WORLD METEOROLOGICAL ORGANIZATION DRARS-CG-1/Doc. 4(3) Rev.1

(5.III.2015)

DRARS Coordination Meeting

Geneva, 11-13 March 2015

ITEM: 4

GUIDE ON DRARS

(Submitted by the Secretariat)

Summary and Purpose of Document

The attached document is a preliminary draft of a "Guide on the Direct Readout Acquisition and Relay System for Low Earth Orbit Satellite Data (DRARS)" provided as basis for discussion at the DRARS Coordination Meeting.

The aim of this guide is to define the minimum standards that will ensure that the products provided by each regional component of the DRARS are suitable for operational use, in particular by Numerical Weather Prediction centres, and that the products of the different regional components are interoperable and consistent. The guide should also provide guidance to the DRARS contributing organization on how to best implement these standards.

The document was drafted on the basis of the "RARS Operators Standards" (version 2, Nov. 2008) and expanded taking into account the outcome of subsequent discussions in RARS Implementation Group meetings, at CGMS and ITSC RARS Technical Sub-Group.

Given the preliminary nature of this document it includes a number of open issues or points to be confirmed, which are highlighted in the text as "*Notes"*, and some place holder text.

The meeting will be invited to review this document in the light of the lessons learnt in RARS implementation and operation, in EUMETSAT EARS Services and in the development of the NOAA Direct Broadcast Real Time Network, and taking into account the new environment of the WMO Information System (WIS).

WMO Information System

WMO Space Programme

GUIDE ON THE DIRECT READOUT ACQUISITION AND RELAY SYSTEM FOR LOW EARTH ORBIT SATELLITE DATA (DRARS)

Draft 4/03/2015

World Meteorological Organization

Weather • Climate • Water

WMO/TD-No. XXX

2015

CONTENTS

1. INTRODUCTION

1.1. PURPOSE AND SCOPE

The purpose of this document is to define the minimum standards and the recommended practices that are applicable to components of the WMO network of Direct Readout Acquisition and Relay System for LEO satellite data (DRARS)**.**

[*Note: It is still time to adjust the name, e.g. it could also be "Direct Readout And Redistribution of Satellite data"*.]

The aims of these standards are twofold:

- To help ensure that the data provided by each particular DRARS regional network can be used operationally, typically for Numerical Weather Prediction (NWP) applications;
- To facilitate inter-regional data exchange and interoperability around the globe, with a particular focus on ensuring the global consistency of the DRARS datasets.

The present guide replaces the existing RARS Operators Standards (v.2, 26/11/2008) with a view to update them, consolidate with other rules or recommendations related to RARS, expand them to accommodate new sensor data and ensure interoperability with the NOAA Direct Broadcast Real Time Network, as discussed within CGMS.

1.2. STRUCTURE OF THE DOCUMENT

The document consists of the following sections:

Section 1: introduction;

Section 2: defines the DRARS components and addresses the overall coordination

Section 3: contains the common standards applicable across all DRARS regional networks;

Section 4: contains the specific standards applicable to each DRARS service

Section 5: conclusions.

Annexes: contain ancillary information which is provided separately for easier reference and to facilitate updating.

1.3. APPLICABLE DOCUMENTS

[AD.1]: WMO Manual on Codes, Volume 1.2, Part B, Publication No. 306.
[AD.2]: WMO Manual on the GTS (WMO No. 386)
[AD.3]: RARS Coding Summary (http://www.wmo.int/pages/prog/sat/documents/RARS_Coding-summary.xls)
[AD.4]: RARS Network Status and Plan http://www.wmo.int/pages/prog/sat/documents/RARS_Network-status-and-plans.pdf
[AD.5]: Observing Capabilities Analysis and Review (OSCAR): www.wmo.int/oscar

