

World Meteorological Organization

XV-RA IV/Doc. 4.4

**REGIONAL ASSOCIATION IV
(NORTH AMERICA, CENTRAL
AMERICA AND THE CARIBBEAN)**

Submitted by: Secretary-General

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Agenda Item: 4.4

Expected Result: 4

INTEGRATION OF WMO OBSERVING SYSTEMS

Strategic Thrust 1: Science and Technology Development and Implementation

SUMMARY

ISSUE TO BE DISCUSSED:

Development and implementation of the WMO Integrated Global Observing Systems (WIGOS) in the Region IV

ADDITIONAL FINANCIAL IMPLICATION:

None

DECISIONS/ACTIONS REQUIRED:

As described in the individual paragraphs in Appendix A.

REFERENCES:

1. *Abridged Final Report with Resolutions of the Fifteenth World Meteorological Congress* (WMO-No. 1026)
2. *Abridged Final Report with Resolutions of the Sixtieth Session of the Executive Council* (WMO-No. 1032)
3. *Abridged Final Report with Resolutions of the Fourteenth Session of Regional Association IV (North America, Central America and the Caribbean)* (WMO-No. 987)
4. Final report of the first session of the EC Working Group on the WMO Integrated Global Observing Systems (WIGOS) and the WMO Information System (WIS), Geneva, 4-7 December 2007
5. Final report of the eighth session of the WMO Consultative Meetings on High-Level Policy on Satellite Matters, New Orleans, USA, 15-16 January 2008
6. Ad-hoc session of the Working Group on Planning and Implementation of the WWW in Region IV (Working documents), Curacao, Netherlands Antilles, 26 March 2006
7. XIV-RA IV/INF. 7 – Consolidated Reports on Activities of RA IV Subsidiary Bodies

CONTENT OF DOCUMENT:**Appendices for inclusion in the final report:**

- A. Draft text for inclusion in the general summary of XV-RA IV
- B. Draft Resolution 4.4/1 (XV-RA IV) - Regional Basic Synoptic Network in Region IV
- C. Draft Resolution 4.4/2 (XV-RA IV) – Regional Basic Climatological Network in Region IV
- D. Draft Resolution 4.4/3 (XV-RA IV) – Amendments to the *Manual on the Global Observing System* (WMO-No. 544), Volume II – Regional Aspects – Region IV (North America, Central America and The Caribbean)

Appendix for information:

XIV-RA IV/Rep. 4.4: Progress/Activity Report

DRAFT TEXT FOR INCLUSION IN THE GENERAL SUMMARY OF XV-RA IV

4.4 INTEGRATION OF WMO OBSERVING SYSTEMS (*agenda item 4.4*)

4.4.1 The Association recalled Resolution 30 (Cg-XV) - Towards Enhanced Integration between WMO Observing Systems, by which Congress had decided to initiate WMO Integrated Global Observing Systems (WIGOS). The Association reiterated that enhanced integration between the WMO observation systems was being pursued as a strategic objective of WMO and one of the 11 major Expected Results for the fifteenth financial period (2008-2011) as reflected in the WMO Strategic Plan and the Result-based Budget. The Association discussed and agreed with actions initiated towards integration of observing systems supporting overall Members' activities in weather, climate and water.

Weather

Surface-based observations

Regional Basic Synoptic Network (RBSN)

4.4.2 The Association noted that owing to Members' efforts, the RBSN has demonstrated sustainable performance. It appreciated the work done by the Working Group on Planning and Implementation of the WWW in Region IV (RA IV-WG-PIW), through the Rapporteur on Regional Aspects of the Global Observing System, to identify and address deficiencies in the observing programmes. It also appreciated the work done by the Regional Lead Centre on Data Quality Monitoring to improve monitoring procedures and for the presentation and distribution of monitoring results on the availability and quality of surface-based observational data.

4.4.3 The Association confirmed the principles to be applied for the inclusion of stations in the RBSN and agreed to the revisions of the RBSN as compiled by the WMO Secretariat in coordination with the Rapporteur on Regional Aspects of the GOS and circulated among RA IV Members prior to this session. By adopting Resolution 4.4/1 (XV-RA IV), the Association approved the new list of RBSN stations in Region IV as given in the Annex to this resolution [*ref. XV-RA IV/INF. 5.1*].

Regional Basic Climatological Network (RBCN)

4.4.4 The Association noted with satisfaction that the RBCN in the Region continued to assure effective and consistent monitoring of the availability of climatological data. This progress is in part due to the GCOS Technical Support Projects, the CBS Lead Centres for GCOS Data, the WWW and GCOS Network Monitoring activities, and the GCOS system improvement programme. It stressed that in order to increase the availability of CLIMAT messages, further efforts by Members should be made to ensure that their operational observing stations compile and transmit the climate-related messages according to existing WMO regulations.

4.4.5 The Association noted that the proposed list of RBCN stations was compiled by the WMO Secretariat in coordination with the Rapporteur on Regional Aspects of the GOS and circulated among RA IV Members prior to this session. By adopting Resolution 4.4/2 (XV-RA IV), the Association approved the list of RBCN stations in Region IV as specified in the Annex to this resolution [*ref. XV-RA IV/INF. 5.2*].

Designation of National Focal Points

4.4.6 The Association noted that problems existed in the mechanism of updating the designated National Focal Points (NFP) on both the RBSN/RBCN (GSN and GUAN) and Weather Reporting Publication, No. 9, Volume A (Observing Stations). It recalled the concept of establishing the lists of NFP for the relevant observational programmes in the Region and urged Members to ensure an update of their designated NFP in a timely and regular manner. The Association also requested Members, through their NFP, to make sure that Volume A correctly describes respective national observing stations.

Aircraft Observations

4.4.7 The Association noted the increasing role of AMDAR data in the Region, with currently two operational AMDAR programmes in Canada and the USA. It also noted interest from areas in the Caribbean, Central America, including Mexico towards implementing their own AMDAR programmes. The Association encouraged Members to enter into negotiations with the domestic airline companies to further extend AMDAR coverage in the Region.

4.4.8 The Association welcomed that the eleventh AMDAR Panel meeting discussed further promotion of AMDAR in the Region including the development of a set of guidelines to assist NMHSs in developing their national AMDAR programmes. It supported proposal that the national AMDAR operational programmes should consider additional coverage of AMDAR data outside the national territory to be provided to the GTS as a contribution to WWW Programme. The Association requested Members to support the development and implementation of a standard suite of AMDAR software and hardware solutions that could be made available to all NMHSs.

Marine and Oceanographic Observations

4.4.9 The Association recalled and endorsed the following recommendations from the sixtieth session of the Executive Council:

- (a) Urging Members to commit resources for the implementation of the JCOMM's Observations Programme Area (OPA) strategic work plan for Building a Sustained Global Ocean Observing System;
- (b) The development, in cooperation with IOC, of an ocean Observing Programme Support Centre (OPSC) and the request to Members to commit resources through voluntary contributions to support the implementation and operations of the Centre;
- (c) Members to consider providing assistance with regard to the development of the JCOMM Catalogue on Best Practices and Standards;
- (d) JCOMM to promote cooperation between the DBCP and the International Tsunami Partnership (ITP) in support of the IOC Intergovernmental Coordination Group for the Pacific Tsunami Warning and Mitigation System (ICG/PTWS), and the IOC Intergovernmental Coordination Group for the Indian Ocean Tsunami Warning and Mitigation System (ICG/IOTWS);
- (e) Urging Members to establish a system of national ocean centres or services dedicated to implementation and maintenance of ocean observing systems and to improve cooperative support and coordination through the JCOMM.

4.4.10 The Association recalled that the concerns of ship owners and masters regarding availability of VOS ship position and identification data on public websites - mainly for ship security reasons for VOS recruited by Members of the Association - had been addressed quite effectively

through Resolution 27 (EC-LIX) as complying masking schemes have been implemented. However, the Association noted the concerns expressed by marine climate users, through JCOMM, regarding some limitations concerning access in delayed mode of unmasked VOS reports that may impact the quality of marine climatology products made available to end users. The Association urged its Members to work out a solution in cooperation with the maritime authorities in order for the unmasked VOS data to be eventually released after a period of time to be agreed upon.

4.4.11 The Association recommended that its Members work closely with the DBCP, the Global Drifter Programme, and Argo for providing deployment opportunities for drifting buoys and profiling floats in data sparse areas. The Association urged its Members to install barometers on all drifters they are planning to deploy in the North-West Atlantic, and North-East Pacific Ocean.

Space-based observations

4.4.12 The Association appreciated that nine geostationary satellites and seven low-Earth orbit satellites provided essential operational continuity of space-based observations, while nineteen R&D satellites also contributed to the GOS. It expressed in particular its appreciation to the USA for ensuring operational coverage of the Region with its GOES-East, GOES-West and NOAA/POES satellites, its contribution to the METOP mission and to the ocean surface topography Jason-2 mission, in cooperation among USA and European partners, and for the NASA R&D missions, including TRMM, Quikscat, Aqua and Terra which were of great support for operational activities.

