WMO Observing Programmes and their Future Requirements

Isabelle Rüedi Observing Systems Division World Meteorological Organization

World Meteorological Organization

- WMO is a specialized agency of the United Nations
- The purpose of WMO is:

To promote and foster meteorology and hydrology and related geophysical sciences

and

to facilitate world-wide co-operation for the benefit of humankind

WMO OMM *in the areas of weather, climate and water*

Organizational Structure of WMO 188 Members





How WMO is structured 8 Scientific Comissions

Scientific Commissions (Basic)

- Commission for Basic Systems (CBS)
- Commission for Instruments and Methods of Observations (CIMO)
- Commission for Hydrology (CHy)
- Commission for Atmospheric Sciences (CAS)

Scientific Commissions (Applications)

- Commission for Aeronautical Meteorology (CAeM)
- Commission for Agricultural Meteorology (CAgM)
- Joint WMO/IOC technical Commission for Oceanography and Marine Meteorology (JCOMM)
- Commission for Climatology (CCI)

WMO's Programmes

- The work of WMO is organized into Programmes
- There are eight major scientific and technical Programmes
 - World Weather Watch Programme
 - World Climate Programme
 - Atmospheric Research and Environment Programme
 - Application of Meteorology Programme
 - Hydrology and Water Resources Programme
 - Education and Training Programme
 - WMO Space Programme
 - Disaster Risk Reduction Programme
- There are two administrative Programmes
 - Technical Cooperation Programme
 - Regional Programme

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WMO Global Observing System



WMO OMM





WMO OMM



WMO OMM

AMDAR Observations



Courtesy from NOAA

Space-based Component of WMO's Global Observing System (GOS)



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Initial Global Ocean Observing System for Climate

Status against the GCOS Implementation Plan and JCOMM targets

continuous satellite measure-Surface measurements from ments of sea surface tempera-87% volunteer ships (VOSclim) ture, height, winds, and colour 200 ships in pilot project 100% Global **drifting surface buoy** array 5° resolution array: 1250 floats Tide gauge network (GCOS 59% subset of GLOSS core network) 170 real-time reporting gauges **XBT** sub-surface temperature 81% section network 51 lines occupied 100% Profiling float network (Argo) 3° resolution array: 3000 floats 73%. Global tropical moored Repeat hydrography and Reference Global reference 62% 34% mooring network 48% buoy network carbon inventory time series

Total *in situ* networks **61%** February 2009

29 moorings planned



119 moorings planned



58 sites







Full ocean survey in 10 years

VOS observations (January 2009)



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ASAP profiles (January 2009)



ASAP Aerological Profiles

• TEMP SHIP (484)



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WI OMM

Global Atmosphere Watch (GAW)

- Systematic monitoring of atmospheric chemical and physical parameters globally
- Focus on global long-term measurements for GHGs, ozone, UV, aerosols, selected reactive gases, and precipitation chemistry
- Analysis and assessment
- Development of predictive capability_

GAW GLOBAL TOTAL COLUMN OZONE NETWORK: 2001-2004

Stations Submitting Data



The symbols represent different instrument types.

Compliments of WOUDC, MSC, Toronto {Ed Hare Manager}.

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Global Climate Observing System (GCOS) - Goal and Structure

- The **Goal** of GCOS is to provide continuous, reliable, comprehensive data and information on the state of the global climate system
- GCOS consists of the climate-relevant components of existing atmospheric, oceanic and terrestrial observing systems and their enhancement to meet the totality of national and international user needs for climate observations
- GCOS is sponsored by WMO, UNEP, IOC and ICSU





WMO Secretariat

The upper-air (radiosonde) observing network of the WMO Global Observing System (GOS) (Status April 2008)

GCOS Upper-Air Network of Radiosondes



Status January 2009 – a subset of the WMO GOS

Rolling Review of Requirements

- Established by ET-ODRRGOS
- Approved by CBS (1996 ?)
- Integral part of the Guide on the GOS (Part II)
- The RRR process includes :
 - Database of user requirements per application area
 - Database of observing capabilities (space + surface)
 - Critical Review of how well requirements are satisfied by current/ planned capabilities for each application area
 - "Statements of guidance" for each application area
 - Vision of the GOS
 - Implementation Plan

The GOS evolution process



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CIMO Mission

To promote and facilitate international standardisation and compatibility of meteorological observing systems used by **Members within the WMO Global Observing System to improve** quality of products and services of Members.