1.4. REFERENCE DOCUMENTS

[RD.1]: CGMS/WMO Regional ATOVS Re-transmission System (RARS) Workshop, EUMETSAT HQ, 16-17 December 2004, Final Report
[RD.2]: Second global CGMS/WMO Regional ATOVS Re-transmission System (RARS) Workshop, WMO HQ, Geneva, 1-2 December 2005, Final Report
[RD.3]: RARS Implementation Group, 3rd session, 5-6 February 2009
[RD.4]: RARS Implementation Group, 4th session, 22-24/03/2010
[RD.5]: RARS Implementation Group, 5th session, 4/5/2011
[RD.6]: RARS Implementation Group, 6th session, 25-26/10/2012
[RD.7]: RARS Technical Sub-Group, ITSC-19, 2014

[*Note: We should review this list and keep only the most relevant documents*]

2. DRARS NETWORK COORDINATION

2.1. OVERVIEW OF DRARS

The aim of DRARS is to provide near real-time access to near-global data from Low Earth Orbit (LEO) satellites, in order to meet the requirements of regional and global Numerical Weather Prediction (NWP) and of other applications interested in global, low latency data in a cost-efficient manner.

Access to LEO data is normally relying on data dump at one CDA station, which allows retrieving complete orbit data, however with a data latency resulting of on-board data storage between the time of acquisition and the time when the data is dumped to the CDA. This on-board storage can be reduced roughly by two when two high-latitude CDAs are used, one in the North and the other in the South, but further reduction requires a whole network of mid- or low latitude stations distributed around the globe, which involves high ground infrastructure costs and a highly complex scheduling of data storage and dumps.

When satellites have a Direct Readout (or Direct Broadcast) capability, which is the case of most LEO meteorological satellites, an alternative data access route is the Direct Readout acquisition from a local ground station, which allows real-time acquisition, albeit with coverage limited to the portion of orbit within the area of visibility of the local station.

The Direct Readout Acquisition and Relay System for LEO satellite data overcomes this limitation in offering a cost-efficient trade-off between coverage and timeliness. It coordinates data acquisition through a globally distributed network of local Direct Readout stations, their processing in accordance with agreed standards, and their rapid delivery to the global user community through appropriate telecommunication systems.

[*Note: we can refer to http://www.wmo.int/pages/prog/sat/rars_en.php or other more detailed documents]*

2.2. DRARS COMPONENTS

The overall DRARS network is composed of several regional or sub-regional networks of DRARS contributing stations coordinated by a regional or sub-regional node. Table 1 contains the list of DRARS regional or sub-regional networks and nodes.

TABLE 1

Regional Network	Regional Node	Sub-regional network	Sub-regional Node
EARS	EUMETSAT		
Asia-Pacific	BOM	Asia-Pacific North	JMA
		Asia-Pacific South	BoM
South America		South America/North	INPE
		South America/South	SMN Argentina
USA	NOAA		

Each DRARS network designates a DRARS Network Manager and an Operational Point of Contact, which are listed in Annex …

[*Note: "Network Manager" or "Coordinator"? Do we need to define explicitly their role?]*

[*Note: Should the managers and Point of Contacts be listed in annex, or refer to e.g.* http://www.wmo.int/pages/prog/sat/rars-implementation_en.php#RARScontacts]

Each DRARS regional or sub-regional network contributes to one or several DRARS "Services". A DRARS Service is performing the Direct Readout Acquisition and Relay of a certain category of satellite data. Table 2 lists the DRARS services (current and potential).

TABLE 2

Service	Instruments
IR/MW sounding	AMSU-A, MHS, HIRS, ATMS, MWTS, MWHS, IRAS
IR/VIS imaging	VIIRS, AVHRR, MERSI
HiRes IR sounding	CrIS, IASI, HIRAS
Scatterometry	ASCAT
MW imagery	MWRI

A global monitoring centre is performing a systematic control of product consistency. This function is assumed by the EUMETSAT SAF-NWP, hosted by the Met Office (United Kingdom) for sounding data.