4.4.13 The Association welcomed the new Vision for the GOS, submitted to CBS-XIV, fostering new satellite missions in response to global needs. It noted that the Executive Council had encouraged the proposed operation of hyperspectral infrared sounders, from low-Earth and geostationary orbits, and underscored the benefit expected from an operational constellation of radio-occultation sounders. It stressed the need to ensure continuity of altimetry and of surface wind measurements over the oceans, notably in support of tropical cyclone prediction, and encouraged the plans for a constellation of sensors for global precipitation measurements.

4.4.14 With respect to the biennial enquiry on availability and use of satellite data and products in WMO Members, the Association, along with a significant increase in the access and the use of satellite data in 2006-2007, noted a low response rate from RA IV Members. The Association reaffirmed the importance of space activities to meet evolving regional needs. Actions related to user information and training, data accessibility, product availability, and the analysis of user feedback were considered of particular relevance for the regional level. The Association agreed to nominate a Rapporteur on the Space Programme to facilitate activities in this area in collaboration with the Centres of Excellence located in Barbados and Costa Rica.

Implementation Plan for the Evolution of Surface- and Space-Based Sub Systems of the Global Observing System (EGOS-IP)

4.4.15 The Association recognized the importance of the Implementation Plan for the Evolution of Surface- and Space-Based Sub Systems of the Global Observing System (EGOS-IP) for the evolution of the GOS in the Region and requested Members to nominate National Focal Points for reporting progress and plans related to EGOS-IP and to report annually to WMO on the status of and plans for evolution of national components of the Surface- and Space-Based Sub Systems of the GOS. The information compiled in these reports would be also used to assess the effectiveness of the GOS within the Region.

GOS-related regulatory material (regional aspects)

4.4.16 The Association noted the activities undertaken on updating the regional entry to the *Manual on the Global Observing System* (WMO-No. 544), Volume II – Regional Aspects, Region IV (North America, Central America and The Caribbean), in response to evolving requirements and adopted Resolution 4.4/3 (XV-RA IV).

Climate

Atmosphere

GCOS Technical Support Project in the Caribbean and Central America

4.4.17 The Association noted with appreciation the activities undertaken in the GCOS Technical Support Project in the Caribbean and Central America between 2004 and 2006, which led to a significant increase in GSN and GUAN network performance in the region through station renovation, capacity building of station operators, and improved data management and dissemination. It specifically welcomed the support by the US to these activities, which also helped improve the performance of the RBCN, and encourages their continued support.

GCOS Reference Upper-Air Network (GRUAN) GRUAN

4.4.18 The Association noted that the GCOS Reference Upper-Air Network (GRUAN) has been designed to provide high-quality observing sites for the atmospheric profile, including surface and upper-air measurements, in support of climate applications, validation of satellite products and climate research. The “Report of the GRUAN Implementation Meeting” Germany, February 2008 (GCOS-121) provides the basis for a list of 13 initial GRUAN candidate sites, including four sites located in the US and three sites in RA V, but funded through US programmes. All candidate sites have been recommended because of their significant expertise in observing the atmospheric column, their ability to share expertise and resources with other site operators, and their great potential to contribute to the development of a wider GRUAN. The Association, therefore, encouraged the US to support the inclusion of those sites in GRUAN and to provide adequate resources for its operation.

WOAP

4.4.19 The Association welcomed deliberations of the third meeting of the WCRP Observations and Assimilation Panel (Boulder, USA, 29 September–October 2008) and supported the upgrade of International Satellite Cloud Climatology Project (ISCCP) to climate data record quality and the transfer of this system from research to operations, with a continuing scientific oversight and evaluation of the ISCCP products.

CEOP

4.4.20 The Association noted the formation in 2007 of the new WCRP GEWEX Coordinated Energy and water cycle Observations Project (CEOP) with its Regional Hydroclimate Projects (RHPs). It welcomed the formation of the US NOAA Climate Prediction Program for the Americas (CPPA), which combined the former GEWEX/GAPP and CLIVAR Pan American Climate Studies (PACS) and serves as a regional CEOP RHP. The Association was pleased to acknowledge that CEOP data policy allows sharing of in situ reference site data, model output data and satellite data and that CEOP data was open to outside groups. It thanked the Earth Observing Laboratory (EOL) of the National Center for Atmospheric Research (NCAR, USA) for archiving of data from the CEOP the reference stations and expressed a hope for continuing support of this process.

Terrestrial

4.4.21 The Association agreed with the WMO/FAO framework to develop standards for terrestrial climate-related observations including the involvement of the GCOS/GTOS TOPC as a technical expert panel.

Cryosphere

4.4.22 The Association noted with appreciation the report of the IGOS Theme on Cryosphere approved by the IGOS Partnership in 2007. It agreed that the report created a framework for coordinated cryospheric observations by WMO Members, satellite agencies and research community and requested its Members to study and implement the recommendations of the Report where appropriate. It underlined the decision of Fifteenth Congress to evaluate the feasibility of a WMO Global Cryosphere Watch (GCW) as a legacy of the IPY. The Association acknowledged the establishment of the ad hoc group to study the feasibility of a WMO GCW and invited Members to contribute to its activities so that it could submit a scoping document on the development and implementation of a GCW within WMO to EC-LXI in June 2009.

Observing Systems under Global Atmosphere Watch (GAW) addressing Climate

4.4.23 In 2007, the GAW-coordinated global total ozone and balloon sonde networks were accepted as GCOS baseline networks. In order to continue to meet the UNFCCC requirements, the Association encouraged Members to support the IGACO-Ozone-UV implementation plan. It also agreed that a GAW initiative to coordinate global aerosol observations was important for climate, air quality and weather prediction and encouraged Members to enhance aerosol measurements in the Region. The Association recognizes the growing value of the WMO Greenhouse Gas Bulletins, which are prepared and distributed with the assistance of the NOAA Earth System Research Laboratory (ESRL) and are based on the data submitted to the GAW World Data Centre on Greenhouse Gases (WDCGG) in Japan. The Association expressed its appreciation for the continuation of these measurements.

4.4.24 The Association noted that Volatile Organic Compounds (VOCs) are an important component of the IGACO strategy to study chemistry-climate interactions and tropospheric air quality through GAW. The Association encouraged Members to enhance the VOCs network and to consider adding these measurements to their programmes in a few strategic locations in the Region and to submit the data in a timely manner to the WDCGG. The Association welcomed the new GAW Station Information System (GAW SIS) Website (at: <http://gaw.empa.ch/gawsis/default.asp>) with links to the WMO GAW World Data Centres (WDCs). It reminded Members that this useful tool is only as up to date as the information supplied by the station managers and urged for regular notification of changes.

Crosscutting aspects

Climate monitoring from space

4.4.25 The Association noted with appreciation that the new vision for the space-based GOS would address climate observation needs with the high-level goal that there should be no gap in the satellite-based climate records. It encouraged space agencies to pursue their close cooperation with WMO, CEOS and CGMS who had responded very positively to the climate monitoring requirements for sustained, comprehensive satellite-based datasets and products formulated by GCOS.

4.4.26 The Association stressed the importance of ensuring data exchange and inter-calibration of satellite sensors to ensure global consistency of space-based datasets for climate

applications and welcomed the progress of the Global Space-based Intercalibration System (GSICS).

GCOS Implementation Progress Report 2009

4.4.27 The Association noted the progress in implementing the global observing system for climate based on the actions identified in the 2004 GCOS Implementation Plan. It also noted that this progress report will be submitted to the UNFCCC in June 2009 and discussed by all Parties of the Convention. National reports on GCOS activities had been requested by the UNFCCC for Annex I countries for delivery by 15 September 2008 as an important source of information for the preparation of 2009 progress report, and by 1 December 2008, a total of 23 reports had been received. The Association urged all Members of RA IV to submit a report to the UNFCCC at their earliest convenience, even though the report is not mandatory for non-Annex I countries.

4.4.28 Noting that the establishment of national GCOS coordinators and committees would greatly facilitate implementing the actions identified in the Implementation Plan and also national reporting on GCOS activities, the Association strongly encouraged its Members to establish such mechanisms if they had not yet done so.

Instrument Standards and Best Practices

Continuous evaluation of Regional Instrument Centres (RICs) and Regional Radiation Centres (RRCs) to verify their capabilities and performance

4.4.29 The Association noted that the Executive Council had adopted revised Terms of Reference (ToRs) for Regional Instrument Centres (RICs) and Regional Radiation Centres (RRCs) and that the WMO Congress and Executive Council had requested regional associations to further strengthen RICs/RRCs and to initiate the process of continuous evaluation of RICs and RRCs under their responsibility to verify their capabilities and performance. The Association requested its Members who operate RICs to declare their level of capability under the new ToRs and those who operate RICs and RRCs to carry out periodic evaluations, in liaison with CIMO, and to report their outcomes to the next session of the Association. The Association also requested its RICs and RRCs to organize capacity building activities in view of sharing their knowledge, in particular on the procedures to be used for the calibration of meteorological and environmental instruments, with other Members.

