

WORLD METEOROLOGICAL ORGANIZATION

**RARS IMPLEMENTATION GROUP (RARS-IG)
AND
IGDDS IMPLEMENTATION GROUP (IGDDS-IG)**

JOINT 4th MEETING

GENEVA, SWITZERLAND

22-24 March 2010

FINAL REPORT



EXECUTIVE SUMMARY

The fourth sessions of the Regional ATOVS Retransmission Service (RARS) Implementation Group and of the Integrated Global Data Dissemination Service (IGDDS) Implementation Group were held as a joint meeting on 22 to 24 March 2010 at the WMO Headquarters in Geneva, Switzerland.

Significant progress was recorded in the implementation of the RARS network, as summarized in the table below which indicates the number of operational stations providing data over the GTS, and the resulting coverage as a percentage of the globe's surface. A particular achievement highlighted by the meeting was that since June 2009 all RARS data were transmitted in GTS bulletins in accordance with the agreed coding convention. New stations in Chile (Santiago), France/Indian Ocean (Saint Denis de la Reunion), Oman (Muscat), Russian Federation (Moscow) and the USA (Miami and Hawaii) had contributed to significantly extend the coverage as summarized below.

| RARS Network | Stations in January 2009 (% coverage) | Stations in January 2010 (% coverage) | Stations end of March 2010 (% coverage) | Planned at end of 2010 (% coverage) | Planned at end of 2011 (% coverage) | Potential stations (% coverage) |
|------------------------|---|---|---|---|---|---|
| EARS | 10 stations 23% | 13 stations 31% | 15 stations 35% | 17 stations 41% | 19 stations 44% | 21 stations 49% |
| Asia-Pacific | 14 stations 28% | 15 stations 28% | 15 stations 28% | 16 stations 30% | 17 stations 33% | 20 stations 35% |
| South America | 5 stations 10% | 6 stations 11% | 6 stations 11% | 9 stations 15 % | 14 stations 16% | 16 stations 19% |
| Overall network | 29 stations 61% | 34 stations 70% | 36 stations 73% | 42 stations 78% | 50 stations 85% | 57 stations 92% |

Table 1: Global RARS network implementation indicators.

The meeting reviewed the Project Plan for the Extension of the RARS Network to Include Advanced Sounders. It identified a network of potential X-band stations and took action towards defining the processing architecture for hyperspectral sounding data.

The meeting reviewed the progress of IGDDS DVB-S dissemination components including EUMETCast, FENGYUNCast, MITRA. It was also informed on GEONETCast and its American component, GEONETCast Americas as well as ISCS and NOAAPORT. It commended EUMETSAT for the Earth Observation Portal, which provides a convenient user interface to the EUMETSAT catalogue in accordance with relevant WIS standards. An update was provided on Direct Broadcast capabilities of NOAA actual and future systems and of the COMS satellite to be launched shortly, and on the approach to Internet distribution of Himawari-8 data.

The meeting was also informed of the satellite data requirements gathering performed in RA III and RA IV, and the ongoing actions to address these requirements. It encouraged similar actions that are under consideration for RA I and RA V.

An open discussion was held on the strategic goals of the IGDDS initiative and the related priorities, taking into account the outcome of ET-SUP-5. Actions were taken to review the IGDDS Implementation Plan accordingly with a view to better delineate recommended strategic guidelines, on one hand, and implementation priorities, on the other hand.

MEETING REPORT

1. INTRODUCTION

Ms Barbara Ryan, Director of the WMO Space Programme, opened the fourth meeting of the RARS and IGDDS Implementation Groups and welcomed the participants (See Annex I). She pointed out that ET-SUP-5, which had met the preceding week, had stressed the importance of improving accessibility of satellite data and products worldwide. She also recalled that the WMO Integrated Observing Systems (WIGOS) and WMO Information Systems (WIS) provided a clear guidance towards increased interoperability through standardization of data management and distribution practices. Finally, she invited the Implementation Groups to focus on improving the service to the users in a simple and pragmatic way.

The Secretariat invited the participants to nominate a Chairperson for this meeting. Richard Francis, United Kingdom, was unanimously nominated Chairperson.

2. STATUS OF THE GLOBAL RARS NETWORK

2.1 Status of EARS

Anders Soerensen presented an update on the EUMETSAT Advanced Retransmission System (EARS) which includes not only ATOVS data retransmission but also AVHRR and ASCAT data retransmission from a subset of stations. EUMETSAT has registered more than 700 users for EARS/ATOVS, more than 900 for EARS/AVHRR, and more than 300 for EARS/ASCAT.

The ATOVS service involves 15 HRPT stations: eight of them are complying with the 30 mn timeliness requirement, four are between 30 and 45 mn, one is above 45 mn and two are still in test mode. The EARS ATOVS product suite includes ATOVS Level 1a in AAPP format, ATOVS Level 1c in BUFR, and AVHRR Level 1d on HIRS grid in BUFR. In order to optimize the overall EARS operation a set of core stations are following a planned acquisition schedule, while the other stations are following agreed priorities as far as possible depending on their availability. Details of participating stations are in Annex III.

The AVHRR service involves six stations. Thanks to a centralized data selection based on data quality and “on the fly” one-minute segments retransmission, AVHRR Level 1 data are delivered within 15 minutes from acquisition.

The ASCAT service currently relies on Fast Dump Extract Service data acquired in Svalbard only. Data are processed to Level 1b in Darmstadt then to Level 2 at KNMI, in order to deliver Ocean Surface Winds in BUFR format.

Anders Soerensen also reported on ongoing developments for retransmission of IASI data, and on mitigation activities for the Metop-A Direct Broadcast, which can only be activated over a portion of the globe for technical reasons. The future Antarctic Data Acquisition station, with the use of data segmentation, should enable retransmission with 15 minutes timeliness. Metop-B, to be launched in 2012, should have full HRPT service.

Action RARS-IG-4.01: RARS-IG values the contribution of stations in Miami, St Denis and Ewa Beach that provide significant addition to the global RARS coverage, and encourages the involved parties to seek technical ways to further improve the timeliness towards the goal of 30 minutes. EUMETSAT to report at the next meeting. (Due date: RARS-IG-5)

2.2 Status of the Asia-Pacific RARS

Anthony Rea reported on the status of the Asia-Pacific RARS (AP-RARS) on behalf of the AP-RARS partners. The AP-RARS involves 15 HRPT stations from Australia; China; Hong Kong, China; Japan; New Zealand; Republic of Korea and Singapore, with two processing and distribution centres:

Tokyo and Melbourne. AP-RARS data are used by a number of NWP centres including ECMWF, UKMO, JMA and Bureau of Meteorology. Details of participating stations are in Annex III.

JMA is performing timeliness monitoring for all AP-RARS sites. This information used to be available on the JMA website and its status will be investigated. The quality monitoring is performed globally by the EUMETSAT NWP-SAF (See 2.4). An AP-RARS website is now available:

<http://www.bom.gov.au/weather/satellite/RARS/index.shtml>

A new HRPT station implemented in Fiji is expected to join the AP-RARS at some stage, but no firm plan is agreed yet with Fiji Meteorological Service (FMS). The potential contribution of HRPT stations operated by the USA in Marshall Islands and Guam is also under consideration, but no reply was received yet from the USA on this issue.

A. Rea also reported on the upgrade of Australian sites (Darwin, Melbourne, Perth, Townsville) with X-Band reception for NPP and NPOESS, following a Pilot Project with Aqua/Terra AIRS data.

Action RARS-IG-4.02: WMO SP to contact the Fiji Met Service in order to investigate issues and possible way forward to integrate Fiji in the Asia-Pacific RARS. (Due date: May 2010)

Jae-Dong Jang provided further details on the new receiving station located at the National Meteorological Satellite Centre (NSMC) of KMA in Jincheon, Korea, which replaces the Seoul station in the AP-RARS. It was noted that Seoul is still operated and serves as a back-up.

2.3 Status of the South American RARS

Ms Gloria Pujol reported on the component of the South American RARS supported by Argentina, which currently involves three stations. Córdoba and Marambio (Antarctica) stations have been contributing to the RARS since 2008. Santiago, Chile has joined the RARS in January 2010. The next planned extension is Cotopaxi, Ecuador. A station in Punta Arenas is under consideration but faces telecommunication bandwidth limitations. It was indicated that Córdoba, Santiago and Cotopaxi had X-Band receiving capability. The Implementation Group noted the excellent reliability figures of the three current stations. Data are sent via FTP by CONAE to the RTH Buenos Aires and forwarded to RTH Washington for onward distribution over the GTS.

In order to alleviate bandwidth limitations, the meeting discussed the possibility to extract ATOVS data without AVHRR information, and to process the data remotely, e.g. in Córdoba instead of Marambio. It was clarified that in order to run AAPP without AVHRR data, the corresponding data should be formally included but set to zero. In case of telecommunication limitations, a trade-off should be made between timeliness and comprehensiveness of the information (declouding information). There is a need to confirm users' requirements in this respect.

Action RARS-IG-4.03: WMO SP and EUMETSAT to seek feedback from the NWP community at ITSC-17 to have better knowledge of, e.g. who the users are, and whether data is still valuable in case the cloud information is not available. (Due date: April 2010)

Sergio Pereira reported on the Brazil component of the South American RARS, which involved three operational stations located in Cachoeira Paulista, Cuiabá and Brasília, with plans to add Natal and Fortaleza in the course of 2010, and Manaus and Boa Vista later on. Data are processed centrally, in Cachoeira Paulista, to Level 1c BUFR files and delivered within 30 minutes in at least 95% of the cases. Since October 2008, RARS files are sent by INMET to the RTH Washington for onward distribution over the GTS. The addition of the CDPI station in Caracas, Venezuela is under consideration.

Action RARS-IG-4.04: WMO SP to contact Venezuela about possible inclusion of the CDPI Caracas station (Responsible: Freddy Flores) in South America-RARS. (Due date: May 2010)

2.4 RARS Operations Monitoring and Software Issues

Richard Francis summarized the changes in the operational monitoring of RARS data since RARS-IG-3, and the developments of the AAPP software package completed in this period. These two functions are performed by the UK Met Office in its role as the lead partner of the EUMETSAT Satellite Application Facility (SAF) for Numerical Weather Prediction (NWP).

It was reported that all RARS stations are now using BUFR edition 4 and all have successfully adopted the agreed numbering of data categories and sub-categories. In addition, all stations are using the correct sub-centre IDs, bulletin headers and file names. This represents significant progress since RARS-IG-3 and was noted by the group with satisfaction.