CIMO Main Focuses

- Standardization of and guidance on instruments and methods of observation
- Instrument intercomparisons
- Traceability and calibration
- Support new instrument development
 - Capacity building



CIMO Structure

- CIMO Management Group
- OPAG on Surface Observation Technology
 - ET on surface technology and measurement techniques
 - ET on surface-based instrument intercomparisons and calibration methods
 - ET on meteorological radiation and atmospheric composition
- **OPAG on Upper-air Observation Technology**
 - **ET on upgrading upper-air networks**
 - **ET on upper-air system intercomparisons**
 - **ET on remote-sensing upper-air technology and techniques**
- OPAG on Capacity building
 - ET on RICs, quality management systems and commercial instrument initiatives
 - Rapporteurs on training activities and training material
 - Rapporteur on the CIMO Guide
 - Rapporteur on regional implementation activities
 - Rapporteur on climate observations

WMO OMM

Aim of CIMO Intercomparisons

- To improve the **quality** and **costeffectiveness** of surface based and upper air observing systems by exploiting existing national tests and performing global intercomparisons;
- To provide recommendations on system performance, improvements of instruments and methods of observation, suitable working references to WMO Members and instrument manufacturers.

CIMO Plans of Intercomparisons

- Intercomparison of Radiosonde systems in Yangjiang, China, 2010
 - Test relative performance of high quality radiosonde operational systems and best quality research sounding systems
 - Advise on systems suitable for RBSN/RBCN and GUAN network
 - Advise GCOS on system suitable as Reference Upper-Air Network (GRUAN)
 - Evaluation of added-value of remote-sensing equipment use in RS-intercomparisons
- Preparatory meeting to take place in late summer
- Evaluation of AMDAR water vapour sensor
- Radar algorithms
- 03/250 estbeds

WIGOS: WMO Integrated Global Observing System

Major new WMO initiative

- Decision of WMO Congress-XV (2007)
- New plan for WMO observing systems



Purpose of WIGOS

- To create an organizational, programmatic, procedural and governance structure that will:
 - improve significantly the availability of observational data and products
 - provide a single focus for the operational and management functions of all WMO observing systems
 - provide a mechanism for interactions with WMO co-sponsored observing systems.
- Integration will lead to efficiencies and cost savings that can be reinvested to overcome known deficiencies and gaps in the present structure and working arrangements.

WIGOS characteristics

WIGOS will:

- Respond to evolving observing requirements in a coordinated manner
- Guarantee system interoperability
- Be built on existing observing systems and ensure interoperability with new ones
- Address the metadata issue

WIGOS benefits

- Improved availability, quality and consistency of observations and product services
- Improved efficiency and timeliness of observations across all domains
- Optimisation of observing network design
- Flexibility to incorporate new observing systems
- More efficient use of resources

WIGOS Components

- Weather observing networks (e.g. WWW/GOS, AMDAR, ASAP etc);
- Atmospheric composition observing networks (e.g. GAW);
- Radiation observing networks (e.g. BSRN);
- Marine meteorological networks and arrays (e.g. VOS, drifting and moored buoy arrays etc.);
- Hydrological observing networks (e.g. observing components of WHYCOS etc.); and
- Climate components of various atmospheric, oceanographic and terrestrial observing systems contributing to GCOS;

Other possible components yet to be defined.

NMC

WIGOS - premise

The concept of WIGOS is based on the premise that agreed-upon

 standards,
 recommended practices and
 procedures
 will apply to all WIGOS components.



WIGOS technical integration level

- Documenting and validation of requirements for operational weather, climate, water and related environmental observations (RRR process);
 - Developing conceptual design of system of systems consisting of the detailed specification of all relevant processes, procedures, relationships;
 - Determining standards, procedures, practices, and protocols;
- Step-by-step implementation of sets of standardization, interoperability and data compatibility arrangements into operational observing networks and systems; and
- Systematic and rigorous performance monitoring and evaluation (PM&E) of WIGOS capabilities.

WIGOS integration

- Three areas of standardization were identified:
 - measurements and observations area (homogeneity, interoperability, compatibility of all observations)
 - WIS information infrastructure (standardized set of WIS data representation and exchange requirements for all WMO Programmes & DAR services)
 - -end-product quality management (QMS).

CIMO/WMO interest in collaboration with COST

- Develop improved guidance on instruments, methods of observations and observing systems for use in GOS and WIGOS
 - Liaison with CIMO expert teams
 Possibility to support external experts
 - Collocate relevant CIMO ET meetings with COST meetings
- Support in spreading results & recommendations beyond Europe possibly as:
 - WMO Publications
 - ISO/WMO common standard

WMO ОММ

Thank you