2.3. HIGH-LEVEL SERVICE SPECIFICATIONS

The DRARS Service Specifications are determined with the aim to respond to user requirements of WMO application areas, as recorded in OSCAR [AD 5]. For example, the requirements of Global NWP (http://www.wmo-sat.info/oscar/applicationareas/view/1) and High-Resolution NWP (http://www.wmo-sat.info/oscar/applicationareas/view/2) require for atmospheric temperature, humidity profiles and wind vector at sea surface, a timeliness of less than 6 to 15 min as a goal and 30 min as breakthrough. Table 3 below summarizes the operational service specification for each DRARS Service.

TABLE 3

Service	Products	Timeliness	Availability	Coverage
IR/MW sounding	L1 brightness temperatures (or radiances ?)	30 min	95%	90%
IR/VIS imaging	L1 radiance /reflectivity			
HiRes IR sounding	Level 1 radiances and PC scores	30 min		
Scatterometry	backscatter cross-sections			

Timeliness is defined here as the data latency between acquisition time (sensor time) and the availability on a publicly available telecommunication network (GTS or other).

[*Note: we need a common understanding of how data latency is counted, and ensure it is monitored accordingly. Acquisition time, or end of orbit pass acquisition, or end of ingest or pre-processing ? For instance the timeliness shown by the JMA monitoring site is surprising*]

The availability rate, which is an indicator of the target uptime for a DRARS station when there is no special operational constraint (i.e. not considering particularly remote sites such as Antarctic stations) is defined here as the percentage of scheduled passes received and processed and available within the specified timeliness.

[*Note: We could also specify the availability separately from the timeliness, and specify in addition the minimum number of* processed *passes that satisfy the timeliness requirement, however this would add complexity without very clear benefit*]

[*Note: The availability target could be expressed with reference to the "possible" passes instead of the "scheduled" passes. This may be notably different when a station operates different missions with few antennas and has to manage scheduling conflicts*]

The coverage is defined here as the percentage of the Earth's surface for which (or above which, in the case of vertical soundings) observations can be acquired. This is calculated in merging the areas of visibility of the local stations contributing to the service, noting that an

isolated station (not overlapping with the area of visibility of another station) without mask contributes to the global coverage by about 4%.

2.4. DRARS NETWORK IMPLEMENTATION

Based on the reports from DRARS Network Managers, the WMO Secretariat maintains a list of DRARS contributing stations associated to each regional or sub-regional node with the status and plans of the different services [AD.4]. This allows monitoring the coverage of the respective DRARS services.

[*Note: clarify whether this role is played by the WMO Space Programme or the WIS branch*]

The Secretariat and all DRARS Network Managers coordinate their efforts to ensure smooth operation of the DRARS Services across all regional networks, to plan expansion of DRARS and to take any appropriate measure to meet evolving user requirements. This coordination is achieved through the DRARS Coordination Group, the Terms of Reference of which are provided in Annex….

[*Note: Annex H contains the RARS Implementation Group ToR established in 2007. To be discussed and updated, e.g. how should this Group report to WMO (CBS through OPAG-ISS?) and inform external entities (CGMS, ITSC,..) as more Services will be included?]*

2.5. PROCEDURE FOR ADDING/MODIFYING A STATION IN THE DRARS NETWORK

The purpose of this procedure is to guide the station operator on the steps to be followed when including a new station in the DRARS network, or modifying the operation mode of a station, ensuring appropriate coordination and information of all parties involved.

The following steps shall be followed for adding a new station:

Step 1: The Operator informs the WMO Space Programme Office (WMOSP) of the WMO Secretariat of the characteristics of the new DRARS station:

- Latitude and Longitude of the station (in degrees, with decimals)
- Name of the station
- Three-letter abbreviated name
- Centre administratively responsible for this station
- Identifier of the centre in Common Code Table (CCT) C-1/C-11 (if available)
- Identifier of the station as sub-centre of this centre in CCT C-12 (if available)
- RTH/GISC which will transmit the data over the GTS/WIS Core Network
- CCCC identifier of this RTH/GISC
- DRARS Services which will be supported by the station.