A summary of the current status of the contributing polar orbiting satellites (NOAA-15 through 19 and Metop-A) was then presented. Almost all have suffered some instrument degradation or other anomalous behavior since RARS-IG-3 to a greater or lesser extent. Nevertheless many RARS stations are tracking them and successfully generating RARS data from them all. A notable exception, at least for the AP-RARS and SA-RARS, is Metop-A for which the HRPT Direct Broadcast is still only available for some of the stations of the EARS-ATOVS network. EUMETSAT have discussed with their Member States the possibility of increasing the area within which HRPT is switched on but this would depend on the continued availability of other satellites in the morning orbit (most notably NOAA-17) and on assessment of the increased risk of a total HRPT failure that this would represent.

Four new stations have been added since RARS-IG-3: Casey, Antarctica (AP-RARS, added in June 2009); St Denis, La Reunion (EARS, Sept 2008); Santiago, Chile (SA-RARS, Jan 2010) and most recently Moscow, Russian Federation (EARS, Feb 2010).

The AAPP software package has undergone four updates since RARS-IG-3, the latest of which, version 6.12, was released on 25 Feb 2010 and represents a major advance. This latest version will support the upcoming EARS-IASI service pilot phase, including the selection and processing of a subset of spectral channels (366 channels) along with 290 Principle Component scores. This important advance is fundamental to the introduction of a first inclusion of advanced sounder data in a RARS network.

Finally, future planned changes were briefly described, including development of a monitoring capability for the EARS-IASI service pilot phase and the development of version 7 of AAPP, to include the pre-processing of ATMS and CrIS data from NPP.

The NWP SAF RARS monitoring page URL is:

http://research.metoffice.gov.uk/research/interproj/nwpsaf/ears_report/monitor.html.

The Implementation Group acknowledged the role of the NWP SAF in support of the RARS network, and, in particular the very helpful assistance of Nigel Atkinson on AAPP issues.

3. OVERALL RARS GEOGRAPHICAL COVERAGE

Jérôme Lafeuille presented the updated coverage figures of the RARS network (Table 1).

| RARS Network | Stations in January 2009 (% coverage) | Stations in January 2010 (% coverage) | Stations end of March 2010 (% coverage) | Planned at end of 2010 (% coverage) | Planned at end of 2011 (% coverage) | Potential stations (% coverage) |
|----------------------|--|--|--|--|--|------------------------------------|
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| | | | | | | |
|------------------------|--------------------|--------------------|----------------------------------|--------------------|--------------------|--------------------|
| Overall network | 29 stations 61% | 34 stations 70% | 36 stations 73% | 42 stations 78% | 50 stations 85% | 57 stations 92% |
|------------------------|--------------------|--------------------|----------------------------------|--------------------|--------------------|--------------------|

Table 1: Global RARS network implementation indicators.

The overall coverage is progressing well towards the goal of 90% with, however, two main gap areas over the central Pacific, and over the Southern Atlantic and Africa respectively, as can be seen in Figures 1 and 2 below.

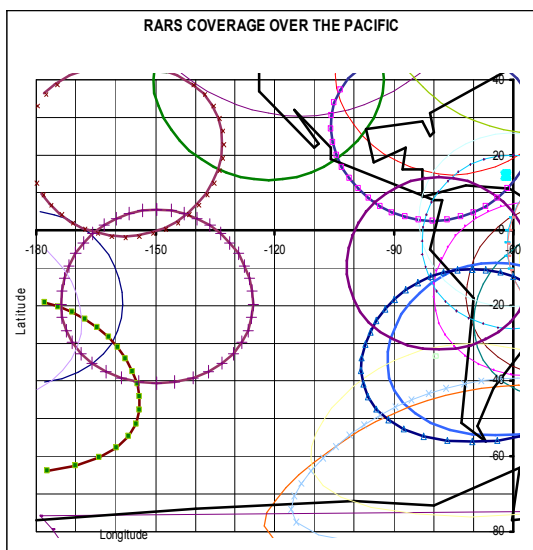


Figure 1: RARS coverage over the Pacific, showing a gap between the acquisition areas of (clockwise): Maupuia, Tahiti, Ewa Beach, Monterey, Miami, Cotopaxi, Santiago and Marambio.

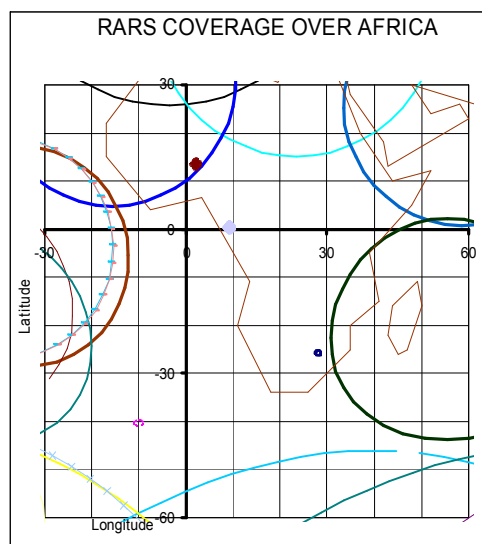


Figure 2: RARS coverage over Africa and the Atlantic, showing a gap between the acquisition areas of (clockwise): Cachoeira Paulista, Natal, Maspalomas, Athens, Oman, Reunion and Siowa.

The Implementation Group reaffirmed the priority to be given to new locations that would expand the coverage, in particular over oceanic areas, such as Fiji, Noumea and/or Tahiti, as well as Africa.

Action RARS-IG-4.05: WMO SP to update the “Status and plans of RARS HRPT stations“, resulting coverage statistics, and maps (with assistance of Anders Soerensen). (Due date: April 2010)

Action RARS-IG-4.06: Brazil (INPE) and Argentina (SMN and CONAE) to investigate possible cooperation with Chile (DMC) towards the implementation of an HRPT station in Isla de Pascua, Chile and its inclusion in the South America RARS to reduce the gap over the Pacific. Brazil and Argentina to report at the next meeting. (Due date: RARS-IG-5)

Action RARS-IG-4.07: EUMETSAT to further investigate possibility of cooperation with CLS-Argos towards the implementation of an HRPT station in Libreville, Gabon and its inclusion in EARS. (Due date: June 2010)

Action RARS-IG-4.08: Richard Francis to explore opportunities for cooperation between UK Met Office and SAWS that could facilitate inclusion of a South African HRPT station (e.g. Pretoria) in the RARS. (Due date: April 2010)

It was underlined that AP-RARS and SA-RARS stations were not processing Metop data, since AHRPT was only operated on Metop-A over a limited part of the globe. Full operation of AHRPT is expected with Metop-B, to be launched in 2012. Metop being the primary operational satellite in the morning orbit, it was stressed that all RARS station operators should prepare for receiving AHRPT from

Metop-B. It was noted that the four Australian stations as well as Kiyose, Jincheon, Cachoeira Paulista, Cuiabá, and Córdoba, were designed to receive Metop AHRPT but this had to be tested. Some test campaign could be envisaged with Metop-A.

Action RARS-IG-4.09: Operators of RARS stations which are not currently equipped for acquisition of Metop data (for instance Santiago, Marambio, Beijing, Urumqi, Guangzhou, ...) are encouraged to take steps to be ready for Metop-B, to be launched early 2012. (Due date: RARS-IG-5)

Action RARS-IG-4.10: EUMETSAT to consider a test activation campaign of Metop-A AHRPT over an extended area including the Asia-Pacific, allowing current Metop receiving capabilities to be tested in advance of Metop-B. EUMETSAT to report at the next meeting. (Due date: RARS-IG-5)

4. RARS DATA DISSEMINATION ISSUES

4.1 Update on RARS Data Representation and Coding

The Implementation Group was glad to note that all operational RARS stations had successfully implemented the agreed coding convention, as described on the RARS website: <ftp://ftp.wmo.int/Documents/PublicWeb/sat/Projects/RARS-Coding-summary.xls>

4.2 RARS Data Dissemination via GTS and Other Means

It was clarified that the “CCCC” code in GTS Bulletin headers was related to the “originating centre” injecting the data on the GTS. Thus the future data from Cotopaxi, Ecuador would be labeled “SABM” like Santiago, Chile since they are handled by Buenos Aires.

5. RARS EXTENSION TO ADVANCED SOUNDING MISSIONS

Richard Francis introduced the subject by firstly recalling the discussions at RARS-IG-3 and the subsequent drafting of a Project Plan for the Extension of the RARS Network to Advanced Sounders (<http://www.wmo.int/pages/prog/sat/documents/RARS-X-projectplan.pdf>). This plan focused on the ATMS and CrIS instruments planned for NPP and later for NPOESS. R. Francis highlighted new uncertainties on the schedule and precise definition of these future satellites because of the restructuring of the NPOESS Program, which is now split into a Joint Polar Satellite System (JPSS) on the afternoon orbit and a defense weather satellite system on an early morning orbit. While it is expected that the JPSS will be NPP follow-on, there is still no indication on the payload and Direct Broadcast data access possibilities of the early morning orbit component, under the responsibility of DoD. Nevertheless, the project to extend the RARS to NPP and its successors should proceed in accordance with the plan until and unless substantive changes to the assumed baseline were announced.

The Project Plan foresees a number of activities that are necessary before an extended RARS can be implemented, including:

- An interaction with users to make them aware of the new service concept and a discussion with them to agree their requirements;
- The upgrade to reception stations (those that are not NPP-ready);
- An upgrade to communication link capabilities as necessary;
- An optimizing of the data processing and data collection architecture;
- The development of appropriate instrument data processing software packages;
- An update to the RARS Operator Standards.

In mid-2009 the NWP SAF was asked to contact European NWP centres and request their inputs to the requirement gathering process. Responses were received from the UK Met Office, ECMWF, SMHI, DMI, Met Norway and Meteo France. The responses included the following stated preference:

- All centres would prefer data sets encoded using BUFR;
- They would prefer radiance data assigned to an instrument grid (equivalent to Level 1c);
- All centres would prefer to receive native sampling for ATMS data (they would do their own pre-processing (e.g. spatial averaging, re-mapping) if necessary);
- They would prefer CrIS data at full spatial resolution and, if full spectral resolution would not be possible (as is almost certain), they would accept a channel sub-set (perhaps with PC scores as currently envisaged for the EARS-IASI service).

Several other inputs that might have a bearing on the project planning were then described. These included the following:

- BOM and INPE have started pilot studies using AIRS data and so any relevant experiences from these initiatives should be considered;
- Level 1 processing for NPP Direct Broadcast users (X-band reception systems) will be using the NASA International Polar Orbiting Processing Package (IPOPP), an early release of which is undergoing testing at several establishments;
- The definition of a version of the BUFR tables for ATMS and CrIS data has been developed by NOAA based on a channel sub-set of CrIS data (although not incorporating PC scores as yet);
- Experience gained from the EARS-IASI service pilot phase will be important to take account of for extending RARS;
- The inclusion of FY-3 data could already be considered for RARS (a pre-processing software package is available from CMA) and, in the future when the FY-3 sounder capability is enhanced (probably from FY-3D onwards), then this satellite could be a useful contributor to the extended RARS.

