deputy Chief	Bachelor	Archives	Administrative Office
<b>8 staff members with 3 Masters and 5 Bachelors.</b>						
<b>Data Processing, QC, and Metadata Team</b>						
Director and Chief	1	Yin Ruguang	Director/Professor	Master	Oceanography	Oceanographic Data Center
	2	Liu Zhenmin	Deputy Director/Professor	Bachelor	Environmental Engineering	Oceanographic Data Center
	3	Yang Jinkun	Deputy Director	Master	Physical Oceanography	Oceanographic Data Center
	4	Li Sihai	Director/Professor	PHD	Marine Science	Marine Remote Sensing and Basic Geographic Information Department
	5	Jiang Weinan	Deputy Director	Bachelor	Cartography	Marine Remote Sensing and Basic Geographic Information Department
	6	Cheng Yongshou	Deputy Director/Professor	Master	Computer Science and Application	Marine Remote Sensing and Basic Geographic Information Department
<b>44 staff members with 3 PHDs, 18 Masters, 16 Bachelors, etc.</b>						
<b>Product Development Team</b>						
Director and Chief	1	Jin Jiye	Director/Professor	Master	GIS	Key Laboratory of Digital Ocean
	2	Zhang Feng	Deputy Director/Associate Researcher	Master	Physiognomy and Geology	Key Laboratory of Digital Ocean
	3	Liu Kexiu	Director/Professor	PHD	Physical Oceanography	Marine Data and Information Products Development Department
	4	Mu Lin	Deputy Director/Professor	PHD	Physical Oceanography	Marine Data and Information Products Development Department
	5	Han Guijun	Director/Professor	PHD	Physical Oceanography	Key Laboratory of Marine Environment Information Technology
	6	Li Wei	Deputy Director/Associate Researcher	PHD	Physical Oceanography	Key Laboratory of Marine Environment Information Technology
<b>41 staff members with 11 PHDs, 18 Masters, 8 Bachelors, etc.</b>						
<b>IT Team (25)</b>						

	NO.	Name	Title/Role	Education	Expertise	Department
Director and Chief	1	Wei Hongyu	Director/Senior Engineer	Bachelor	Information Management	Network and System Development Department
	2	Li Zhanbin	Deputy Director/Senior Engineer	Master	Computer Science and Application	Network and System Development Department
	3	Xue Huifen	Professor	Bachelor	Environment Engineering	Marine Archives and Library
<b>25 staff members with 3 Masters, 16 Bachelors, etc.</b>						
<b>Capability Training Team</b>						
Director and Chief	1	Yang Ying	Director/Professor	Bachelor	Information Management	IOI WESTPAC Regional Center
	2	Fan Xiaoting	Deputy Director/Senior Researcher	Bachelor	Chinese Linguistics	IOI WESTPAC Regional Center
	3	Hu Enhe	Director/Senior Researcher	Bachelor	Marine Chemistry	Marine Management Department
	4	Lu Wenhai	Deputy Director/Senior Engineer	Master	GIS and Mapping	Marine Management Department
	5	Lin Ning	Director/Senior Researcher	Bachelor	Computer Science and Application	Marine Island Department
	6	Wang Xiaohui	Director/Senior Researcher	Bachelor	ST Information Management	Marine Economic Research Department
	7	Wang Zhankun	Deputy Director/Associate Researcher	Bachelor	Oceanography	Marine Economic Research Department
<b>39 staff members with 3 PHDs, 12 Masters, 23 Bachelors, etc.</b>						
<b>Total No.</b>	<b>162 staff members</b>					

APPENDIX E

Quality Management System Certificate of NMDIS/China