Step 2: If the Centre is not yet identified in CCT C-11, or if the station is not yet identified in CCT C-12 as a sub-centre of this centre, the operator requests the addition of a code for the

centre and/or the sub-centre in the relevant Common Code Tables, through the Permanent Representative (PR) or focal point for codes and data representation matters of the country/territory to the WMO Secretariat (Secretary-General or OBS/WIS/DRMM and OBS/SAT (CC)).

[*Note: this should be aligned with the normal procedure for requesting additions to a CCT*]

Step 3: The Operator implements the operational acquisition, pre-processing, and processing processes necessary to generate DRARS products in accordance with the applicable DRARS standards (processing, formatting, message coding and routing) defined in Sections 3 and 4.

Step 4: The operator sends file samples by FTP for validation during a minimum test period of one week [*Note: Duration to be confirmed*]

- To the RTH in charge of transmitting the data into the GTS (if different from the Operator)
- To the relevant DRARS regional node
- To the DRARS monitoring centre.

Step 5: The RTH, the Regional Node and the DRARS Monitoring centre check the consistency and regularity of the data and interact as appropriate with the Operator until full compliance is demonstrated.

Step 6: Once the test is successful, the Operator:

- Informs the WMO Space Programme Office of the planned start of the routine dissemination, and of any change to the bulletin headings and file naming (if relevant)
- Requests the responsible RTH Focal Point in an appropriate manner so that the Focal Point can update relevant parts of the Vol. C1 with respect to the new bulletins at least two months in advance. A/N (advanced notification) of Vol. C1 will be released to WMO Members.

Step 7: The PR of the Operator's country/territory informs the WMO Secretariat of changes to the DRARS operation and provides input for inclusion of an announcement in the WWW Operational Newsletter; the Secretariat, updates the DRARS documentation accordingly and takes any other appropriate action to inform the satellite community.

In case of modification or termination of a DRARS station operation, the Operator informs the Space Programme Office of any change of status of the station, for instance if an additional DRARS Service is ready to be implemented at the station. The production associated with the new Service is implemented following Steps 3 to 7 above.

If a Service is cancelled, or the overall operation of a station is terminated, the Operator:

- informs the WMO Space Programme Office of the planned termination
- records the end of the bulletins in Vol. C1

The WMO Space Programme Office updates the DRARS documentation accordingly.

3. OVERALL DRARS STANDARDS AND RECOMMENDED PRACTICES

3.1. INTRODUCTION

These standards and recommended practices cover aspects of DRARS operations that are not specific to a particular service and should apply for any regional network contributing to the overall DRARS network. The standards are mandatory and are only defined in areas that affect the interoperability of DRARS regional networks, the access to and the utilization of DRARS products, and the interface to the WMO Information System (WIS). On the other aspects, some practices are recommended or indicated as guidance, but the actual implementation can be defined in an optimal manner by each DRARS regional network.

The standards are expressed with the verb “shall”, while the recommended practices and guidance are expressed with the verbs “should” or “can”.

A DRARS operator is defined as the managing entity responsible for providing an end-to-end service within a particular region (i.e., with responsibility for data collection from the HRPT stations, processing, dissemination of the products to users and inter-regional data exchange). If responsibility for the implementation of these functions is shared between several parties, then it is the responsibility of the lead entity (i.e., the DRARS operator) to ensure that all the involved parties comply with the relevant parts of this standard.

Overall DRARS standards and recommended practices are defined in the following areas:

- Product Processing and Product Format.
- Product Distribution
- Quality of Service
- Operations and Maintenance including anomaly processing
- Publication of Service Information
- DRARS network coordination

3.2. PRODUCT PROCESSING (COMMON ASPECTS)

3.2.1. Processing Level

Any products exchanged inter-regionally shall be at level 1

Processing to level 1, and BUFR encoding, can be done at the regional centre, or locally at the receiving station location.

If processing to level 1 is done locally, then the station sub-centre ID would nominally be that coordinated by the organisation responsible for the local receiving station; instead of a sub-centre ID defined/coordinated regionally. If the local station processes to level 1c, but does not do the BUFR format conversion, then the DRARS regional centre will be responsible for the BUFR format conversion and for ensuring that the appropriate local centre and sub-centre information is inserted.