Finally, the next steps as described in the Project Plan were outlined, including:

- Consideration of an initial set of potential participating stations (taking account of what is already known of their X-band reception capability);
- Consideration of an initial definition of the data processing architecture;
- Consideration of the communication needs (which to some extent is dependent on decisions of the chosen architecture).

Anders Soerensen informed the meeting that EUMETSAT was developing a EARS/IASI service and was investigating options for extending EARS to supporting future satellites including NPP, NPOESS, FY-3.

The meeting emphasized that there was a rapidly changing environment both on the space segment and the ground segment, and that the project should be focused on delivering outcomes with the most clearly assessed benefit. For NWP, the impact of improving timeliness depends on the cut-off for either the main run or the later update. Some impact studies have been made by NWP centres (BOM, KMA, probably others).

As concerns receiving sites, the Implementation Group agreed that the project should rely as far as possible on existing resources and reviewed the list of RARS sites currently equipped, or planned to be equipped, with X-Band receiving capability in 7.8 GHz (Annex A.2 of the Project Plan). The updated list includes: Lannion, Moscow, Khabarovsk, Novosibirsk, Oman, Gander (TBC), Edmonton (TBC), Cachoeira Paulista, Cuiabá, Córdoba, Santiago, Melbourne, Darwin, Perth, Casey (with communication limitation), Townsville, Kiyose, Jincheon, Beijing, Guangzhou, Urumqi, Maupuaia, Singapore. (See Annex IV).

As concerns the processing architecture, the Implementation Group considered that the baseline for RARS-NPP should be on-site processing using IPOPP. The use of "Simulcast" was thought to be inadequate because it is not optimized for timeliness and relays all the data without selection. There is a need for active optimization of acquisition and data transfer, as is the case in the EUMETSAT EARS-

AVHRR service; in order to make such a coordinated approach applicable in different computer environments, it was suggested to use the concept of "Virtual Machines". The Implementation Group agreed that pilot activities on AIRS and IASI should be evaluated before adopting any particular strategy. The following actions were agreed:

Action RARS-IG-4.11: EUMETSAT, in cooperation with NWP SAF, to demonstrate the possibility to deliver an AAPP package to "virtual machines". (Due date: June 2010)

Action RARS-IG-4.12: EUMETSAT, in cooperation with EARS-IASI partners, to demonstrate the removing of overlap among EARS-IASI data from adjacent EARS stations, as a possible model for the extension of RARS to advanced sounders. (Due date: February 2011)

6. RARS USER INFORMATION

6.1 User Interaction and Outreach Issues

Jérôme Lafeuille recalled the previous decision to give visibility to the RARS project through the International TOVS Study Conferences (ITSC) and informed the meeting that a poster on RARS would be presented on behalf of the RARS Implementation Group at the 17th ITSC (ITSC-17, Monterey, CA, USA, 14-20 April 2010). The outline of the Poster had been circulated for review. The final version of the poster is attached as Annex V.

6.2 WMO RARS Website

The WMO RARS web pages are available at: <http://www.wmo.int/pages/prog/sat/RARS.html>. Diagrams will be updated in accordance with the latest RARS network status. It was suggested to illustrate the RARS coding conventions by practical examples.

6.3 Individual RARS Websites

The individual RARS websites were recalled:

- EARS:
<http://www.eumetsat.int/Home/Main/Satellites/GroundNetwork/EARSSystem/index.htm?l=en>
- Asia-Pacific RARS (BOM): <http://www.bom.gov.au/weather/satellite/RARS/index.shtml>
- Asia-Pacific RARS (JMA): <http://mscweb.kishou.go.jp/rars/index.htm>
- NWP-SAF:
http://research.metoffice.gov.uk/research/interproj/nwpsaf/ears_report/monitor.html

It was noted that access to the NWP-SAF monitoring pages is no longer subject to registration.

7. SUMMARY OF RARS-RELATED ACTIONS

7.1 Status of RARS actions from previous meetings

One action was outstanding from the first meeting: "*Action RARS-IG-1.3 part b): For files that only contain RARS data, to start implementing the WMO Core Profile of the ISO Metadata standard (version 1.0 adopted by CBS Ext.(06)), and to contribute to the further development of these standards, in particular through the Inter-Programme Expert Team on Metadata Implementation.*"

EUMETSAT confirms that the product navigator is the source of metadata. It describes all EUM data resources, compatible with ISO 19115/19139 standards and the EU INSPIRE directive http://www.eumetsat.int/Home/Main/Access_to_Data/ProductNavigator/index.htm; INPE has also implemented these changes. BOM and Argentina have planned to do so.

The action seems on a good track but its full implementation should be checked, when the first Data Collection or Production Centres (DCPC) and Global Information System Centres (GISC) will be implemented on a pilot basis in the context of the WMO Information System (WIS). This could be done by Argentina (SMN and CONAE), Australia (BOM, also acting for New Zealand, Singapore, Hong Kong), Brazil (INPE in collaboration with INMET), China (CMA), Japan (JMA) and Korea (KMA) for their respective products. The action is therefore CLOSED, and replaced by a new action:

Action RARS-IG-4.13: The RARS operators and regional or sub-regional RARS network coordinators to check that the RARS products are listed and described with proper metadata in the relevant WIS DCPC and GISC catalogues. (Due date: RARS-IG-5)

One action was outstanding from the second meeting: *“Action RARS-IG-2.11: BOM to review their proposed website for compliance with the RARS Operator Standards, EARS and WMO websites, and to propose an update for propagation to other RARS operators. Due date: end-July 2008.”* The website developed by BOM largely complies. There is no plan for propagation at present, but this is not seen as a priority. The action is therefore **closed**.

All actions from the third meeting have been completed and can be **closed**, noting the following comments:

- Regarding Action RARS-IG-3.1, a letter was sent by WMO on 29 September 2009 to the Permanent Representative of the USA about the potential inclusion of HRPT stations in Guam and the Marshall Islands within the RARS network, but no response was received so far.
- Regarding Action RARS-IG-3.3, the two HRPT stations located in Edmonton are physically closed and serving as back-up to each other; they will share the same identifiers.

The Chairman expressed his appreciation of the good progress made as all previous actions had been successfully completed and closed.

7.2 Summary of outstanding and new actions

The actions discussed under item 1 to 7.1 above were reviewed and agreed. The consolidated list of RARS related actions is contained in Annex VIII.

This concluded the first part of the meeting, dedicated to RARS. The second part of the meeting was dedicated to IGDDS issues.

8. IGDDS DVB-S SERVICES AND GEONETCAST

8.1 IGDDS Standards for DVB-S Dissemination Services

Jérôme Lafeuille firstly clarified that there had been an evolution along the years in the concept of the Integrated Global Data Dissemination Service (IGDDS). The initial scope of IGDDS was to respond to the request of EC-LVI *“to consider an IGDDS that builds on the “Alternative Dissemination Methods” concept and is central to the vision of an integrated space-based component of the GOS”*. In the context of the WIS, the scope of IGDDS was then widened to ensure that space-based observation data and products would be handled in an integrated manner with the other (non-space) data. Furthermore the so-called “ADM” (i.e. the use of DVB-S services) should not exclude other means such as Direct Broadcast or Internet. In summary, **IGDDS is now addressing the whole circulation scheme of satellite data and products within the WIS, in compliance with WIS standards, with an overarching goal to enhance data access by WMO Members**. Achieving the dissemination of satellite data and products worldwide by DVB-S services remains a core objective of IGDDS, without being limitative.

Jérôme Lafeuille then recalled the DVB-S Operator standards, adopted in April 2009, which are addressing the following topics:

- Architecture;
- Functionalities, redundancy/robustness;
- Format, file naming and metadata (WIS conventions);
- User consultation, requirements gathering;
- Reception terminals, software;
- Publication of service information;
- User Support;
- Maintenance;
- Reporting.

Each DVB-S operator had therefore been invited to report on its service with reference to these topics. It was agreed to develop a table summarizing the characteristics of current and planned DVB-S services of relevance to the IGDDS, based on the information shared at the meeting. This table is provided as Annex VI of the present report.

8.2 EUMETCast Status and Plans

Lothar Wolf reported on EUMETCast status and plans. He indicated that EUMETCast was part of a wider dissemination system comprising also RMDCN (point-to-point GTS network in Europe), Internet and DANTE (for bi-lateral non operational data exchange) links. He highlighted the dramatic increase of dissemination data rates resulting in new missions: MTP (0.166 Mbps), MSG (3 Mbps), EPS (8 Mbps), Sentinel 3 (~30 Mbps), MTG (~ 80 Mbps), EPS 2G (~90 Mbps), which requires highly efficient and flexible dissemination technologies.

EUMETCast includes three services: a Ku-Band service covering Europe; a C-Band service covering Africa, Caribbean region and western Asia; and a C-Band service covering the Americas. The EUMETCast system level availability is around 99.99% (99.5% guaranteed) with mission related timeliness. The data contents include a number of EUMETSAT mission data and products and third-party meteorological and environmental data (recent inclusion of the French RETIM service). More than 3500 EUMETCAST stations are registered. Meteosat, NOAA and Metop imagery represents the most popular product category with between 1000 and 2000 users registered for each of these products. User consultation is performed on a regular basis through representatives of the EUMETSAT Member States. Another user consultation mechanism is being implemented with the African community. EUMETSAT is planning to migrate to the DVB-S2 standard within two years, which will allow a dynamic increase of the actual data rate, and would imply the use of larger antenna dishes.

8.3 FENGYUNCast Status and Plans

Lui Jian reported on the plans for the new FENGYUNCast¹ that will merge the two DVB-S dissemination systems of CMA: the current FENGYUNCast for satellite data, operated so far by the National Meteorological Satellite Centre (NSNC), and the system used to disseminate meteorological observations and forecast, operated so far by the National Meteorological Information Centre (NMIC). The new service will use an entire 36 MHz bandwidth transponder in C-Band, allowing up to 70 Mbps effective data rate in DVB-S2 standard. The new FENGYUNCast¹ will be operated by CMA/NMIC, the uplink will be at the Beijing ground station of NSMC, and will use the Asiasat-4 satellite.

Receiving will be possible with on-the-shelf equipment together with a USB key containing the decryption software, with prior registration and authorization. Migration to the new FENGYUNCast¹ is planned for the end of 2010.

In terms of satellite data, the system is expected to broadcast data from FY-2, FY-3, Aqua/Modis and Meteosat. The data contents may be reviewed depending on data policy arrangements and user requirements.

¹ The official name of the new FENGYUNCast service is now "CMACast".