Instrument Intercomparisons

4.4.30 The Association highlighted the importance of carrying out instrument intercomparisons as they are extremely informative in providing comparable information on the performance of different instrument types, in improving the calibration of instruments and in fostering the development of better instruments. The Association therefore encouraged its Members to do their utmost in supporting, organizing and participating in future instrument intercomparisons.

Test-Bed Instrument Facility

4.4.31 The Association encouraged its Members to participate in the workshops organized in conjunction with the COST Action ES0702 EG-CLIMET "European Ground-Based Observations of Essential Variables for Climate and Operational Meteorology" that addresses integration of ground-based remote sensing and in-situ observations for future upper-air observing networks.

Atmospheric Chemical Composition and UV Measurements

4.4.32 The Association agreed that GAW significantly contributes to quality control/assurance and calibration of atmospheric chemistry observations globally. The Association recognized the vital support given by the United States and Canada to GAW by hosting several GAW World Central Facilities and supporting intercomparisons and calibration activities of instruments. The Association noted with concern that the funding for the UV calibration laboratory at NOAA in Boulder was threatened. Recalling that both WMO Congress and Executive Council sessions have recognized the lack of appropriate facilities for this activity globally, the Association stressed that it is essential that the existing two high quality regional UV calibration centres (recently a new facility is being hosted by Switzerland for Europe) continue their activities. It noted the discontinuation of the activities of the World Data Centre for Precipitation Chemistry (WDCPC) due to financial difficulties and urged for a solution to be found as soon as possible. The Association encourages the ongoing work on the global assessment of precipitation chemistry that combines observations and model simulations. It noted the importance of precipitation chemistry networks in the RA IV (CAPMoN and NADP). It also recognized the lack of facilities for a halocarbon Central Calibration Laboratory (CCL) in WMO GAW and encouraged Members to offer hosting this CCL with a long term commitment.

4.4.33 The Association encourages the development of GAW in other parts of the Region, noting the active interest by for example Cuba in pursuing an atmospheric chemistry measurement programme. It also supports combining efforts with other networks for more efficient monitoring of the atmosphere.

4.4.34 The Association was informed on the activities of the GESAMP Working Group 38 in assessing the atmospheric input of chemicals to the ocean. It expressed concern on a strong lack of coastal and open ocean measurements (wet, dry, atmospheric, and ocean water concentrations) needed to improve knowledge on the input and impact of chemicals into the oceans and therefore encouraged Members to continue measurements of precipitation chemistry.

Future development of GEOSS

4.4.35 The Association was informed on the Executive Council decisions related to the Global Earth Observation System of Systems (GEOSS) and its ten-year Implementation Plan. It advised Members to provide full support for the GEO process and resulting GEOSS within WMO's mandate and to make available all essential data as defined in WMO Resolution 40 (Cg-XII) through the GEO interoperable arrangements to serve the needs of the global community.

Implementation of the WIGOS concept

WIGOS Development and Implementation Plan

4.4.36 In the light of the decision of EC-LX, the Association reiterated that Members and appropriate regional bodies be involved in the implementation of the WIGOS Development and Implementation Plan (WDIP) (available at http://www.wmo.int/pages/prog/www/wigos/index_en.html) and urged Members to collaborate actively in its implementation. It confirmed the decision of the EC that WDIP be regularly reviewed and updated based on inputs from the technical commissions, regional associations and the advisory/steering bodies of WMO co-sponsored programmes contributing to WIGOS. In this regard, the Association requested its president to submit proposals for reviews and updates of WDIP reflecting regional aspects of implementation and further development of the WIGOS concept on an annual basis. The Association requested its working bodies to include tasks contributing to the appropriate sections and activities of the WDIP relevant to the Region into their work programmes.

WIGOS Concept of Operations

4.4.37 The Association noted with appreciation the development of the WIGOS Concept of Operations (CONOPS) elaborated by the EC Working Group on WIGOS and WIS that described the end state for a fully-operational WIGOS; it contained goals, objectives, major characteristics, operational framework, data policy and benefits of WIGOS (available at http://www.wmo.int/pages/prog/www/wigos/index_en.html) [ref. XV-RA IV/INF. 6]. Like WDIP, also CONOPS will be regularly reviewed and updated based on the experiences received from the test-of-concept period (2007-2011).

4.4.38 The Association agreed that implementation of the WIGOS concept should offer unprecedented opportunity to include all WMO and WMO-sponsored networks and subsystems in the integration process thus allowing WMO to more effectively respond to new challenges and evolving user requirements. The Association also agreed that integration should ensure the continued partnership and participation of the bodies responsible for these observing systems as they become part of an integrated system of systems with sustained sense of ownership.

WIGOS Pilot Projects

4.4.39 The Association reiterated that undertaking at the earliest possible stage several WIGOS Pilot Projects (PP) would be useful to address major issues in the integration process and would help in elaborating the WDIP. It welcomed activities initiated under the following five Pilot Projects identified by Fifteenth Congress.

WIGOS Pilot Project for CIMO

4.4.40 The Association noted the development of the CIMO Pilot Project on WIGOS addressing the cross-cutting and underpinning role and responsibilities of CIMO within WIGOS, which would provide the requirements for instruments and methods of observations, including tests, calibration and intercomparisons, for a sustained, optimized, end-to-end WIGOS encompassing homogeneity, interoperability, compatibility of observations from all WIGOS constituent observing systems. The Association urged Members that would be carrying out WIGOS Demonstration Projects and/or would be strongly implicated in WIGOS Pilot Projects to actively cooperate with CIMO.

WIGOS Pilot Project for JCOMM

4.4.41 The Association noted the development of the Pilot Project for the integration of marine and other appropriate oceanographic observations into WIGOS in close relationship with the Intergovernmental Oceanographic Commission. The Association urged Members to participate actively in the Pilot Project through: (i) engaging in active cooperation with the oceanographic data centres in order to ensure the development or interoperable arrangements between their data systems and the WIS; and (ii) offering facilities for running regional marine instrument centres on a trial basis.

WIGOS Pilot Project for AMDAR

4.4.42 The Association noted that the EC Working Group on WIGOS/WIS had approved a draft Pilot Project on Integration of AMDAR into WIGOS and established an ad hoc Steering Group to finalize this Pilot Project. An initiation meeting of this Pilot Project developed six Pilot Project aims and objectives to assist the integration of AMDAR into WIGOS. In addition, the AMDAR Technical Coordinator function has been transferred from the WMO AMDAR Panel into a WMO full staff position funded through the AMDAR Trust Fund.

WIGOS Pilot Project for GAW

4.4.43 Noting that within GAW, for some data types transmission would be required in near real-time (NRT), while for others transmission with considerable time delay would be adequate, the Association recognized the importance of NRT delivery of ozone and aerosol variables and that these should be addressed as a matter of priority. Ozone and aerosol observations from the GAW network are needed for ingestion into atmospheric models, via data assimilation techniques, in support of improved forecasts of weather, surface UV and air quality. The GAW pilot project would contribute to the design of activities that enhance the transfer of GAW data in NRT through WIS. The Association considered that the benefits of WIGOS include the standardization of observing techniques, the routine collection and exchange of essential data as well as the transmission of data in a timely fashion to meet known requirements. It recognized that GAW already had in place activities and central facilities to this effect, but that these needed expansion and would benefit from improved data dissemination through WIS. The Association urged Members to support the efforts to move to NRT delivery of GAW data.

WIGOS Pilot Project for Global Hydrological Network

4.4.44 The Association noted the development of a project proposal for the Hydrological Applications and Run-Off Network (HARON) as a Hydrological Network Pilot Project for WIGOS. It supported recommendations by the thirteenth session of CHy that further steps in the implementation of this WIGOS pilot project should be undertaken. The Association urged Members to actively participate in this Pilot Project and engage in active cooperation with hydrological services and relevant data centres.

WIGOS Demonstration Projects

4.4.45 The Association noted that launching Demonstration Projects (DP) in selected NMHSs, feedback and lessons learnt from these NMHSs will be extremely beneficial in understanding others' expectations of WIGOS concept implementation. The following countries took the initiative and formally agreed to implement DPs in their NMHSs: Kenya, Morocco and Namibia (RA I), Republic of Korea (RA II), Brazil (RA III), United States of America (RA IV), Australia (RA V) and the Russian Federation (RA VI). The Association supported the involvement of regional associations and Members in the practical implementation of WIGOS concept in the operation as crucial to ensuring benefits for all Members.

4.4.46 The Association noted with appreciation the initiation of the USA to launch Demonstration Project "United States of America/RA IV-WIGOS Demonstration Project for an Integrated Atmosphere Observing System" and requested its newly established Working Group on Integrated Observing System and WMO Information System (WIS) in RA IV to closely collaborate with the NOAA National Weather Service in the implementation of the Demonstration Project. In this regard, the Association requested NOAA to regularly inform the president of the Association on the implementation and progress in its Demonstration Project. The Association also encouraged the Members to initiate their Demonstration Projects.