3.2.2. Product Consistency

DRARS Operators shall use agreed pre-processing packages and agreed auxiliary input data such as orbit information in order to ensure that the processed products are fully consistent with the corresponding global data sets pre-processed by the respective satellite operators

The suite of pre-processing packages to be used by DRARS is illustrated below and is detailed in the sections of this document addressing specific services. The list of software processing packages and organizations responsible for maintaining them is provided in …..

[*Note: where should such a list be maintained ? This one is probably not specific enough: http://www.wmo.int/pages/prog/sat/processingtools_en.php*]

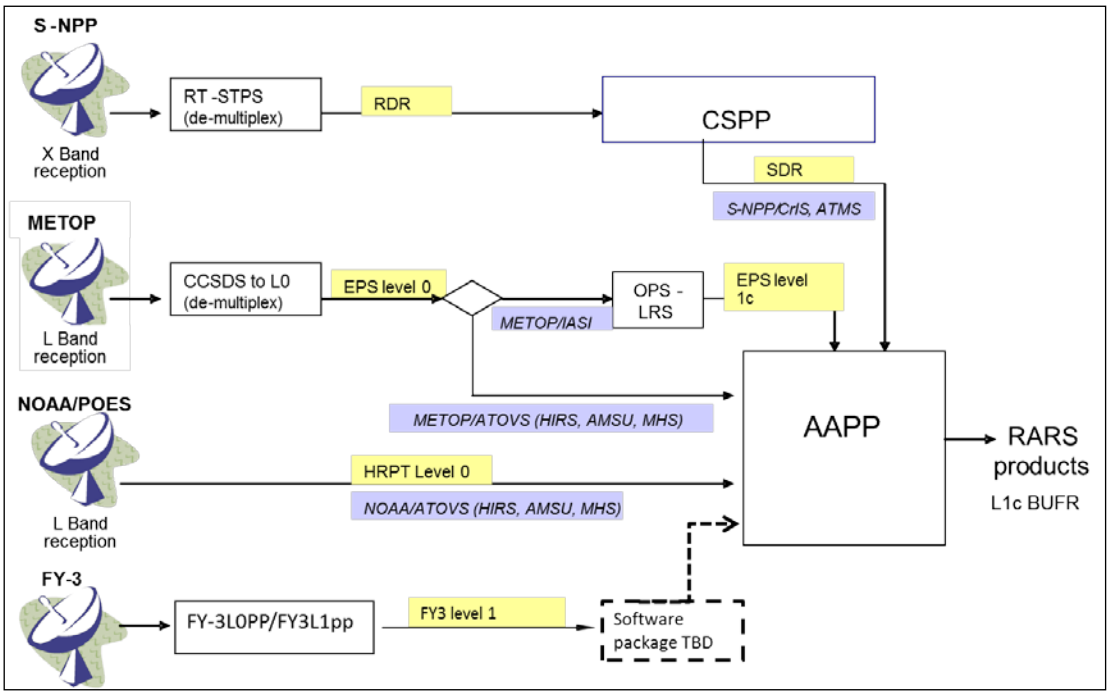

Figure 1: Schematic diagram of processing packages to be used for DRARS

The orbit information sources shall be: taken from the following sources:
Metop: http://oiswww.eumetsat.org/metopTLEs/html/ or the Multi-Mission Administration Messages contained in the Metop HKTM L0 files.

NOAA: https://www.space-track.org (login needed) or http://celestrak.com/NORAD/elements/

FY3: http://www.shinetek.com.cn/eos_data/ or
http://satellite.cma.gov.cn/portalsite/default.aspx

Orbital elements should be updated from the above sources at least once per day.

[

3.3. PRODUCT CODING AND FORMAT (COMMON ASPECTS)

3.3.1. Data exchange format

A “DRARS product” is the result of the processing of the data acquired by one station, from one satellite pass, from one instrument. All DRARS products exchanged inter-regionally shall be in the agreed format described in Section 4 for the relevant service. Three levels of formatting are considered here: BUFR message, Meteorological Bulletins, and files

For each satellite pass and each instrument (with the exception of imagery products), DRARS products are encoded in BUFR messages. Because of the BUFR message size limitation, several BUFR messages are needed to encode one product. The number of BUFR messages needed for one product depends on the instrument and the duration of the satellite pass.