8.4 MITRA Status and Plans

A brief report on MITRA was presented by the WMO Secretariat on behalf of Dzhilil Akhtyamov. The meeting noted that MITRA is a DVB-S dissemination service in C-Band (3.675 MHz). It involves three satellites (Express AM1, Express AM33, Express AM3) located at 40°E, 96.5°E and 104°E respectively in order to cover the whole Russian Federation and the Community of Independent States. Special attention is paid to robustness through: (i) Redundant transmission among the three spacecraft; (ii) Forward Error Correction (FEC) coding; (iii) Peer-to-peer recovery of missing data. MITRA has more than 300 registered users across the Russian Federation and neighbouring countries. A permanent technical support service is available in the Russian language.

MITRA has developed a “hot folder” approach allowing specific user groups to become a virtual broadcaster and to submit products via FTP to the MITRA operator for dissemination to the members of the group.

The report raised the attention of the IGDDS Implementation Group to the issue of interference with Broadband Wireless Access (BWA) systems, including the WiMAX technology. While C-Band is not subject to meteorological conditions, it is increasingly affected by interference with e.g. radar or BWA systems, which requires specific mitigation measures such as narrow-band filters.

8.5 NOAAPORT and ISCS Status and Plans

Paul Seymour reported on the NOAAPORT, also known as the Satellite Broadcast Network (SBN) of NOAA, which is the primary vehicle by which hydrometeorological products are provided to the field offices of the National Weather Service (NWS) and their “AWIPS” systems. NOAAPORT is a DVB-S system operated in C-Band, which delivers approximately 10 Mbps of products in a number of formats including GRIB, BUFR, GINI, Radar Level 3, text etc. The system relies on SES-Americom located at 101°W, with a coverage area corresponding to North and Central America. NOAA is considering to expand the bandwidth in 2011-2013 and to migrate to DVB-S2 standard.

The meeting noted that NOAAPORT could be considered as an IGDDS component. It was clarified that a vast majority of NOAAPORT products were freely available to external partners; however NOAAPORT is to be used with AWIPS workstations, which is not a low-cost solution since it includes extensive processing capabilities.

Paul Seymour also reported on the International Satellite Communications System (ISCS) service, which is a VSAT dissemination service for meteorological and aeronautical operations in RA IV. Its current data rate is 128 kbps. Initially a two-way service, it will be limited to one-way dissemination as of April 2010 and until June 2012. NOAA is investigating different technical options for delivering a similar service beyond 2012.

The meeting pointed out the potential interest, for the users, of merging this service with other broadcast services operated in the same geographical area.

8.6 GEONETCast-America Status and Plans

Paul Seymour furthermore reported on GEONETCast-Americas (GNC-A), an environmental data dissemination system implemented by NOAA as a contribution to the Global Earth Observation System of Systems (GEOSS) of the Group on Earth Observations (GEO). GNC-A is a C-band DVB-S dissemination service with 2 Mbps bandwidth (with options to increase to 10 Mbps). It relies on Intelsat-9 spacecraft located at 58°W and covers North, Central and South America as well as the Caribbean region. GNC-A is offering a relatively low-cost access to environmental data produced by NOAA or other partners within the region (e.g. INPE, CONAE, SERVIR, etc). GNC-A is the NOAA component of the overall GEONETCast network described below.

The meeting noted that the system had a high flexibility allowing a number of regional partners to contribute in providing data or products, and was open to respond to regional requirements. A number of

actions were undertaken to engage users and providers in Central and South America. An alert channel is available, which could be very useful for some hazard warning applications.

8.7 GEONETCast Status and Plans

Paul Seymour introduced the global GEONETCast system on behalf of the GEONETCast Implementation Group including CMA, EUMETSAT, NOAA and WMO. He explained that GEONETCast is a near-global distribution system currently supported by three operators:

- CMA with its FENGYUNCast service covering Asia and part of the Pacific;
- EUMETSAT with its three EUMETCast services covering Europe, Africa, and the Americas and Caribbean region;
- NOAA with its GEONETCast-America service covering the Americas and Caribbean region.

He recalled the guiding principles of GEONETCast, which largely respond to the IGDDS principles (DVB-S dissemination to be received by off-the-shelf, relatively low-cost equipment, integrating data from multiple sources and formats, inter-regional data exchange, data discovery and subscription capability, user requirement consultation mechanism), however with the aim to serve not only WMO needs but virtually any GEOSS application requiring low-cost, timely and reliable data distribution. The meeting noted the recent inclusion of a training channel and an alert channel.

The meeting recommended that the IGDDS Implementation Group evaluate GEONETCast with respect to the IGDDS requirements in order to be able to advise both the GEONETCast Implementation Group and the WMO Members.

Action IGDDS-IG-4.1: WMO Space Programme to include on the agenda of IGDDS-IG-5 an evaluation of GEONETCast with respect to IGDDS requirements.

9. STATUS OF OTHER IGDDS DISSEMINATION CAPABILITIES

9.1 Evolution of Direct Broadcast

It was stated that, although DVB-S services are recommended as a cost-efficient way to integrate data from multiple sources into a single data stream, Direct Broadcast services have their own merits in particular for real-time acquiring data from non-geostationary spacecraft.

Jae-Dong Jang (KMA) introduced the dissemination plan of the new Communication, Ocean and Meteorological Satellite (COMS) of Korea, which is ready for a launch in June 2010. The Meteorological Imager (MI) will scan the whole disc every three hours, Asia every 15 minutes, and the Korean peninsula every eight minutes. Data will be disseminated in HRIT (3 Mbps) and LRIT (256 kbps TBC) in accordance with CGMS standards, within 15 minutes after acquisition. The meeting welcomed this information and congratulated KMA for this new contribution to the space-based observing system.

Paul Seymour presented NOAA's current and planned Direct Broadcast services for GOES and POES satellites. GOES currently supports GVAR, LRIT, and additional services such as DCS retransmission, Emergency Manager Weather Information Network (EMWIN), and Search and Rescue. There will be a change of GVAR format starting with GOES-14. The new generation starting with GOES-R in 2015 will provide a considerably enhanced dissemination capability, still at 1.7 GHz, with the "GVAR to GOES Rebroadcast" (GRB) service (31 Mbps) in addition to eGVAR (2.11 Mbps) ensuring continuity with current GVAR, and LRIT (increased to 400 kbps, including the EMWIN dataflow). POES satellites currently support HRPT and APT (analog, 137 MHz), in addition to DCS and Search and Rescue. As concerns the new generation following POES, the NPOESS baseline included HRD (20 Mbps, X-Band) and LRD (4 Mbps, L-Band) for both the afternoon and the early morning orbit; this baseline may be reviewed as part of the NPOESS programme restructuring. P. Seymour provided details on the Emergency Manager Weather Information Network (EMWIN), which is re-broadcasting products via GOES satellite transponders. The EMWIN is planned to migrate to a new generation in the middle of 2010, with a change of modulation and frequency and a doubled data rate.

Jérôme Lafeuille presented a synthesis of current and planned Direct Broadcast services (frequency and data rate), which was reviewed and updated by the meeting, as contained in Annex VII. He recalled that the Coordination Group for Meteorological Satellites (CGMS) has defined the HRIT/LRIT and AHRPT/LRPT dissemination standards for Direct Broadcast based on recommendations of the Consultative Committee on Space Data Systems (CCSDS). With the exception of APT on POES and MPT on FY-3, all Direct Broadcast services from operational satellites (HRIT, LRIT, AHRPT, LRPT, WEFAX, GVAR, S-VISSR...) are operated in L-Band, at 1.7 GHz. It was pointed out that future generations of geostationary and polar-orbiting meteorological satellites tend to use X-band, at 7.8 GHz, for high data rate dissemination services. These current or planned X-Band services are not supported by any CGMS agreed standard. The question is raised of the need and possibility of proposing a standard for these high data rate services. If relevant, an action should be initiated towards preparing a discussion at the next CGMS meeting.

Another candidate for harmonization is the inclusion of an EMWIN type of information in the low-rate dissemination of future missions. EMWIN is the Emergency Manager Weather Information Network, a low-cost information service dedicated to emergency managers and implemented in the current LRIT and future HRIT dissemination of GOES satellite series. Based on the successful experience of the USA in this respect, the possibility, cost and advantages could be investigated of implementing a similar service on other geostationary satellites under the coordination of CGMS.

9.2 Internet-based Dissemination

Toshiuki Kurino reported on JMA's dissemination services for MTSAT and follow-on spacecraft. He informed that HRIT and LRIT will continue to be operated via MTSAT-1R after the switch-over of acquisition to MTSAT-2 in July 2010. In addition, JMA will continue to provide JMA Data Dissemination System (JDDS) relying on landlines. The JDDS currently uses FTP over Internet and will evolve, in the context of WIS, to a Virtual Private Network (VPN). He indicated that the JDDS contains image data in JPEG and SATAID products particularly adapted to the needs of NMHSS in Pacific islands. JMA is determined to establish, maintain and update the imagery dissemination services to NMHSSs via Internet with user-friendly satellite products for Nowcasting, training and other activities. JMA is also willing to make available additional image sectors depending on user requirements.

For the next generation Himawari 8/9, JMA is planning to downlink data to two ground stations and ensure dissemination via a Wide Area Network (WAN). The Internet dissemination system will be upgraded beforehand to secure a smooth transition. The data will include 16-channel image data every 10 minutes in different forms:

- Level 1 data in standard format, e.g. netCDF;
- Reduced data (1km/4km, 10 bits) compatible with current MTSAT HRIT, in transition period;
- Reduced data (5 km, 8 bits) compatible with current MTSAT LRIT, in transition period;
- JPEG image sectors for users with limited bandwidth.

10. INTEGRATION AND STANDARDIZATION ISSUES

10.1 Data Discovery, Access and Retrieval: Metadata and Product Navigator

Lothar Wolf introduced the EUMETSAT EO Portal which provides EUMETSAT users with a single point of online access to all EUMETSAT data and dissemination services. It allows users to discover, search, order and subscribe to operational services of EUMETSAT, using international standards. By the end of 2010 it will also include services of partner agencies. The EO portal includes on one hand a Product Navigator for search and discovery, compliant with ISO metadata profile 19115/19119, ISO 19139, and OGC catalogue services CSW 2.0.2, and, on the other hand a user management interface and webmap service. The EO Portal is fully compliant with WIS and GEOSS standards and the EU INSPIRE directive.

10.2 Task Force on Codes

Jérôme Lafeuille gave a brief update on the Task Force on Codes, which had one face-to-face meeting and one virtual meeting. The initial work has been focused on updating Common Code Tables:

- C-11 and C-12 tables of centres and sub-centres (for RARS);
- C-5 (satellites), C-8 (instruments) in preparation for future missions;
- C-13 (data categories and sub-categories).

On the latter issue the Task Force proposed a new categorization of data, which is currently in “demonstration” status, whereby the categories are linked to the variables rather than to specific instruments. Feedback from satellite operators is needed on the practicality of this approach.

Satellite operators are encouraged to support the efforts of the Task Force, whose role is to advise the CBS Expert Team on Data Representation and Codes and the CGMS.