DRAFT RESOLUTION

Res. 4.4/1 (XV-RA IV) – REGIONAL BASIC SYNOPTIC NETWORK IN REGION IV

REGIONAL ASSOCIATION IV,

Noting:

- (1) Resolution 2 (XIV-RA IV) – Regional Basic Synoptic Network (RBSN),
- (2) The *Manual on the Global Observing System* (WMO-No. 544), Volume I, Part III, Regulations 2.1.3.1 - 2.1.3.5 and the definition of the Regional Basic Synoptic Networks,
- (3) The *Manual on the Global Telecommunication System* (WMO-No. 386), Volume I, Part I, Attachment 1-3, Section 3,

Considering that the establishment and maintenance of a Regional Basic Synoptic Network of surface and upper-air synoptic stations, adequate to meet the requirements of Members and of the World Weather Watch, constitute one of the most important obligations of Members under Article 2 of the WMO Convention,

Decides that the stations and the observational programmes listed in the Annex to this resolution constitute the RBSN in Region IV;

Urges Members:

- (1) To secure, at the earliest date possible, full implementation of the network of the stations and observational programmes set forth in the Annex to this resolution;
- (2) To comply fully with the standard times of observation, the global and regional coding procedures and data collection standards, as laid down in the *WMO Technical Regulations* (WMO-No. 49) and the *Manuals on the GOS* (WMO-No. 544), *on Codes* (WMO-No. 306) and *on the GTS* (WMO-No. 386);

Authorizes the president of the Association to approve, at the request of the Members concerned and in consultation with the Secretary-General, minor amendments to the list of RBSN stations in accordance with the procedures laid down in the *Manual on the Global Observing System* (WMO-No. 544), Volume II – Regional Aspects, Region IV (North America, Central America and The Caribbean).

Annex: 1

Note: This resolution replaces Resolution 2 (XIV-RA IV), which is no longer in force.

Annex to draft Resolution 4.4/1 (XV-RA IV)

LIST OF STATIONS COMPRISING THE RBSN IN REGION IV

**See: XV-RA IV/INF. 5.1 and
<http://www.wmo.int/pages/prog/www/ois/rbsn-rbcn/rbsn-rbcn-home.htm>**

DRAFT RESOLUTION

Res. 4.4/2 (XV-RA IV) – REGIONAL BASIC CLIMATOLOGICAL NETWORK IN REGION IV

REGIONAL ASSOCIATION IV ,

Noting:

- (1) Resolution 3 (XIV-RA IV) – Regional Basic Climatological Network (RBCN),
- (2) The *Manual on the Global Observing System* (WMO-No. 544), Volume I, Part III, Regulations 2.1.3.1-2.1.3.2 and the definition of the Regional Basic Climatological Networks,
- (3) The *Manual on the Global Telecommunication System* (WMO-No. 386), Volume I, Part I, Attachment 1-3, Section 2.4 (i),

Considering that the Fourteenth World Meteorological Congress welcomed the establishment of the Regional Basic Synoptic Network in all WMO Regions and the Antarctic and urged Members to ensure that their operational observing stations compiled and transmitted the CLIMAT and CLIMAT TEMP messages according to existing regulations,

Decides that the stations listed in the Annex to this resolution constitute the RBCN in Region IV;

Urges Members:

- (1) To ensure, at the earliest date possible, full implementation of the network of RBCN stations set forth in the Annex to this resolution;
- (2) To comply fully with the global and regional coding procedures and data collection standards in accordance with procedures laid down in the *WMO Technical Regulations* (WMO-No. 49) and the *Manuals on the GOS* (WMO-No. 544), *on Codes* (WMO- No. 306), and *on the GTS* (WMO-No. 386) when operating the RBCN;

Authorizes the president of the Association to approve, at the request of Members concerned and in consultation with Secretary-General, minor amendments to the list of RBCN stations in accordance with the procedures laid down in the *Manual on the Global Observing System* (WMO-No. 544), Volume II – Regional Aspects, Region IV (North America, Central America and The Caribbean).

Annex: 1

Note: This resolution replaces Resolution 3 (XIV-RA IV), which is no longer in force.

Annex to draft Resolution 4.4/2 (XV-RA IV)

LIST OF STATIONS COMPRISING THE RBCN IN REGION IV

**See: XV-RA IV/INF. 5.2 and
<http://www.wmo.int/pages/prog/www/ois/rbsn-rbcn/rbsn-rbcn-home.htm>**

DRAFT RESOLUTION

Res. 4.4/3 (XV-RA IV) - AMENDMENTS TO THE *MANUAL ON THE GLOBAL OBSERVING SYSTEM* (WMO-No. 544), VOLUME II – REGIONAL ASPECTS – REGION IV (NORTH AMERICA, CENTRAL AMERICA AND THE CARIBBEAN)

REGIONAL ASSOCIATION IV,

Noting:

- (1) The *Manual on the Global Observing System* (WMO-No. 544), Volume II – Regional Aspects – Region IV (North America, Central America and The Caribbean),
- (2) The *ad hoc* session of the Working Group on Planning and Implementation of the WWW in Region IV,

Considering that there is an urgent need to update the regional entry for the *Manual on the Global Observing System* (WMO-No. 544), Volume II, in response to evolving requirements,

Decides that the amended text of section 4 of the *Manual on the Global Observing System* (WMO-No. 544), Volume II – Regional Aspects – Region IV (North America, Central America and The Caribbean) as listed in the Annex to this resolution, be adopted with immediate effect;

Requests the Secretary-General:

- (1) To arrange for the inclusion of the amendment in Volume II of the *Manual on the Global Observing System* (WMO-No. 544) – Regional Aspects, Region IV (North America, Central America and The Caribbean);
- (2) To bring this modification to the attention of Members of RA IV.

Annex: 1

Annex to draft Resolution 4.4/3 (XV-RA IV)

**AMENDMENTS TO THE *MANUAL ON THE GLOBAL OBSERVING SYSTEM*
(WMO-No. 544), VOLUME II – REGIONAL ASPECTS – REGION IV (NORTH AMERICA,
CENTRAL AMERICA AND THE CARIBBEAN)**

REPLACE the text of section 4 – Region IV – North America, Central America and The Caribbean to read:

4.1 Regional Basic Synoptic Network of surface and upper-air observing stations

4.1.1 Composition of the Regional Basic Synoptic Network (RBSN)

4.1.1.1 The RBSN of surface and upper-air observing stations is reviewed and revised at each session of the Association. The list of stations constituting the current RBSN is given in the report of the most recent session of the Association. Changes are announced in the monthly “Operational Newsletter” issued by the Secretariat (see paragraph 4.1.5 below).

4.1.1.2 Manned surface land stations included in the RBSN shall conform to the specifications laid down for land stations in Volume I of this Manual.

4.1.2 Surface synoptic observations

All surface stations included in the RBSN should make surface observations at the four main standard times of observation, i.e., 0000, 0600, 1200 and 1800 UTC, and at the four intermediate standard times of observation, i.e., 0300, 0900, 1500 and 2100 UTC. Any surface station that cannot carry out the full observational programme should give priority to carrying out the observations at the main standard times.

4.1.3 Upper-air synoptic observations

All upper-air stations included in the RBSN should carry out radiosonde and/or radiowind observations up to the 10 hPa level at 0000 and 1200 UTC. Stations which are unable to carry out the full observing programme should give priority to the making of observations at 1200 UTC.

4.1.4 Principles to be applied when revising the RBSN

(a) As a target over land areas the RBSN should have a spatial resolution of 150 km for the surface and 250 km for upper-air stations;

(b) If an RBSN station was ‘silent’ according to monitoring results and another RBSN station located nearby (less than 100 km for surface stations) had regularly reported its observation, the ‘silent’ station should be replaced in the RBSN. If there is no alternative regularly reporting station nearby the ‘silent’ station may remain on the list if there is an intention to restore operations;

(c) In data sparse areas existing stations may be nominated for the RBSN even if there are no plans for them to carry out the full schedule of observations;

(d) The nomination by a Member of a station in the network implies a clear commitment of the Member concerned to make every effort to carry out the schedule.

4.1.5 Arrangements and procedures for updating and amending the Regional Basic Synoptic Network

Certain minor changes in the RBSN of surface and upper-air synoptic stations which do not affect the data requirements of the Region as a whole are inevitable. To provide a simple and rapid means of effecting changes by the Members concerned, the following procedure shall be followed:

- (a) Regional Association IV authorizes the president of the Association to approve, at the request of the Member concerned, on the advice of the Rapporteur on Regional Aspects of the GOS (or Chairperson of a Sub-Group on the GOS), and in consultation with the Secretary-General, minor changes to the RBSN without formal consultation with the Members of the Association, it being understood that any change of substance, i.e., one adversely affecting the density of the network or proposing a change in observational hours, would still require the formal agreement of Members through the adoption of a resolution by postal ballot;
- (b) The Secretary-General shall notify all Members of WMO of changes agreed with the president of the Association;
- (c) Each Member of the Association is encouraged to nominate a national focal point (NFP) for WMO on operational matters related to the RBSN. The nominated NFP should coordinate information with the Rapporteur(s) on Regional Aspects of the GOS and the Secretariat with a view to timely updating information regarding the RBSN.