An Abbreviated Heading is assigned to each BUFR message to form a “Meteorological Bulletin”. The structure of the heading is described in “Explanation of Data Designators T1T2A1A2ii CCCC YYGGgg BBB (WMO No 386, Vol I, Part II, 2.3.2.2/Attachment II-5)”. The different Bulletins composing a product have all the same headings, with the exception of the number “ii” which differentiates the individual Bulletins of the same product.

DRARS production centres can submit products to the GTS either directly as Meteorological Bulletins, or embedded in files. These files shall follow the file naming convention: pflag_productidentifier_oflag_originator_yyyyMMddhhmmss[_freeformat].type[.compression]

In summary, a DRARS product shall be comprised of a series of BUFR encoded messages, which shall each be included in a bulletin, which should all be embedded in one file.

The BUFR identification section, the abbreviated heading and the file name shall be defined in accordance with the RARS Coding Summary [AD.3], which is posted on the DRARS web site: http://www.wmo.int/pages/prog/sat/documents/RARS_Coding-summary.xls .

For instance the file naming convention for DRARS product files is to use “pflag=w”, “product identifier= country-organization-station,instrument,rars+satellite+station”, and “freeformat=[AAPPfilename]”. As a consequence, DRARS product file names are as follows: w_country-organization-station,instrument,rars+satellite+station_c_CCCC_ yyyyMMddhhmmss_ AAPPfilename_bufr.bin.

3.3.2. Encoding of Section 1 of the RARS BUFR Message

Annex A contains a full description of Section 1 (Identification) of the BUFR Message. In order to facilitate identification of BUFR messages containing DRARS products, the three fields below shall be used as explained here:

- Octets 5-6: Identification of Originating/Generating Centre;
- Octets 7-8: Identification of Originating/Generating Sub-centre;
- Octet 12: International Data Sub-category.

Octets 5-6 of Section 1: Identification of Originating/Generating Centre

The ID of the Originating/Generating Centre should be that of the centre responsible for the processing to level 1.

Octets 7-8 of Section 1: Identification of Originating/Generating Sub-centre

The ID of the Originating/Generating Sub-centre shall be used to indicate the receiving station that receives the data.

If processing to level 1c is done locally at the station site, then the station sub-centre ID would nominally be that coordinated by the organisation responsible for the station; instead of a sub-centre ID defined/coordinated regionally.

If the local station processes to level 1c, but does not do the BUFR format conversion, then the RARS regional centre will be responsible for the BUFR format conversion and for ensuring that the appropriate local centre and sub-centre information is inserted.

Octet 12 of Section 1: International Data Sub-category

The data category indicated in Octet 11 is defined by BUFR Code Table A which gives “3” for satellite sounding data, “12” for satellite surface data, “21” for satellite radiance data and “101” for satellite image data. Subcategories of these categories are defined by Common Code Table C-13 of the WMO Manual on Codes for several instruments (AMSU-A, AMSU-B, HIRS, MHS, IASI, SSMI.ASCAT, CrIS, ATMS, VIIRS) or for generic types of instruments (IR sounding, Hyperspectral sounding, MW sounding, radio-occultation) (see Annex C).

Octet 12 of section 1 shall be populated using the appropriate sub-category, which reflects the instrument or the instrument category.

[*Note: Annex C shows several possibilities, for instance MHS data can be described as “MHS” (003-6) or as “MW temperature/humidity sounding” (003-40), CrIS can be described by “CrIS” (21-5) or by “Hyperspectral temperature/humidity sounding” (003-30). An harmonized approach should be defined*]

[*Note: do we need to address the BUFR encoding of the other sections? This BUFR encoding is normally done by the pre-processing software.*]

3.3.3. Recording in Vol.C1

The Abbreviated Headings of Meteorological Bulletins are recorded in the Catalogue of Meteorological Bulletins (WMO Publication No.9, Vol.C1). This enables any WMO Member to be aware of the availability of these bulletins and, if interested, to request them from the relevant Regional Telecommunication Hub (RTH).