10.3 DCPC Designation Process (verbal update)

The meeting was informed of the ongoing process of designation of WIS Data Collection or Production Centres (DCPC) and Global Information System Centres (GISC) for the WMO Information System (WIS). It was emphasized that every satellite operator was potentially a DCPC and was encouraged to apply as such.

Action IGDDS-IG-4.2: Each IGDDS satellite operator to include in his report to the Implementation Group a status with respect to the DCPC designation. (Due date: IGDDS-IG-5)

11. REGIONAL REQUIREMENTS FOR DATA ACCESS

11.1 Satellite Data Requirements Workshop for RA III/RA IV

The inventory of data and product requirements is one of the important steps foreseen in the IGDDS Implementation Plan, and is furthermore requested in the context of the WIS. This process has to be conducted at the regional level, since it has to take into account specific regional context for example in terms of meteorological applications, communications infrastructure, or available data sources and processing capabilities.

Sergio Pereira and Jérôme Lafeuille reported that this had been addressed for RA III and RA IV, with the support of a Satellite Data Requirements Task Team established in June 2009 by the WMO Secretary-General and led by the RA III Rapporteur on the Space Programme. A template for identifying requirements was defined, and requirements were developed by the Task Team. A Satellite Data Requirements Workshop was then held on 1-3 February 2010 at INPE in Sao Jose dos Campos, Brazil to review the outcome of this requirements gathering exercise with the Task Team members (from nine South and Central American countries), the president of CBS, representatives of NOAA and EUMETSAT, and the WMO Secretariat. Among its major outcomes, the workshop enabled:

- (a) Better understanding of the technical and operational context of WMO Members in the area;
- (b) Better understanding of the capabilities of existing and planned data dissemination means;
- (c) Review and update of the data requirements;
- (d) Demonstration of a process for requirements gathering and subsequent dialogue among data users and providers;
- (e) Definition of a number of precise actions, aiming to respond to the highest priority needs in the short-term;
- (f) Recommendations to prepare a sustainable response to regional needs in the longer term.

The meeting appreciated that a formal dialogue had been established among users and providers, with the understanding that requirements had to be evaluated before possible adoption. It is suggested to

inform the CBS in order to formalize the process, ensure its sustainability and to encourage similar initiatives in other Regions.

It was pointed out that the NMHSs are encouraged to represent the needs of their whole country but in most cases this can only be achieved if they also involve other organizations (e.g. disaster management, etc).

11.2 Dissemination Requirements for the Pacific region

The meeting discussed the possible extension of this approach to the Pacific area (RA V). It was highlighted that NMHSs of Pacific islands were highly dependent on satellite information, in particular for tropical cyclone monitoring, but had in many cases a very limited capability to acquire satellite data either directly or via Internet. It was noted that the Pacific area represented a large gap between the areas covered by FENGYUNCast and GEONETCast respectively. An additional DVB-S dissemination service, such as an extension to the Pacific area of an existing system, could be a very helpful complement to current services. It was emphasized that a potential advantage of such service is that it could easily combine data from different contributors (e.g. MTSAT and GOES-W data and value-added products) thus providing the users with a single access to multiple data flows with a limited infrastructure investment, while enabling the providers to share the telecommunication cost. Without fully duplicating the other dissemination means it could, for example, contain a minimum set of information providing some redundancy and robustness for the case of unavailability of the Internet access and/or the Direct Readout equipment. The WMO Secretariat confirmed that this would well respond to the Executive Council recommendation to “*consider an IGDDS that builds on the ADM concept.*”

The meeting strongly encouraged WMO and the relevant satellite data providers to facilitate a regional initiative to collect satellite data requirements for Pacific island countries. It was pleased to note the willingness of the BOM, JMA, and NOAA representatives to support this process and to investigate possibilities to support a new dissemination initiative in response to such requirements.

11.3 RA I EUMETCast Products and Dissemination Expert Group

The meeting was informed that EUMETSAT and WMO were preparing the establishment of an Expert Group to review the requirements for data and products dissemination over EUMETCast in RA I (Africa). A first meeting of this group is expected to be convened either during the forthcoming African Ministerial Conference or during the 9th EUMETSAT User Forum in September 2010.

Finally, the meeting recalled the initiatives taken by APSDEU to consider additional requirements for FENGYUNCast, the new Pilot Project in RA II to develop information on data access and to review requirements, and the ROSHYDROMET action to identify requirements of NMHSs of CIS.

12. USER INFORMATION ON DATA AND PRODUCT ACCESSIBILITY

Jérôme Lafeuille reported recommendations of the fifth session of the Expert Team on Satellite Utilization and Products (ET-SUP-5) held in Geneva from 15 to 19 March 2010 on improving data accessibility.

Among other points, he recalled that the lack of information on what data and products are available, and on how to access them in practice, was often quoted as a limiting factor for the wide use of satellite data and their benefit to society. The meeting was reminded that the Space Programme Office maintains web pages indicating the status and plans of all missions contributing to the GOS (<http://www.wmo.int/pages/prog/sat/GOSgeo.html>, <http://www.wmo.int/pages/prog/sat/GOSleo.html>, <http://www.wmo.int/pages/prog/sat/GOSresearch.html>), with hyperlinks to the information on data accessibility. All satellite operators were encouraged to review, complete and update this information as appropriate.

13. IGDDS IMPLEMENTATION PLAN REVIEW AND UPDATE

Jérôme Lafeuille recalled earlier discussions of the IGDDS-IG on the IGDDS Implementation Plan. It was suggested to better highlight on one hand the strategy, and on the other hand the actions. The purpose of the Implementation Plan is to facilitate evolution along the recommended strategy. It should identify priorities for implementing the strategy and list the corresponding actions focussing on critical and time-limited actions without trying to be exhaustive since it should remain high-level.

The meeting agreed on the following priorities:

- Organizing the formulation of data requirements (both from a regional approach and a thematic approach) and the dialogue between data users and providers;
- Implementing regional DVB-S dissemination systems in every region to offer a cost-efficient and integrated access to most satellite data sources;
- Demonstrating the inclusion of all relevant data types in the broadcast services, including inter-regional data exchange;
- Support harmonization of future Direct Broadcast systems as well;
- Support the implementation of complementary data access and distribution via the Internet;
- Implementing WIS data standards and conventions, satellite operators becoming Data Collection or Production Centres (DCPC) within the WIS framework;
- Permanent information resources through adequate portals, and active user information including links to appropriate software tools;
- Monitoring the progress and seeking feedback.

It was clarified that current ongoing actions were fully consistent with such a revision of the Implementation Plan. The meeting considered that the progress and achievements should be recorded and acknowledged. The meeting also stressed the need for the IGDDS Implementation Plan to describe a clear articulation with the overall WIS. It was also recommended to emphasize the prospective dimension, anticipating the evolution of technology, user communities and needs, which can provide useful guidance to WMO Members. The following actions were agreed:

Action IGDDS-IG-4.3: WMO SP Secretariat to draft an outline of a new strategy document and implementation plan that would replace the current IGDDS Implementation Plan (v2), for review and inputs by IGDDS-IG members. (Due date: End 2010)

Action IGDDS-IG-4.4: IGDDS-IG members to review and provide and inputs to the draft strategy and implementation documents. (Due date: IGDDS-IG-5)

Action IGDDS-IG-4.5: IGDDS Implementation Group members to inform the IG of relevant strategic or planning activities that could be of relevance to the refinement of the strategy and implementation plan. (Due date: IGDDS-IG-5)

14. INFORMATION ON RELEVANT ONGOING ACTIVITIES

No additional point was raised under this item.

15. SUMMARY OF IGDDS-RELATED ACTIONS

15.1 Status of IGDDS actions from previous meetings

In reviewing the outstanding actions from previous meetings, the Implementation Group noted the progress made. It also noted that several actions were still ongoing but should be reformulated. It was agreed that all previous actions would be **closed**, and replaced by the following new actions:

Action IGDDS-IG-4.6: ROSHYDROMET to report at IGDDS-IG-5 on the progress in establishing subregional requirements. (Due date: IGDDS-IG-5)

Action IGDDS-IG-4.7: IGDDS Implementation Group members participating in APSDEU and the North America and Europe Data Exchange meetings to report back to IGDDS-IG-5 on latest status of the requirements gathering activity of these groups. (Due date: IGDDS-IG-5)

Action IGDDS-IG-4.8: JMA, BOM and KMA to express their requirements for proposed additions to the FENGYUNCast dissemination schedule in coordination with WMO SP, to enhance the regional operational value of FENGYUNCast, with a view to obtaining a consolidated regional proposal to be formally communicated to CMA. (Due date: End July 2010)

Action IGDDS-IG-4.9: CMA to investigate the feasibility of adding the requested products to the FENGYUNCast dissemination schedule and to provide a timetable for their introduction. (Due date: End of 2010)

Action IGDDS-IG-4.10: EUMETSAT to inform the IGDDS Implementation Group members of the impact on the users of migrating to DVB-S2. (Due date: End 2010)

15.2 Summary of outstanding and new actions

A summary of the IGDDS actions is provided in Annex IX.

16. ANY OTHER BUSINESS

An update was given on the DCP data circulation scheme with implications on the responsibilities for quality control, coding and injection to the GTS. It was concluded that the Expert Team on Operational Implementation of the GTS was the best qualified to advise the IGDDS Implementation Group members on these issues.

17. CONCLUSION

The participants agreed that such a joint RARS-IGDDS meeting was very helpful to keep track on these two important projects. While web meetings are encouraged to draw intermediate status of actions, a face-to-face meeting once a year was felt necessary. It was suggested to investigate options for collocating the meeting with either the APSDEU and/or NAEDEX meeting (noting that APSDEU and NAEDEX are considering to hold a joint meeting in Boulder, USA in March 2011), or the NOAA Direct Readout Conference, to be held in Miami in April 2011.

The Chairman thanked all participants for their contribution and closed the meeting on 24 March 2009 at 16h00.