4.2 Regional Basic Climatological Network (RBCN) of surface and upper-air observing stations

4.2.1 Composition of the Regional Basic Climatological Network (RBCN)

4.2.1.1 The RBCN was established by the Regional Association to provide a comprehensive network of CLIMAT and CLIMAT TEMP reporting stations. It is based primarily on RBSN stations and includes all GCOS (GSN and GUAN) stations, regardless of whether these report CLIMAT or CLIMAT TEMP. RBCN also includes all other stations that report CLIMAT or CLIMAT TEMP needed for description of regional climate features. These other stations should be selected under the same criteria used for GSN and GUAN stations. Non-RBSN stations reporting CLIMAT messages should be considered, particularly those with long records, as well as any Reference Climatological Stations.

4.2.1.2 The RBCN of surface and upper-air observing stations is reviewed and revised at each session of the Association. The list of stations constituting the current RBCN is given in the report of the most recent session of the Association.

4.2.2 Arrangements and procedures for updating and amending RBCN

RA IV authorizes the president of the Association to approve, at the request of the Member concerned, on the advice of the Rapporteur on the Regional Aspects of the GOS (or Chairperson of a Sub-Group on the GOS), and in consultation with the Secretary-General, minor amendments to the list of RBCN stations without formal consultation with the Members of the Association, following similar procedures to those specified for the RBSN.

4.3 Regional arrangements and procedures for observations

4.3.1 Pressure-reduction method

According to the WMO Technical Regulations, Annex V, Manual on the Global Observing System, Volume I, Part III, Regulation 3.3.2.6, the atmospheric pressure at a station shall be reduced to mean sea-level. However, pending a worldwide decision on a uniform pressure-reduction method, the method being used in the United States for reducing atmospheric pressure to mean sea-level should be applied in the Region.

4.3.2 Regional comparison of barometers

4.3.2.1 Each Member in the Region should ensure that the barometer of each synoptic station in its territory is traceable to a fixed national barometric standard, through an appropriate series of comparisons at least every two years.

4.3.2.2 National barometric standards should be traceable to an absolute barometric standard recognized by WMO, within or outside the Region, through an appropriate intercomparison at least every 10 years.

4.3.2.3 The barometric standard at the National Bureau of Standards (NBS), Gaithersburg, Maryland (United States) shall be recognized as the absolute standard for Region IV.

4.3.2.4 The barometric standards in Guatemala City, Mexico D.F., Miami, San Juan, Silver Spring, Maryland and Toronto shall be the sub-regional standard barometers for the Region.

NOTES: (1) The term "barometric standard" is used rather than "standard barometer" since often the standard is not a barometer (e.g. a dead weight tester is a pressure standard, but not a barometer).

(2) There is no standard barometer in Washington D.C. The standard barometer at NWS Headquarters (Silver Spring) is not a national standard, but a working standard traceable to NBS.

4.3.3 Ground weather radar observations

Meteorological radars are important for both operational and research purposes in synoptic meteorology and hydrology, and in improving the accuracy of short-period forecasts (especially those for aviation), while non-meteorological radars, such as aircraft surveillance radars, may often be used advantageously for meteorological purposes and thus fill any temporary gaps in the radar network. Members should, therefore, take all practical steps to encourage the installation of meteorological radars in their own countries, coordinating, where desirable, with neighbouring countries, and should also make maximum use of non-meteorological radars for meteorological purposes.

4.3.4 Regional Instrument Centres (RICs)

4.3.4.1 RICs with full capability should have the following capabilities to carry out their corresponding functions:

Capabilities:

(a) A RIC must have or have access to the necessary facilities and laboratory equipment to perform the functions necessary for the calibration of meteorological and related environmental instruments;

- (b) A RIC must maintain a set of meteorological standard instruments and establish traceability of its own measurement standards and measuring instruments to the SI;
- (c) A RIC must have qualified managerial and technical staff with necessary experience in fulfilling its functions;
- (d) A RIC must develop its individual technical procedures for calibration of meteorological and related environmental instruments using calibration equipment employed by the RIC;
- (e) A RIC must develop its individual quality assurance procedures;
- (f) A RIC must participate in, or organize inter-laboratory comparisons of standard calibration instruments and methods;
- (g) A RIC must, as appropriate, utilize the resources and capabilities of the Region to the best interest of the Region;
- (h) A RIC must, as far as possible, apply international standards applicable for calibration laboratories, such as ISO 17025;
- (i) A recognized authority must assess a RIC, at least every five years, to verify its capabilities and performance;

Corresponding Functions:

- (j) A RIC must assist Members of the Region in calibrating their national meteorological standards and related environmental monitoring instruments;
- (k) A RIC must participate in or organize WMO and/or regional instrument intercomparisons, following relevant CIMO recommendations;
- (l) According to relevant recommendations on the WMO Quality Management Framework a RIC must contribute positively to Members regarding quality of measurements;
- (m) A RIC must advise Members on inquiries regarding instrument performance, maintenance and the availability of relevant guidance materials;
- (n) A RIC must actively participate in, or assist in the organization of regional workshops on meteorological and related environmental instruments;
- (o) The RIC must cooperate with other RICs in standardization of meteorological and related environmental measurements;
- (p) A RIC must regularly inform Members and report¹, on an annual basis, to the president of the Regional Association and to the WMO Secretariat on services offered to Members and activities carried out.

¹ Web based approach is recommended

4.3.4.2 RICs with basic capabilities and functions should have the following capabilities to carry out their corresponding functions:

Capabilities:

- (a) A RIC must have or have access to the necessary facilities and laboratory equipment to perform the functions necessary for the calibration of meteorological and related environmental instruments;
- (b) A RIC must maintain a set of meteorological standard instruments² and establish traceability of its own measurement standards and measuring instruments to the SI;
- (c) A RIC must have qualified managerial and technical staff with necessary experience in fulfilling its functions;
- (d) A RIC must develop its individual technical procedures for calibration of meteorological and related environmental instruments using calibration equipment employed by the RIC;
- (e) A RIC must develop its individual quality assurance procedures;
- (f) A RIC must participate in, or organize inter-laboratory comparisons of standard calibration instruments and methods;
- (g) A RIC must, when appropriate, utilize the resources and capabilities of the Region to the best interest of the Region;
- (h) A RIC must, as far as possible, apply international standards applicable for calibration laboratories, such as ISO 17025;
- (i) A recognized authority must assess a RIC, at least every five years, to verify their capabilities and performance;

Corresponding functions:

- (j) A RIC must assist Members of the Region in calibrating their national meteorological standards and related environmental monitoring instruments according to Capabilities (b);
- (k) According to relevant recommendations on WMO Quality Management Framework a RIC must contribute positively to Members regarding quality of measurements;
- (l) A RIC must advise Members on inquiries regarding instrument performance, maintenance and the availability of relevant guidance materials;
- (m) The RIC must cooperate with other RICs in standardization of meteorological and related environmental measurements;
- (n) A RIC must regularly inform Members and report³, on an annual basis, to the president of the Regional Association and to the WMO Secretariat on services offered to Members and activities carried out.

² For calibrating one or more of the following variables: temperature, humidity, pressure and others specified by the Region

³ Web based approach is recommended

4.3.4.3 The instrument centres at Mt. Washington, New Hampshire (United States), the Caribbean Meteorological Institute in Barbados and the RMTC in San José (Costa Rica) are designated as Regional Instrument Centres.

4.3.5 Regional Radiation Centres (RRCs)

4.3.5.1 A RRC is a centre designated by a Regional Association to serve as a centre for intraregional comparisons of radiation instruments within the Region and to maintain the standard instruments necessary for this purpose.

4.3.5.2 A Regional Radiation Centre shall satisfy the following conditions before it is designated as such and shall continue to fulfil them after being designated:

(a) It shall possess and maintain a standard group of at least three stable pyrheliometers, with a traceable 95% uncertainty of less than 1 Wm^{-2} to the World Standard Group, and in stable clear sun conditions with direct irradiances above 700 Wm^{-2} , 95% of any single measurements of direct solar irradiance will be expected to be within 6 Wm^{-2} of the irradiance;

(b) One of the radiometers shall be compared through a WMO/CIMO sanctioned comparison, or calibrated, at least once every five years against the World Standard Group;

(c) The standard radiometers shall be intercompared at least once a year to check the stability of the individual instruments. If the mean ratio, based on at least 100 measurements, and having an 95% uncertainty less than 0.1%, has changed by more than 0.2% and if the erroneous instrument cannot be identified, then a recalibration at one of the World Radiation Centres must be performed prior to further use as standard;

(d) It shall have, or have access to, the necessary facilities and laboratory equipment for checking and maintaining the accuracy of the auxiliary measuring equipment;

(e) It shall provide the necessary outdoor facilities for simultaneous comparison of national standard radiometers from the Region;

(f) The staff of the centre should provide for continuity and should include a qualified scientist with wide experience in radiation;

(g) It shall be assessed by a National or International agency or CIMO experts, at least every five years to verify traceability of the direct solar radiation measurements.