Nowadays, most centres are transmitting their DRARS products embedded in "files". Since they are no longer strictly considered as "Bulletins" the DRARS products transmitted as files are generally not recorded in Vol. C1, and therefore are not visible to the potential users. In the future, these products will be discoverable through their metadata entries in the WIS GISC catalogues, but it is not yet systematically the case.

In order to make the DRARS products more easily discoverable, it is recommended to record the DRARS products in Vol.C1 even if the product is embedded in a file.

The procedure for recording Meteorological Bulletins is described in: http://www.wmo.int/pages/prog/www/ois/Operational_Information/VolC1_en.html under "UPDATING PROCEDURES AND METHODS OF NOTIFYING THE WMO SECRETARIAT OF AMENDMENTS / ADVANCED NOTIFICATIONS". The WMCs and RTHs on the Main Telecommunication Network (MTN) shall maintain Vol. C1 as regards bulletins issued from the zone for which they are responsible. The format to record a bulletin is described in: http://www.wmo.int/pages/prog/www/ois/Operational_Information/VolumeC1/AN_RecordFormat_en.html .

Table 4 provides guidance to complete the fields 9-15 of this record.

TABLE 4

Field No	Field Name	Value
9	Category	"E" (Essential data/products)
10	TTAAii	(Indicate TTAAii as defined by the DRARS coding
11	CCCC	(Indicate CCCC as defined by the DRARS coding
12	CodeFor	"FM 94-XIV"
13	TimeGrou	"AS AVAILABLE"
14	Content	"RARS"
15	Remarks	"TRANSMITTED AS A FILE"

[*Note: Should this sub-section on Vol.C1 be moved to the "Product distribution" section ?*]

3.4. PRODUCT DISTRIBUTION

The DRARS regional networks shall strive to make DRARS products available to the global users community and in particular to the NWP centres worldwide, through the WMO Information System.

The recommended route for DRARS data access within a region is to be defined at the regional level in consultation between the GISC/DCPC and the DRARS regional nodes taking into account the level of connectivity of the main regional users.

Inter-regional data exchange shall be implemented between regional nodes and GISCs, taking into account the recommendations of the APSDEU-NAEDEX groups, which keeps under review the requirements of NWP centres for inter-regional exchange of satellite data.

It will be the matter of a trade-off between the benefit provided by additional data and the resulting load on the telecommunications. While the primary distribution means will be the GTS (or WIS/RMDCN), the use of a satellite broadcast service such as EUMETCast or CMACast is an advantage for users with limited GTS connectivity. A schematic illustration of the telecommunication scheme is provided in Figure 1.