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AGENDA

Introductory Session

- 1. Introduction**
- 1.1 Opening of the Session
- 1.2 Adoption of the Agenda
- 1.3 Working Arrangements for the Session

Session on RARS

- 2. Status of the Global RARS Network**
- 2.1 Status of EARS
- 2.2 Status of the Asia-Pacific RARS
- 2.3 Status of the South American RARS
- 2.4 RARS Operations Monitoring and Software Issues
- 3. Overall RARS Geographical Coverage**
- 4. RARS Data Dissemination Issues**
- 4.1 Update on RARS Data Representation and Coding
- 4.2 RARS Data Dissemination via GTS and Other Means
- 5. RARS Extension to Advanced Sounding Missions**
- 6. RARS User Information**
- 6.1 User Interaction and Outreach Issues
- 6.2 WMO RARS Website
- 6.3 Individual RARS Websites
- 7. Summary of RARS-related Actions**
- 7.1 Status of RARS actions from previous meetings
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Session on IGDDS

- 8. IGDDS DVB-S Services and GEONETCast**
- 8.1 IGDDS Standards for DVB-S Dissemination Services
- 8.2 EUMETCast Status and Plans
- 8.3 FENGYUNCast Status and Plans
- 8.4 MITRA Status and Plans
- 8.5 NOAAPORT and ISCS Status and Plans
- 8.6 Geonetcast-America Status and plans
- 8.7 Geonetcast Status and Plans
- 9. Status of Other IGDDS Dissemination Capabilities**
- 9.1 Evolution of Direct Broadcast
- 9.2 Internet-based Dissemination
- 10. Integration and Standardization Issues**
- 10.1 Data Discovery, Access and Retrieval: Metadata and Product Navigator
- 10.2 Task Force on Codes
- 10.3 DCPC Designation Process (verbal update)
- 11. Regional Requirements for Data Access**
- 11.1 Satellite Data Requirements Workshop for RA III/RA IV
- 11.2 Dissemination Requirements for the Pacific Area
- 11.3 RA I EUMETCast Products and Dissemination Expert Group
- 12. User information on Data and Product Accessibility**
- 13. IGDDS Implementation Plan Review and Update**
- 14. Information on Relevant Ongoing Activities**
- 15. Summary of IGDDS-related Actions**
- 15.1 Status of IGDDS actions from previous meetings
- 15.2 Summary of outstanding and new actions

Conclusion Session

- 16. Any Other Business**
- 17. Conclusion**

| Area | Regional RARS Centre | HRPT Station Name | Latitude | Longitude | Operator | RARS Station Identifier (alphabetic) | Processing centre ID <i>Originating Centre</i> (Code Tables C-1 and C-11) | Sub-centre ID <i>Originating Sub-centre</i> (Code Table C-12) | Location Indicator in GTS Bulletin (CCCC) | Status or planned implementation |
|--------------|----------------------|-------------------|----------|-----------|--------------|--------------------------------------|---|---|---|------------------------------------|
| Asia-Pacific | Melbourne (BOM) | Casey | 66.26° S | 110.53° E | BOM | csy | 2 | 201 | AMMC | Operational |
| | | Davis | 68.58° S | 77.97° E | BOM | dvs | 2 | 203 | AMMC | Operational |
| | | Melbourne CribPt | 37.88° S | 144.96° E | BOM | mel | 2 | 211 | AMMC | Operational <i>Metop ready</i> |
| | | Darwin | 12.46° S | 130.84° E | BOM | dar | 2 | 214 | AMMC | Operational <i>Metop ready</i> |
| | | Perth | 31.95° S | 115.89° E | BOM | pth | 2 | 217 | AMMC | Operational <i>Metop ready</i> |
| | | Townsville | 19.28° S | 147.05 E | AIMS | tvf | 2 | 219 | AMMC | Operational <i>Metop ready</i> |
| | | Fiji | 17.7° S | 177.6° E | FMS | fij | 2 | 232 | AMMC | 2010 |
| | | Noumea | 22.27° S | 166.45° E | Meteo-France | nou | 2 | 235 | | TBD |
| | | Tahiti/Papeete | 17.56° S | 149.61° W | Meteo-France | pap | 2 | 237 | AMMC | TBD |
| | | Vladivostock | 43.0° N | 131.54° E | Roshydromet | vla | 2 | 250 | | Not planned |
| | | Guam | 13.47° N | 144.78° E | USAF | gua | 2 | 251 | AMMC | Not planned |
| | | Kelburn | 41.3° S | 174.5° E | MetService | kel | 69 | 247 | NZKL | Replaced by Maupuia in August 2009 |
| | | Singapore | 1.3° N | 103.83° E | NEA | sgp | 72 | 249 | WSSS | Operational |
| | | Maupuia | 41.30° S | 174.82° E | NIWA | mau | 204 | 101 | NZGP | Operational |
| | | Kwajalein Atoll | 8.7° N | 167.7° E | USAF | kwa | TBD | TBD | | Not planned |

| Area | Regional RARS Centre | HRPT Station Name | Latitude | Longitude | Operator | RARS Station Identifier (alphabetic) | Processing centre ID <i>Originating Centre</i> (Code Tables C-1 and C-11) | Sub-centre ID <i>Originating Sub-centre</i> (Code Table C-12) | Location Indicator in GTS Bulletin (CCCC) | Status or planned implementation |
|---------------------------------|-----------------------|--------------------|-----------|-----------|--------------|--------------------------------------|---|---|---|--------------------------------------|
| Europe and North-America (EARS) | Darmstadt (EUMETSAT) | Maspalomas | 27.78°N | 15.63°W | INTA | mas | 254 | 20 | EUMS | Operational <i>Metop received</i> |
| | | Kangerlussuaq | 66.98° N | 50.67° W | DMI | kan | 254 | 30 | EUMS | Operational <i>Metop ready</i> |
| | | Edmonton | 53.33° N | 113.5° W | EnvCanada | edm | 254 | 40 | EUMS | Operational <i>Metop ready</i> |
| | | Gander | 48.94° N | 54.57° W | EnvCanada | gan | 254 | 60 | EUMS | Operational <i>Metop ready</i> |
| | | Monterey | 36.35° N | 121.55° W | NOAA | mon | 254 | 70 | EUMS | Operational <i>Metop ready</i> |
| | | Wallops Island | 37.8°N | 75.3° W | NOAA | wal | 254 | 80 | EUMS | Operational <i>Metop ready</i> |
| | | Gilmore Creek | 64.97°N | 147.40° W | NOAA | gil | 254 | 90 | EUMS | Operational <i>Metop ready</i> |
| | | Athens | 38.0° N | 23.44° E | HNMS | ath | 254 | 100 | EUMS | Operational <i>Metop received</i> |
| | | Ewa Beach (Hawaii) | 21.33° N | 158.06 W | NOAA | ewa | 254 | 120 | EUMS | Operational <i>Metop ready</i> |
| | | Miami | 25.73° N | 80.15 W | NOAA | mia | 254 | 130 | EUMS | Operational <i>Metop received</i> |
| | | Lannion | 48.7°N | 3.5° W | Meteo-France | lan | 254 | 140 | EUMS | Operational <i>Metop received</i> |
| | | Svalbard | 78.13° N | 15.23° E | KSAT | sva | 254 | 150 | EUMS | Operational <i>Metop ready</i> |
| | | St Denis (Reunion) | 20.88 ° S | 55.50 ° E | Meteo-France | std | 254 | 170 | EUMS | Operational <i>Metop received</i> |
| | | Moscow | 55.75° N | 37.62° E | Roshydromet | mos | 254 | 180 | EUMS | Operational <i>Metop ready</i> |
| | | Muscat | 23.61° N | 58.54° E | DGMAN | mus | 254 | 190 | EUMS | Operational <i>Metop received</i> |

| Area | Regional RARS Centre | HRPT Station Name | Latitude | Longitude | Operator | RARS Station Identifier (alphabetic) | Processing centre ID <i>Originating Centre</i> (Code Tables C-1 and C-11) | Sub-centre ID <i>Originating Sub-centre</i> (Code Table C-12) | Location Indicator in GTS Bulletin (CCCC) | Status or planned implementation |
|------|----------------------|-------------------|----------|-----------|-------------|---|---|---|--|--|
| | | Khabarovsk | 48.47° N | 135.35° E | Roshydromet | kha | 254 | 200 | EUMS | Planned for 2010 <i>Metop ready</i> |
| | | Novosibirsk | 54.8° N | 83.13° E | Roshydromet | nov | 254 | 210 | EUMS | Planned for 2010 |
| | | Resolute Bay | 74.71° N | 94.97°W | Env. Canada | res | 254 | | | Potential, not planned |
| | | Libreville | 0.27° N | 9.25° E | CLS | lib | 254 | | | Potential, not planned |
| | | Pretoria | 25.9 S | 28.2 E | SAWS | pre | 254 | | | Potential, not planned |

| Area | Regional RARS Centre | HRPT Station Name | Latitude | Longitude | Operator | RARS Station Identifier (alphabetic) | Processing centre ID Originating Centre (Code Tables C-1 and C-11) | Sub-centre ID Originating Sub-centre (Code Table C-12) | Location Indicator in GTS Bulletin (CCCC) | Status or planned implementation |
|---------------|---------------------------|-------------------------|----------|-----------|----------|--------------------------------------|--|--|---|-----------------------------------|
| South America | Cachoeira Paulista (INPE) | Cachoeira Paulista | 22.33° S | 45° W | INPE | cpt | 46 | 10 | SBBR | Operational <i>Metop ready</i> |
| | | Cuiaba | 15.55° S | 56.7° W | INPE | cba | 46 | 11 | SBBR | Operational <i>Metop ready</i> |
| | | Brasilia | 15.78° S | 47.92° W | INMET | inm | 46 | 12 | SBBR | Operational |
| | | Fortaleza | 3.73° S | 38.56° W | FUNCEME | fcm | 46 | 13 | SBBR | Operational in September 2010 |
| | | Natal/Navay | 5.785° S | 35.22° W | CHM | chm | 46 | 14 | SBBR | Not planned |
| | | Manaus | 03.02° S | 60.05° W | SIVAM | svm | 46 | 15 | SBBR | 2011 |
| | | Natal/INPE | 5.836° S | 35.21° W | INPE | nat | 46 | 16 | SBBR | Planned for end of 2010 |
| | | Boa Vista | 02.75° N | 60.75° W | INPE | bvs | 46 | 17 | SBBR | 2011 |
| | | Caracas | 10.5° N | 66.94° W | CDPI | | 46 | | | Potential station |
| | | Euzebio | 03.88° S | 38.45° W | INPE | euz | 46 | | | Not planned |
| South America | Córdoba (CONAE) | Córdoba | 31.52° S | 64.45° W | CONAE | etc | 147 | 10 | SABM | Operational <i>Metop ready</i> |
| | | Ushuaia (or Rio Grande) | 54.80° S | 68.33 W | CONAE | etu | 147 | 15 | SABM | 2011 (TBC) |
| | | Marambio | 64.23° S | 58.63° W | CONAE | ebm | 147 | 20 | SABM | Operational |
| | | Santiago de Chile | 33.25° S | 70.41° W | DGAC | ets | 147 | 30 | SABM | Operational |
| | | Punta Arenas | 53.02° S | 70.51° W | DGAC | epa | 147 | 40 | SABM | 2011 (TBC) |
| | | Base Presid. Frei | 62.2° S | 58.93° W | DGAC | epf | 147 | 50 | SABM | 2011 (TBC) |
| | | Cotopaxi | -0.61° S | 78.58 W | CLIRSEN | cpe | 147 | 60 | SABM | End of 2010 |
| | | Isla de Pascua | 27.12 S | 109.4 W | DGAC | idp | | | | Not planned |

LIST OF POTENTIAL X-BAND RECEPTION STATIONS (March 2010)

The following table lists the reception stations that RARS Operators have indicated having technical capability to participate in the project.

| EARS | South American RARS | Asia-Pacific RARS |
|----------------|----------------------------|----------------------------------|
| Lannion | Cachoeira Paulista | Melbourne |
| Moscow | Cuiabá | Darwin |
| Khabarovsk | Córdoba | Perth |
| Novosibirsk | Santiago | Casey (Communication limitation) |
| Oman | | Townsville |
| Gander (TBC) | | Kiyose |
| Edmonton (TBC) | | Jincheon |
| | | Beijing |
| | | Guangzhou |
| | | Urumqi |
| | | Maupuia |
| | | Singapore |

RARS POSTER PRESENTED AT ITSC-17

International TOVS Study Conference XVII
 Monterey, CA, 14-20 April 2010

RARS Global Network Status and Plans

Jérôme Lafeuille (WMO) and the RARS Implementation Group

Regional ATOVS Retransmission Services (RARS)

- The initial objective of the RARS project is to deliver Level 1c ATOVS data for NWP, from at least 90% of the globe, within 30 minutes from acquisition.
- In a new phase, the RARS activity is being extended to IR hyperspectral sounders.