4.3.5.3 The following National Radiation Centres are designated to serve as Regional Radiation Centres in RA IV: Toronto (Canada), Mexico D.F. (Mexico) and Boulder (United States).

World Meteorological Organization
REGIONAL ASSOCIATION IV
(NORTH AMERICA, CENTRAL
AMERICA AND THE CARIBBEAN)

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INTEGRATION OF WMO OBSERVING SYSTEMS

**Strategic Thrust 1: Science and Technology Development
and Implementation**

PROGRESS/ACTIVITY REPORT

SUMMARY

Reference: XV-RA IV/Doc. 4.4

CONTENT OF DOCUMENT:

Appendix:

- Progress/Activity Report

PROGRESS/ACTIVITY REPORT

Weather

Surface-based observations

Regional Basic Synoptic Network

1. The RBSN, being a minimum regional requirement to permit Members to fulfil their responsibilities within the WMO World Weather Watch (WWW) Programme, continued to provide essential and unique observational data and information on the state of the Earth and its atmosphere. The Annual Global Monitoring (AGM) and the special MTN Monitoring (SMM) of the operation of the WWW, carried out respectively in October and on a quarterly basis each year provides information on the performance level of the observing systems.
2. Overall, during the intersessional period, the implementation of the RBSN surface and upper-air observational programme in the Region has shown increasing stability. During the same period the availability of surface and upper-air reports on the Main Telecommunication Network (MTN) against those expected from RBSN stations has remained relatively consistent as indicated below:

Availability of SYNOP and TEMP data at MTN centres from RA IV
AGM: 1 to 15 October (2005–2007) and SMM: 1 to 15 April (2008)

Year	Surface (SYNOP)		Upper-air (TEMP)	
	Number of stations	Reports received (%)	Number of stations	Reports received (%)
2005	541	81%	136	88%
2006	535	79%	136	89%
2007	535	79%	136	88%
2008	535	79%	136	86%

Note: Results based on the RBSN.

Aircraft Observations

3. The global AMDAR programme continues to expand into new areas, more operational programmes have commenced reporting and still more countries and regions are exploring the possibility of developing their own AMDAR programme to enhance their upper-air observing networks. The volume of data disseminated on the GTS has continued to grow and is now peaking at around 240,000 to 250,000 observations per day. The humidity-water vapour sensor technology is now closer to becoming an integrated operational system. The USA and E-AMDAR Programmes are due to release their final reports into the operational performance of the WVSS-II sensor in the last quarter of 2009. The AMDAR community, with the assistance of WMO, has been working towards the development of the WVSS-II water vapour sensor and an AMDAR software solution as standard part numbers for all aircraft makes and models. The WMO AMDAR Panel, through the Secretary-General of WMO, appealed to WMO Members for additional contributions to help fund the ARINC 620V4 software development project that would see AMDAR software made available on all new and existing Airbus A320 and A330/A340 aircraft. However, this strategy proved unsuccessful in obtaining the necessary funds. It has been identified that the future work programme of the WMO AMDAR Panel must include developing a strategy to implement a standard suite of AMDAR software and hardware solutions that could be made available to all NMHSs. As part of the future work programme the AMDAR Panel will also continue to work closely

with all aircraft manufacturers and related industries to assist in the development of AMDAR software. These issues were addressed by the 11th AMDAR Panel meeting and the 5th Science and Technology Workshop, held in Malaysia, Petaling Jaya, 17-21 November 2008.

4. RA IV currently has two operational AMDAR programmes, namely: Canada and the USA. The current Canadian operational AMDAR fleet consists of 47 CRJ-100/200 and 51 DHC-8-100/300 Air Canada Jazz-operated aircraft. The Air Canada Jazz AMDAR fleet contributes approximately 35,000 observations per day to the Global AMDAR Programme. These observations translate into roughly 5,000 weekly soundings from 54 Canadian airports located coast-to-coast. The USA AMDAR Programme is evaluating TAMDAR data from 10 PenAir Saab 340 aircraft in a year-long assessment ending 15 January 2009. PenAir flights from Anchorage to southwest Alaska, the Alaska Peninsula and Pribilof Islands are providing the data for the assessment. The data is used in day-to-day operations and assessed as to its utility. A final report, summarizing TAMDAR utility to forecast operations will be sent to NWS Headquarters and to the manufacture of the TAMAR unit (AirDat, LLC) shortly after the conclusion of the assessment. Under a NOAA contract with ARINC and the manufacturer of the WVSS-II water vapour sensor (SSI) was significantly re-engineered in the spring of 2008 to improve the sensors reliability. Production of 60 WVSS-II units will be completed in fall 2008; of these 60 units, 31 will be installed on Southwest B737-300 aircraft, and 25 will replace older WVSS-II units currently flying on United Parcel Service B757 aircraft, with 4 spare units available. A report on the performance of the WVSS-II water vapour sensor will be made available towards the end of 2009. The USA AMDAR Programme will develop a USA AMDAR optimisation system that could potentially provide AMDAR observations outside the USA area of operations.

5. The WMO AMDAR Panel has been working with other AMDAR Programmes outside RA IV to assist with providing additional observations to complement the existing AMDAR coverage in the Region. The European AMDAR Programme (E-AMDAR) has also been configured to report additional AMDAR data from European based aircrafts over Canada into the Caribbean region.

Marine and Oceanographic Observations

6. Sixty per cent of the global ocean observing system is now in place (58% at Cg-XV) and Argo reached its initial design goal of 3000 in active service in November 2007. The plan is to continue to increase the percentage of completion by EC-LXI. Efforts will continue to be made to ensure sustainability of the different components of the ocean observing network that have reached their design goal (drifters and Argo). The main concentration of the ASAP operations globally continues to be over the Northern Atlantic (about 5000 launches annually) thanks to contributions from RA VI Members. However, RA IV Members appear not to be substantially participating in ASAP while it was recognized at ICT-IO5 that ASAP soundings over remote ocean areas complement well AMDAR data (vertical AMDAR soundings are only available over populated areas). WMO will continue to support satellite data telecommunication Pilot Projects (e.g., DBCP and SOT Iridium pilot project) which are showing promising results leading to the potential decrease of average costs of individual observations. JCOMM has initiated a Pilot Project for WIGOS which, together with the establishment of an ocean Observing Programme Support Centre (OPSC, to expand the existing JCOMMOPS), is expected to increase the performance of the overall ocean observing system. JCOMM has initiated two Pilot Projects for: (i) the test and evaluation of wave measurements from moored buoys; and (ii) the development of cost-effective technology for the measurement of wave observations from drifters. The DBCP is exploring establishing closer links with the International Tsunami Partnership of IOC.

7. Although the baseline global ocean observing system developed under GOOS and implemented by JCOMM is designed to meet climate requirements, marine services in general will be improved by implementation of the systematic global observations called for by the GCOS-92

plan. The system supports global weather prediction, global and coastal ocean prediction, marine hazard warning, marine environmental monitoring, naval applications, and many other non-climate uses. Details and recommendations regarding the plan are covered hereunder.

Space-based observations

8. In November 2008, operational geostationary coverage of RA IV was provided by GOES-11 and GOES-12, in GOES-East and GOES-West positions, with GOES-O being prepared for launch in February 2009. Observation from the polar-orbit was provided on the afternoon orbit by NOAA-18 and -19 and on the morning orbit by the METOP mission operated by EUMETSAT in partnership with NOAA. The ocean surface topography Jason-2 mission is operated in cooperation among European partners. Furthermore, NASA operates a number of R&D missions, some of them routinely providing data of great benefit to operations, e.g. TRMM, Quikscat, Aqua and Terra.

9. Only nine RA IV Members (41%) responded to the biennial enquiry on availability and use of satellite data and products in WMO Members, six of them recorded a significant increase in the access and the use of satellite data in 2006-2007 with respect to the previous two-year period. Four Members reported receiving satellite data from direct readout, five via the Internet, and only one via Advanced Dissemination Means.

Implementation Plan for the Evolution of Surface- and Space-Based Sub Systems of the Global Observing System - (EGOS-IP)

10. EC-LX recognized the importance of the Implementation Plan for the Evolution of Surface- and Space-Based Sub Systems of the Global Observing System (EGOS-IP) to strengthen the GOS and requested Members to continue to report annually to WMO on the status of and plans for evolution of national components of the Surface- and Space-Based Sub Systems of the GOS vis-à-vis recommendations of the EGOS-IP. The CBS Implementation Coordination Team (ICT-IO) recognized that only a few Members had nominated National Focal Points for reporting on EGOS-IP actions.

Instrument Standards and Best Practices

Continuous evaluation of Regional Instrument Centres (RICs) and Regional Radiation Centres (RRCs) to verify their capabilities and performance

11. WMO Regional Instrument Centres (RICs) play an important role in providing facilities to calibrate meteorological instruments that is of paramount importance to provide meteorological data of high accuracy, culminating in the provision of data for climate change studies. EC-LIX adopted revised Terms of Reference for RICs and RRCs and Cg-XV suggested that a regular assessment of their capabilities and performance should be carried out regularly.