Concept

- Numerical Weather Prediction (NWP) requires timely access to polar-orbiting sounder data.
- Using the Direct Readout data stream ensures timely data access. However, a single Direct Readout station can only acquire polar-orbiting satellite data within a radius of ca. 2500 km (depending on spacecraft altitude) which is not sufficient for regional and global NWP uses.
- In gathering data received from a number of individual Direct Readout stations implemented throughout the world, the acquisition area is virtually extended to quasi global coverage.
- In optimizing data concentration and processing from these individual stations, data can be available within 30 minutes from acquisition.
- Data are shared over the Global Telecommunications System of WMO (GTS) and other means, in standard BUFR format, for global access.
- Common processing standard: data are processed to level 1c using AAPP
- Global RARS data monitoring helps ensuring data consistency and quality.

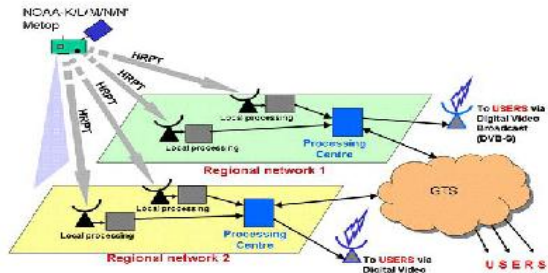


Figure 1: RARS System Concept (Source: EUMETSAT)

RARS Network Implementation

The global RARS network is comprised of three components:

- The EUMETSAT Advanced Retransmission System (EARS) managed by EUMETSAT involves 15 HRPT stations from Canada, Denmark, France, Greece, Norway, Oman, Russian Federation, Spain and the USA

Data quality and timeliness monitoring

The EUMETSAT Satellite Applications Facility on Numerical Weather Prediction (NWP-SAF) hosted by the UK Met Office performs routine RARS data monitoring. Data collected by the RARS are compared with equivalent data extracted from the global data set processed by NOAA. Consistency of these different data sets is vital to enable the RARS data to be used alongside global data, for example, in NWP applications.

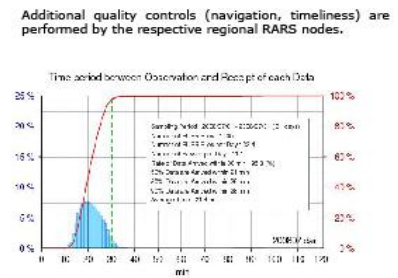
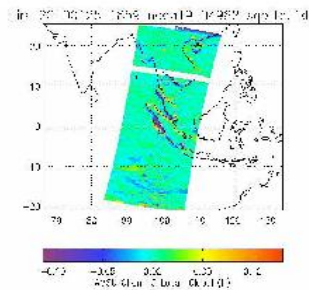
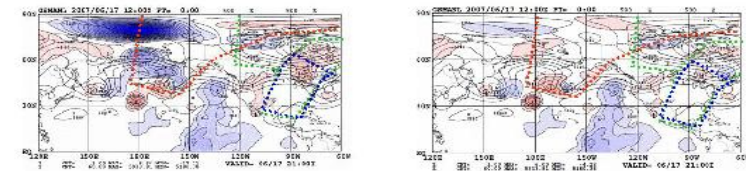


Figure 3: Example of monitoring by NWP SAF (left) and by a regional node (right). (Sources: Met Office, JMA)

RARS Benefits to NWP

Timely availability of satellite sounding data through the RARS project enables using this data in Numerical Weather Prediction models with short cut-off time for regional or short-range global weather forecast.



- The Asia-Pacific RARS coordinated by the Bureau of Meteorology, Australia, with one telecommunications node in Melbourne and another in Tokyo, involves 15 HRPT stations from Australia, China, Japan, Korea, New Zealand and Singapore;
- The South-America RARS with one coordination node in Argentina and another in Brazil, involves 6 HRPT stations from Argentina, Brazil, and Chile.

List of RARS stations in 2010 (from North to South)

| EARS | Asia-Pacific RARS | South America RARS |
|--|---------------------------------------|--------------------------------------|
| Svalbard (Norway) | Urumqi (China) | * Fortaleza (Brazil) |
| Kangerlussuaq, Greenland (Denmark) | Beijing (China) | * Natal (Brazil) |
| Gilmore Creek, Alaska (USA) | Jincheon (Republic of Korea) | * Colopasi (Ecuador) |
| Moscow (Russian Federation) | Kyose (Japan) | Cuiaba (Brazil) |
| * Novosibirsk (Russian Federation) | Guangzhou (China) | Brasilia (Brazil) |
| Edmonton (Canada) | Hong Kong (China) | Cachoeira Paulista (Brazil) |
| Gander (Canada) | Singapore (Singapore) | Córdoba (Argentina) |
| Lannion (France) | Darwin (Australia) | Santiago (Chile) |
| * Khabarovsk (Russian Federation) | * Fiji (Fiji) | Marambio (Antarctica, Argentina) |
| Athens (Greece) | Townsville (Australia) | |
| Wallops Island (USA) | Perth (Australia) | |
| Monterey (USA) | Melbourne (Australia) | |
| Maspalomas, Canary islands (Spain) | Maupua (New Zealand) | |
| Miami (USA) | Casey (Antarctica, Australia) | |
| Muscat (Oman) | Davis (Antarctica, Australia) | |
| Ewa Beach, Hawaii (USA) | Syowa (Antarctica, Japan) | |
| St Denis, Reunion Island (France) | | |
| 17 stations covering 41% of the globe | 16 stations covering 30% of the globe | 9 Stations covering 14% of the globe |
| Geographical location, affiliations and identifiers can be found on the RARS web pages: http://www.wmo.int/pages/prog/sat/documents/RARS-HRPT-Stations-status-and-plans.pdf | | |

* : stations planned to be added in 2010

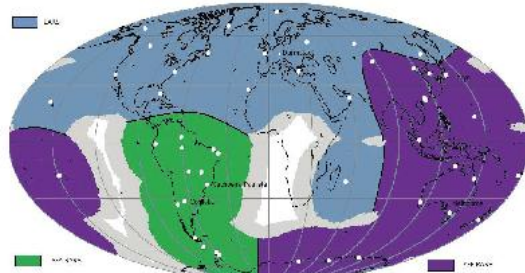


Figure 2: Geographical coverage as of April 2010

Accessing RARS Data

Contact the GTS Focal Point of your National Meteorological or Hydrological Service (NHMS) to receive data via the GTS. RARS BUFR descriptors, GTS headers and filenames are given in the RARS Coding Summary (See RARS web pages). Example of RARS file name:

Z_RARS_C_AMMC_20061102225012_Rmel_hirsIIc_noaa17_20061102_2223_22652_IIc_bufc.bin

Figure 4: Impact of RARS on global analysis. The diagrams above illustrate the quality of operational analysis in the Japanese NWP system, without (left panel) or with (right panel) the use of EARS data. The 500hPa geopotential field resulting from the operational analysis with 2h20 cut-off time is compared with a reference analysis performed on a longer cycle. Each panel shows the difference between the short cut-off and the long cycle analyzed fields. On the left panel, without using EARS data, the difference reaches 17m over the North Pacific (dark blue area). On the right panel, when EARS data are used, the difference does not exceed 2m on that region. EARS significantly improves the operational analysis since it provides important sounding information by the cut-off time. (Source: JMA)

Towards a new phase: RARS extension to advanced sounders

IASI and AIRS have demonstrated the significant benefit of hyperspectral sounding data to NWP. A plan has been defined to extend the scope of RARS to advanced sounder datasets. This raises new challenges, in particular because of the order of magnitude change in data volume and the need for data selection.

- Instruments:
 - o Primary objective is the Cross-track Infrared Sounder (CrIS) of the NPOESS Preparatory Project (NPP), planned for September 2011, and follow-on Joint Polar Satellite System (JPSS) satellites until sufficient timeliness is achieved by the SafetyNet (subject to confirmation);
 - o Next objective is IASI on Metop-B planned for launch in 2012, noting that the direct broadcast function is not currently operated globally on Metop-A for technical reasons;
 - o Potentially IRHAS on FY-3D, planned in 2015.
- Data requirements:
 - o Radiances in BUFR, at full spatial resolution
 - o Principal components (if available) or channel subset to be determined
- Processing packages:
 - o IPOPP (for NPP/CrIS) and AAPP (for Metop/IASI) will be used.
 - o Processing architecture options will be evaluated in 2010, and telecommunications options to be refined accordingly.
- Receiving stations:
 - o A number of RARS stations are already Metop-compatible.
 - o NPP requires X-band receiving stations. A set of potential stations was identified and the resulting coverage is shown in Figure 5.
 - o Candidate stations to complete the coverage are welcome. Final selection of stations is planned in 2011, with a view to avoid redundancy to optimize telecommunication costs.

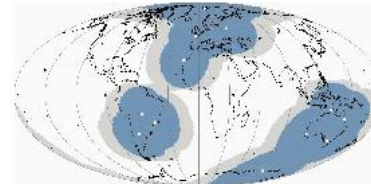


Figure 5: Potential X-Band Reception Coverage (based on information from current RARS participants)

More Information: <http://www.wmo.int/pages/prog/sat/RARS.html>

Contact: Jérôme Lafeuille, WMO Space Programme (JLafeuille@wmo.int)



SUMMARY OF DVB-S SYSTEMS AND SERVICES (March 2010)

Note: Geonetcast is not described in this table as such since it is the addition of Eumetcast, Fengyuncast and Geonetcast-America.