12. As RICs and RRCs and their activities are extremely important for the success of WIGOS (observation standardization is at the core of the WIGOS implementation), strengthening RICs/RRCs should have a high priority under the WIGOS umbrella.

Instrument Intercomparisons

13. Two instrument intercomparisons are presently being conducted: the field intercomparison of rainfall intensity, Vigna di Valle, Italy, which has been extended until 30 April 2009, and the intercomparison of thermometer screens and shields in conjunction with humidity measuring instruments, Ghardaia, Algeria, which started on 1 November 2009. The next intercomparison of High Quality Radiosonde Systems will be hosted by China, in 2010.

Test-Bed Instrument Facility

14. A new COST Action ES0702 EG-CLIMET “European Ground-Based Observations of Essential Variables for Climate and Operational Meteorology” was initiated in May 2008 in Europe that will last at least for a period of four years. This action will conduct research of the use of integrated profiling systems (ground based remote sensing) with in situ, aircraft and weather radar observations to examine options for future upper-air networks. The Executive Council requested CIMO to participate in the action, which would allow the initiation of the CIMO test-bed instrument facilities. Worldwide participation in the workshops organized in the context of this action is possible and would be very beneficial in view of the importance of this action in the development of WIGOS.

Standardization

15. A new version of the Catalogue of Observing Stations (WMO Pub. 9 – Volume A) was posted on the WWW Website once a week every Monday or more frequently depending on updates. Lists of RBSN/RBCN stations were updated and posted on real-time basis when a change became valid. The list of marine and ocean stations, including VOS (WMO Pub. 47, the *International List of Selected, Supplementary and Auxiliary Ships*) was updated quarterly. A new version of the Catalogue of radiosonde equipment was posted on the WWW Website in June 2007. A routine meteorological message identified by the code name ‘METNO’ compiled in a standard format was transmitted every Thursday of the week for dissemination via the GTS to inform Members on the latest changes.

16. GCOS offered to host a WMO/GCOS Training Workshop on GUAN Upper-Air Observations in India (2009) to train operational staff from GUAN Asian and to possibly organize an evaluation of locally manufactured upper-air sounding systems in connection with this event.

Climate

Atmosphere

RBCN Network Performance

17. The RBCN, established by all regional associations, is seen as being a minimum regional requirement to permit Members to fulfil their responsibilities within the WMO relevant to climate. It continued to provide a strong justification for maintaining a minimum number of CLIMAT/CLIMAT TEMP reporting stations which allowed for a more effective and consistent performance monitoring of the availability of climatological data. Similar to the RBSN monitoring, the AGM and the SMM of the operation of the WWW, provides information on the performance level of the climatological programme.

18. During the intersessional period, the implementation of the RBCN climatological stations in the Region has shown a positive increase. The availability of CLIMAT and CLIMAT TEMP reports on the MTN against those expected from RBCN stations indicated a variable trend over the same period as shown below:

Availability of Climatological data at MTN centres from RA IV
AGM: 1 to 15 October (2005–2007) and SMM: 1 to 15 April (2008)

Year	CLIMAT		CLIMAT TEMP	
	Number of stations	Reports received (%)	Number of stations	Reports received (%)
2005	267	75%	58	62%
2006	315	83%	85	85%
2007	316	89%	85	85%
2008	316	86%	85	73%

Note: Results based on the RBCN.

Oceans

19. The Argo profiling float network has reached completion with 3000 floats operational in November 2007 thanks to the active participation from the Association's Members. All operational floats report their data in real time onto the GTS (TESAC and BUFR format) via the two Global Data Assembly Centres (GDAC) of USA and France. Argo has revolutionized understanding and monitoring of the world's oceans and it has been recognized that continued operations of the array is crucial for GOOS and the ocean component of GCOS. Most Argo national programmes continue to be supported by research funding, which poses difficulties for sustaining the observations over decadal timescales. Support from operational agencies and users are needed to justify the long-term funding. The Prediction and Research Moored Array in the Tropical Atlantic (PIRATA) moored array has completed its pilot phase (reflected in a redefinition of the acronym) and continued in a 17 surface mooring and one subsurface ADCP mooring configuration in 2008

GSN/GUAN Network Performance

20. A subset of RBCN stations of highest value for global climate monitoring receives particular attention as GCOS Surface Network (GSN) and GCOS Upper-Air Network (GUAN) stations. Performance of the GSN has significantly improved in 2007, with up to 80% of monthly CLIMAT messages received at the GSN monitoring centres from all 1016 stations globally (cf. around 70% in 2006). Major regional performance differences remain, e.g., 95% of CLIMAT messages received in RA IV, only 35-50% in RA I throughout 2007. At one point in 2007, 98% of all 164 GUAN stations were reporting TEMP messages, but this has decreased since to 94% in February 2008. Thanks to the GCOS system improvement programme (see EC-LX/Doc. 3.2) around 95% of all GSN stations were functional in early 2007. This progress is also due to the GCOS Technical Support Projects, the CBS Lead Centres for GCOS Data, and the WWW and GCOS Network Monitoring activities.

21. The GCOS/WCRP Atmospheric Observation Panel for Climate (AOPC) at its thirteenth session in April 2007 discussed the value of CLIMAT TEMP data for climate purposes. It noted that recent research indicated that daytime radiosonde data exhibit significant time-varying biases relative to night-time data. Accordingly, it was now recognized that monthly CLIMAT TEMPs, which combine daytime and night-time data, had very limited value for ongoing climate research purposes. Furthermore, although CLIMAT TEMPs historically had had more local quality control and a more complete data-basis than the internationally transmitted TEMP reports for individual ascents, this advantage had become marginal as a result of improvements in transmission of the daily TEMP messages and improved real-time quality control at operational weather prediction centres. In addition, remaining telecommunication problems can be remedied by the retransmission of missing or corrupted TEMPs using an agreed protocol for retrospective data. In recognition of these findings, the AOPC agreed that the calculation and transmission of CLIMAT

TEMP messages was no longer required for GCOS purposes. The WMO Executive Council at its sixtieth session charged the Commission for Climatology (CCI) and the World Climate Data and Monitoring Programme (WCDMP) of the WMO Secretariat to explore with WMO Members the implication of this recommendation for their work.

GCOS Reference Upper-Air Network (GRUAN)

22. The Implementation Meeting of the GCOS Reference Upper-Air Network (GRUAN), organized by the Atmospheric Observation Panel for Climate (AOPC) Working Group on Atmospheric Reference Observations (WG-ARO), was held at the Richard Aßmann Observatory in Lindenberg, Germany, 26-28 February 2008, hosted by the Deutsche Wetterdienst (DWD). In May 2008, the observatory in Germany was designated by WMO as the Lead Centre for GRUAN for a pilot phase. The Meeting was held under the auspices of GCOS and focused upon necessary actions required to refine the cooperation with all partners, resolve scientific and technical issues from the report of the AOPC WG-ARO, and define a work plan for the implementation of the network. The reference network will provide long-term, high-quality climate records to constrain and calibrate data from more spatially-comprehensive global observing systems, including satellites and current radiosonde networks. Based on the "Report of the GRUAN Implementation Meeting" (GCOS-121), a priority list of 13 initial GRUAN candidate sites was developed. Wherever possible, the choice of sites has been based on co-location with sites of existing global networks, such as GUAN, BSRN and GAW, to ensure maximum synergy with these networks. In September 2008, the 13 initial GRUAN candidate sites were invited to formally confirm their participation in the network. So far, confirmation to formally participate in GRUAN has been received from four sites, three in RA VI and one in RA II.

23. The US hosts four of the GRUAN candidate sites (Barrow, Beltsville, Boulder and Lamont Southern Great Plains) and supports the operation of another three sites in Darwin (Australia), on Manus Island (Papua New Guinea) and in the Republic of Nauru, through the Atmospheric Radiation Measurement (ARM) Programme. In 2005 and 2006 US support, through NOAA and UCAR, to community workshops has been instrumental for defining the requirements for GRUAN and thus laying the foundation for its design.

Observing Systems under GAW addressing climate

24. Both the GAW CO₂ and CH₄ networks were recognized as GCOS Comprehensive Networks in 2006. In 2007, an agreement was reached between GCOS and GAW which specified the terms under which the GAW ozone and contributing networks were designated as the GCOS Global Baseline Total Ozone Network and the GCOS Global Baseline Profile Ozone Network. The agreement further specified terms under which selected NDACC stations could contribute to a GCOS Reference Upper-Air Network.

25. In 2006, WMO's Global Atmosphere Watch (GAW) initiated the annual publication of the WMO Greenhouse Gas Bulletin. The second and third Bulletins were released just prior to the meeting of the Conference of the Parties to the United Nations Framework Convention on Climate Change. They represent a collective effort by greenhouse-gas-monitoring networks around the world, coordinated by the Global Atmosphere Watch. These bulletins contain a summary of the change in atmospheric concentrations of the long-lived greenhouse gases. They are made in collaboration with the Japan Meteorological Agency (JMA), which hosts the WMO-GAW World Data Centre for Greenhouse Gases (WDCGG), and with the National Oceanic and Atmospheric Administration (NOAA) of the USA. Together with the update on greenhouse gas abundancies, there is also an annual update of the Annual Greenhouse Gas Index (AGGI), developed by NOAA. This index shows how much the radiative forcing changes from one year to the next as a consequence of the changes in greenhouse gas concentrations.