(1) Dissemination system

| Name | Eumetcast (1) | Eumetcast (2) | Eumetcast (3) | Fengyuncast New (End 2010) | MITRA | ISCS | NOAA Port | Geonetcast-America |
|---|---|---|---|---|---|--|------------------------------|---|
| Satellite | HotBird-6 | AtlanticBird-3 | NSS-806 | Asiasat-4 | ExpressAM1 ExpressAM33 ExpressAM3 | Intelsat 701 Intelsat 903 Intelsat 906 | Americom 101°W | Intelsat-9 |
| Frequency Band Standard | 10.8 GHz Ku Band DVB-S | 3.7 GHz C Band DVB-S | 3.8GHz C Band DVB-S | C Band DVB-S2 | 3.7 GHz C Band DVB-S | C band VSAT | C Band DVB-S | C Band DVB-S |
| Footprint | Europe+ middle East RA VI | Africa, Caribbeans Western Asia | Americas | Asia and West Pacific | Asia (except South) | Americas, Pacific and Atlantic | Americas East Pacific | Americas |
| Max data rate | 16 Mbps | 3 Mbps | 2 Mbps | 72 Mbps | 1 Mbps | 128 kbps | 10 Mbps | 2 Mbps |
| Users | 2828 users for the 3 services | 2828 users for the 3 services | 2828 users for the 3 services | 17 NMHS outside China | | ICAO and NMHS | NWS Field Offices +extern | |
| Service Level Agreement with telecom provider | Guaranteed: 99.5% Actual: 99.99% | Guaranteed: 99.5% Actual: 99.99% | Guaranteed: 99.5% Actual: 99.99% | Guaranteed: 99.5% (TBC) | | 99.9 % | | Guaranteed: 99.5% (Reliability also dependent on Internet feed) |
| Issues or plans | Prepares DVB-S2 within 2 years | Prepares DVB-S2 within 2 years | Prepares DVB-S2 within 2 years | Migration planned for end of 2010 | Interference with local wireless systems | To be defined beyond 2012 | Considers DVB-S2 | |
| Management and Monitoring | Bandwidth management to guarantee timeliness | Bandwidth management to guarantee timeliness | Bandwidth management to guarantee timeliness | | | | | |
| Receiving software | Tellicast | Tellicast | Tellicast | CMA-made | | PDSend/ PRReceive | | Kencast |
| Access | USB Key for decryption | USB Key for decryption | USB Key for decryption | USB Key for decryption | | | | |

SUMMARY OF CURRENT AND PLANNED DIRECT BROADCAST FREQUENCIES

Geostationary Satellites

| Satellite | Service | Frequency | Data rate |
|------------------|------------|-------------|--------------|
| Meteosat-8 | LRIT | 1691.0 MHz | 128 kbps |
| Meteosat-9,10,11 | LRIT | 1691.0 MHz | 128 kbps |
| | HRIT | 1695.15 MHz | 1.0 Mbps |
| GOES-11 | WEFAX | 1691.0 MHz | |
| | GVAR | 1685.7 MHz | 2.1 Mbps |
| GOES-12 | WEFAX/LRIT | 1691.0 MHz | 128 kbps |
| | GVAR | 1685.7 MHz | 2.1 Mbps |
| | EMWIN-I | 1690.7 MHz | 9.6 kbps |
| GOES-13,14,15 | WEFAX/LRIT | 1691.0 MHz | 128 kbps |
| | GVAR | 1685.7 MHz | 2.1 Mbps |
| | EMWIN-N | 1692.7 MHz | 19.2 kbps |
| MTSAT-1R, 2 | LRIT | 1691.0 MHz | 75 kbps |
| | HRIT | 1687.1 MHz | 3.5 Mbps |
| GOMS-N2, N3 | LRIT | 1691.0 MHz | 64-128 kbps |
| | HRIT | 1691.0 MHz | 0.665-1 Mbps |
| FY-2E,F,G,H | LRIT | 1691.0 MHz | 150 kbps |
| | S-VISSR | 1687.5 MHz | 660 kbps |
| INSAT 3D | LRIT | | |
| | HRIT | | |
| COMS-1 | LRIT | 1692.14 MHz | 256 kbps |
| | HRIT | 1695.4 MHz | 3 Mbps |
| GOES-R,S,T | HRIT/EMWIN | 1697.4 MHz | 400 kbps |
| | e-GVAR | 1685.0 MHz | 2.11 Mbps |
| | GRB | 1690.2 MHz | 31 Mbps |
| FY-4 | TBD | TBD | TBD |
| | TBD | TBD | TBD |
| MTG | TBD | TBD | TBD |

Sun-Synchronous Satellites

| Satellite | Service | Frequency | Data rate |
|----------------|---------------------|------------------------------|------------------|
| NOAA-18, 19 | HRPT | 1698 or 1707 MHz | 665.4 kbps |
| | APT | 137.5 or 137.62 MHz | 1.7 kHz |
| MetOp-A,B,C | AHRPT | 1701.3 MHz (1707 MHz backup) | 3.5 Mbps |
| | LRPT | 137.1 MHz (137.9125 MHz) | 72 kbps |
| Meteor-M-1,2 | HRPT | 1700 MHz | 665 kbps |
| | LRPT | 137.9 or 137.1 MHz | 72 kbps |
| FY 1,D | HRPT | 1700.4 MHz | 1.33 Mbps |
| FY 3 | AHRPT | 1704.5 MHz | 4.2 Mbps |
| | MPT | 7775 MHz | 18.7 Mbps |
| NPP | HRD | 7812 MHz | 15 Mbps |
| NPOESS-1,2,3,4 | HRD | 7834 MHz | 20 Mbps |
| | LRD | 1707 MHz | 3.88 Mbps |
| EPS 2G | DVB-S2 (TBC) | 7.8 GHz | 40-90 Mbps |

(In bold: X-Band services)

LIST OF RARS-IG-4 ACTIONS

Action RARS-IG-4.01: RARS-IG values the contribution of stations in Miami, St Denis and Ewa Beach that provide significant addition to the global RARS coverage. It encourages the involved parties to seek technical ways to further improve the timeliness towards the goal of 30 minutes. EUMETSAT to report at the next meeting (Due date: RARS-IG-5)

Action RARS-IG-4.02: WMO SP to contact the Fiji Met Service in order to investigate issues and possible way forward to integrate Fiji in the Asia-Pacific RARS. (Due date: May 2010)

Action RARS-IG-4.03: WMO SP and EUMETSAT to seek feedback from the NWP community at ITSC-17 to have better knowledge of, e.g. who the users are, and whether data is still valuable in case the cloud information is not available. (Due date: April 2010)

Action RARS-IG-4.04: WMO SP to contact Venezuela about possible inclusion of the CDPI Caracas station (Responsible: Freddy Flores) in South America-RARS. (Due date: May 2010)

Action RARS-IG-4.05: WMO SP to update the “Status and plans of RARS HRPT stations“, resulting coverage statistics, and maps (with assistance of Anders Soerensen). (Due date: April 2010)

Action RARS-IG-4.06: Brazil (INPE) and Argentina (SMN and CONAE) to investigate possible cooperation with Chile (DMC) towards the implementation of an HRPT station in Isla de Pascua, Chile and its inclusion in the South America RARS to reduce the gap over the Pacific. Brazil and Argentina to report at the next meeting. (Due date: RARS-IG-5)

Action RARS-IG-4.07: EUMETSAT to further investigate possibility of cooperation with CLS-Argos towards the implementation of an HRPT station in Libreville, Gabon and its inclusion in EARS. (Due date: June 2010)

Action RARS-IG-4.08: Richard Francis to explore opportunities for cooperation between UK Met Office and SAWS that could facilitate inclusion of a South African HRPT station (e.g. Pretoria) in the RARS. (Due date: April 2010)

Action RARS-IG-4.09: Operators of RARS stations which are not currently equipped for acquisition of Metop data (for instance Marambio, Santiago, Beijing, Urumqi, Guangzhou, ...) are encouraged to take steps to be ready for Metop-B, to be launched early 2012. (Due date: RARS-IG-5)

Action RARS-IG-4.10: EUMETSAT to consider a test activation campaign of Metop-A AHRPT over an extended area including the Asia-Pacific, allowing current Metop receiving capabilities to be tested in advance of Metop-B. EUMETSAT to report at the next meeting. (Due date: RARS-IG-5)

Action RARS-IG-4.11: EUMETSAT, in cooperation with NWP SAF, to demonstrate the possibility to deliver an AAPP package to “virtual machines”. (Due date: June 2010)

Action RARS-IG-4.12: EUMETSAT, in cooperation with EARS-IASI partners, to demonstrate the removing of overlap among EARS-IASI data from adjacent EARS stations, as a possible model for the extension of RARS to advanced sounders. (Due date: February 2011)

Action RARS-IG-4.13: The RARS operators and regional or sub-regional network coordinators to check that the RARS products are listed and described with proper metadata in the relevant WIS DCPC and GISC catalogues. (Due date: RARS-IG-5)

LIST OF IGDDS-IG-4 ACTIONS

Action IGDDS-IG-4.1: WMO Space Programme to include on the agenda of IGDDS-IG-5 an evaluation of GEONETCast with respect to IGDDS requirements.

Action IGDDS-IG-4.2: Each IGDDS satellite operator to include in his report to the Implementation Group a status with respect to the DCPC designation. (Due date: IGDDS-IG-5)

Action IGDDS-IG-4.3: WMO SP Secretariat to draft an outline of a new strategy document and implementation plan that would replace the current IGDDS Implementation Plan (v2), for review and inputs by IGDDS-IG members. (Due date: End 2010)

Action IGDDS-IG-4.4: IGDDS-IG members to review and provide inputs to the draft strategy and implementation documents. (Due date: IGDDS-IG-5)

Action IGDDS-IG-4.5: IGDDS Implementation Group members to inform the IG of relevant strategic or planning activities that could be of relevance to the refinement of the strategy and implementation plan. (Due date: IGDDS-IG-5)

Action IGDDS-IG-4.6: ROSHYDROMET to report at IGDDS-IG-5 on the progress in establishing subregional requirements. (Due date: IGDDS-IG-5)

Action IGDDS-IG-4.7: IGDDS Implementation Group members participating in APSDEU and the North America and Europe Data Exchange meetings to report back to IGDDS-IG-5 on latest status of the requirements gathering activity of these groups. (Due date: IGDDS-IG-5)

Action IGDDS-IG-4.8: JMA, BOM and KMA to express their requirements for proposed additions to the FENGYUNCast dissemination schedule in coordination with WMO SP, to enhance the regional operational value of FENGYUNCast, with a view to obtaining a consolidated regional proposal to be formally communicated to CMA. (Due date: End July 2010)

Action IGDDS-IG-4.9: CMA to investigate the feasibility of adding the requested products to the FENGYUNCast dissemination schedule and to provide a timetable for their introduction. (Due date: End of 2010).

Action IGDDS-IG-4.10: EUMETSAT to inform the IGDDS Implementation Group members of the impact on the users of migrating to DVB-S2. (Due date: End 2010)