26. The WMO/GAW Expert Workshop on Global Long-term Measurements of Volatile Organic Compounds (VOCs) was held in January 2006. The report of this meeting (GAW Report No. 171) forms the basis of the GAW strategy of supporting VOC measurements and contributes to the GAW Strategic Plan. Reactive non-methane hydrocarbon compounds commonly referred to as VOCs play an important role in the chemistry and therefore the oxidizing power of the atmosphere, which in turn affects climate and air quality. The main importance of VOCs is in the lower troposphere. Only a few compounds, for example formaldehyde, have the potential to be observed by current or proposed satellite instruments. It is therefore important and timely to institute at selected ground-based sites and from aircraft platforms a long-term measurement programme of VOCs. The World Data Centre for Greenhouse gases (WDCGG) will archive data from the GAW-VOC network.

27. The first meeting of the United Nations GESAMP (Group of Experts on the Scientific Aspects of Marine Environment Protection) Working Group 38, The Atmospheric Input of Chemicals to the Ocean, took place at the University of Arizona, Tucson, Arizona, USA from 10-14 December 2008. This meeting was organized by the Global Atmosphere Watch (GAW) and World Weather Research Programme. Recognition continues to grow concerning the impact of the atmospheric input of both natural and anthropogenic substances on ocean chemistry, biology, and biogeochemistry as well as climate. Working Group 38 addressed the following issues: (i) assessing the need for the development of new model and measurement products for improving our understanding of the impacts of the atmospheric deposition of nitrogen species and dust (iron) to the ocean; (ii) reviewing the current information on the atmospheric deposition of phosphorus species to both the marine and terrestrial environments, considering both natural and anthropogenic sources, and evaluate the impact of atmospheric phosphorus deposition on marine and terrestrial ecosystems; and (iii) cooperating with the WMO Sand and Dust Storm Warning and Assessment System and with the WMO Precipitation Chemistry Data Synthesis and Community Project to evaluate the needs of the marine community and assist in clearly articulating them in the development of these WMO efforts.

28. In 2007 and 2008 WMO organized Expert Meetings on the Precipitation Chemistry Data Synthesis and Community Product in order to establish a coordinated work on a scientific assessment of precipitation chemistry by combining GAW data, data from cooperating regional networks and data from simulation models. Precipitation chemistry remains a major environmental issue due to concerns over acid deposition, eutrophication, trace metal deposition, ecosystem health, biogeochemical cycling, and global climate change. In more recent years, concerns have expanded from wet deposition alone to include such considerations as air concentrations, dry deposition, and surface-air exchange, particularly as they relate to the atmospheric lifetimes of acidifying species, greenhouse gases, and oxidizing species. The number of GAW precipitation chemistry measurement sites still remains insufficient. Through the cooperation with contributing partner networks (DEBITS, EANET, CAPMoN, EMEP, NADP), GAW aims to fill a gap in the GAW precipitation chemistry global database. The Expert Meetings recommended performing a process of global precipitation assessment that should be addressed to the period of 2000-2004. Agreement was achieved on the content of a community consensus product, such as maps/data of seasonal averages of selected major ions. It is expected that the ongoing work on the Assessment will be finalized by the end of 2010.

WCRP research observations

29. A third meeting of the WCRP Observations and Assimilation Panel, which is at present co-sponsored by GCOS, took place in Boulder, USA, on 29 September–1 October 2008. It made a number of significant recommendations on the climate observations and data processing, which are summarized in its report available online on the WCRP Website. Specifically, WOAP drew attention to the possible intermediate-term gap in the monitoring of profiles of ozone and related species. WOAP expressed its support for the re-manifestation of the climate instruments on NPOESS. WOAP recommended the development of a mechanism to ensure adequate

consideration of climate data requirements for operational data collection and archival activities. After the upgrade of International Satellite Cloud Climatology Project (ISCCP) to climate data record quality, WOAP recommended to continue the record in an operational mode into the future. The transfer of this system from research to operations is appropriate and could be a model for other data sets in the future. WOAP encouraged the relevant agencies to ensure that the research community maintains a role in the scientific oversight and evaluation of ISCCP products after the transfer in 2010.

30. In 2007, the WCRP Global Energy and Water Cycle Experiment (GEWEX) merged two of its three major components, the Coordinated Enhanced Observation Period (CEOP) and the GEWEX Hydrometeorology Panel (GHP) into the new Coordinated Energy and water cycle Observations Project (CEOP). Former GEWEX Continental Experiments have evolved into more comprehensive Regional Hydroclimate Projects (RHPs). The Climate Prediction Program for the Americas (CPPA) serves as a regional CEOP RHP. It is a competitive research programme to improve operational intraseasonal to interannual climate prediction and the hydrological applications. It is an integrated programme that combines the former GEWEX/GAPP and CLIVAR Pan American Climate Studies (PACS). CPPA is sponsored by the US National Oceanic and Atmospheric Administration (NOAA) Climate Program Office. The new CEOP also includes groups focused on cold regions, high elevations, monsoon, and semi-arid regions. CEOP now adds global, regional, and land surface model studies, and the Hydrologic Applications Project to show not only their capability to simulate the present climate but also to predict it at seasonal timescale and be useful for global change assessments in some of the RHPs. CEOP data policy allows sharing of in situ reference site data, model output data and satellite data. CEOP data is already open to outside groups. Archiving of the reference stations is taking place at the Earth Observing Laboratory of the National Center for Atmospheric Research (USA). Continuing support data archival by NCAR EOL is essential for the success of CEOP and the water and energy balance studies.

Terrestrial

31. The urgent need for the establishment of a framework to develop standards for terrestrial climate-related observations has been recognized by the GCOS, GTOS and Cg-XV. In a paper submitted by GTOS to the UNFCCC SBSTA-29 in 2007, options for such a framework were proposed, and WMO and FAO have jointly decided to favour the establishment of a terrestrial committee, following the ISO approach, recognizing the GCOS/GTOS Terrestrial Observation Panel for Climate (TOPC) as a technical expert group. In this connection, a formal working arrangement has been agreed between WMO and the International Organization for Standardization (ISO), through which WMO would be recognized as an International Standardizing Body by ISO.

Cryosphere

32. A major achievement of the WCRP Climate and Cryosphere Project is associated with the completion in 2007 of the report of the IGOS Theme on Cryosphere, which, along with the IPY 2007-2008, inspired Cg-XV in May 2007 to support the proposal of Canada that WMO create a Global Cryosphere Watch (GCW). The GCW is seen as a framework and service for implementing the IGOS Theme on Cryosphere, developing cryospheric observations, providing authoritative cryosphere data products and information, the means to predict the future state of the cryosphere over a wide range of time and space scales, and for facilitating assessment of changes in the cryosphere and their impact on climate. An ad hoc expert group is being established to explore the possibility of creating such a global system as an important part of IPY legacy, and prepare recommendations for its scope and ways of implementation. The Environment Canada seconded a cryospheric expert Dr Barry Goodison to the WMO Secretariat to lead the feasibility study on a WMO GCW and lead the ad hoc group. A report on the GCW feasibility and progress is expected at the EC-LXI in June 2009.

Future development of GEOSS

33. WMO participated in the GEO-V Plenary session in Bucharest in November 2008. The key issues discussed at the session included: the preparation of a new GEO Work Plan for 2009-2011; the development of a new "Strategic Targets" document for 2015 to replace the former targets in the 10-year Implementation Plan; the development of a new "Monitoring and Evaluation framework for GEOSS"; and the continuation of the work on a white paper on "Data Sharing Principles". The WMO continues to play an active role in GEOSS leading and /or participating in over 30 Work Plan Tasks.

Implementation of WIGOS concept

34. The first session of the Subgroup on the WMO Integrated Global Observing System (EC-WG/SG-WIGOS-1) of the Executive Council Working Group on the WMO Integrated Global Observing System (WIGOS) and the WMO Information System (WIS) was held at the WMO Secretariat in Geneva, Switzerland, from 10 to 13 November 2008.

35. The main attention of the SG-WIGOS was focused on the role, scope, time frame, objectives and status of implementation of WIGOS Pilot and Demonstration Projects and their potential input for the update of CONOPS and WDIP; on the elaboration of the WIGOS Integration Levels; and on a review of needs and potential problems of WMO co-sponsored observing systems.

36. For each WIGOS Project, a detailed Implementation Plan and Project Team Work Plan should be available to the WIGOS Project Office for planning required support and resources, and monitoring activities planned. It was recommended that details of the activities planned under each WIGOS Project together with the action schedule should be specified and available at WIGOS Website (http://www.wmo.int/pages/prog/www/wigos/index_en.html).

37. SG-WIGOS agreed that current process of implementing the WIGOS concept should be focused on test-of-concept phase, building on development and implementation Pilot and Demonstration Projects initiated by technical commissions and NMHSs respectively.