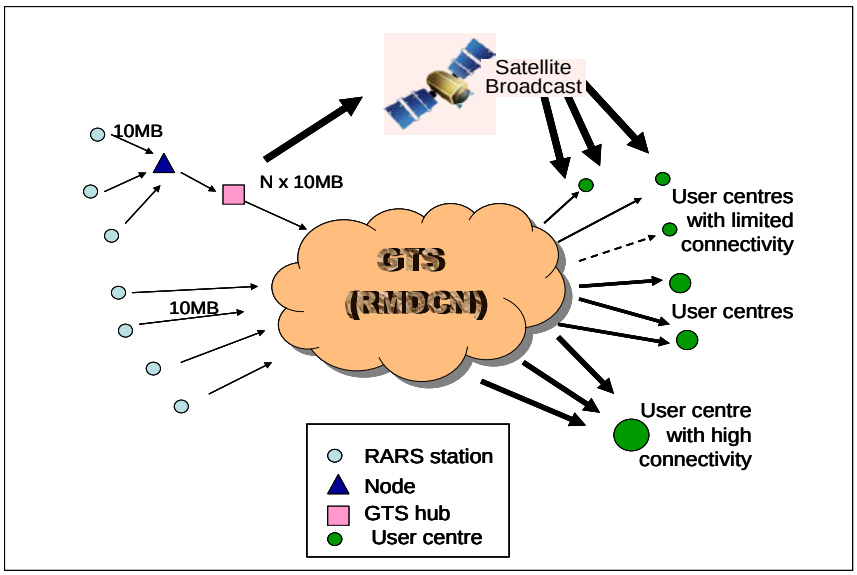

Figure 1

- DRARS stations with direct access to a core WIS node (GISC or DCPC) should directly inject into the WIS (e.g. Kyose/Tokyo, Crib Point/Melbourne)
- DRARS station with GTS access should directly inject into the GTS (e.g. New Delhi)
- DRARS station with no GTS/WIS access should send their products either to a GTS or WIS core node via FTP (e.g. Maupuia to Melbourne, Cordoba to Buenos Aires, Cachoeira Paulista to Brasilia, Jincheon to Seoul))
- As an alternative, DRARS stations which are part of a coordinated regional/subregional network should send their products to the regional/subregional

node that will send the whole DRARS product package to a GTS hub/GISC/DCPC (e.g. EARS stations concentrated by EUMETSAT via VPN, before being sent to Offenbach hub; Natal, Cuiaba via Cachoeira Paulista, before being sent to Brasilia hub).

[Note: the distribution mode should be specified in the service-specific provisions]

3.5. OPERATIONS

3.5.1. Quality control

Each DRARS regional node shall implement appropriate quality control measures to monitor the integrity of RARS data formats that are disseminated, their length and timeliness.

A global quality monitoring is performed by the EUMETSAT NWP SAF.

[*Note: Should we say more about it ? What is the outcome of this monitoring ? What about the monitoring of other services* ?]

3.5.2. Quality assurance

In order to help ensure that the service provided is of an appropriate quality, the DRARS Operator shall:

- utilize an appropriate system for the tracking and resolution of operational anomalies;
- ensure that all operations and maintenance staff are appropriately trained;
- ensure that appropriate provisions are in place to protect against unauthorised access to the DRARS equipment (from both physical, and network security points of view).
- ensure that the maintenance approach (e.g. levels of redundancy, spares holdings, maintenance contracts and maintenance team size) is consistent with meeting the stated service availability targets (see section 2.3);
- ensure that adequate arrangements are in place to monitor the satisfactory performance of the service (supported by the availability of validated operational and maintenance procedures.

3.5.3. Anomaly reports and other user feedback

Each DRARS operator and each DRARS node shall designate an Operational Point of Contact to be contacted in case of operational problems.

The contact details of Operational Points of Contact of each node will be posted on the DRARS regional network home page and the WMO Space Programme DRARS home page to allow the users to report operational problems. Depending on the nature of the problem, the DRARS node will contact the relevant DRARS station operator, and/or the relevant WIS or GTS focal point, and/or the global monitoring unit (EUMETSAT SAF-NWP at Met Office).

[*Note: should this information be posted on a WIS monitoring page instead of a Space Programme home page? TBD within the WMO Secretariat*]

Each DRARS operator should implement appropriate User Feedback Management processes in order to properly track and manage the resolution of problems, including notification of the providers of pre-processing software packages.

Each provider of a pre-processing software package, should implement software anomaly management processes, that provide for fast resolution of problems with the software packages that affect the end-users.

3.6. PUBLICATION OF SERVICE INFORMATION

[Note: do we need a coordinated global communications mechanism such as a list-server or email system, to send RARS news, along the lines of what NOAA/NESDIS does to support all operational users and keep them up to date with system changes etc (e.g. AAPP S/W releases)?. Action was initially given to WMO Secretariat to establish a list-server to keep participants up-to-date with developments during the development phase.]

In order to keep users informed about the service, the DRARS regional or sub-regional node operator shall maintain a web-site which shall contain the following up-to-date service-related information:

- a description of the service offered by the DRARS Operator, including:
- the instruments and satellites from which data is collected;
- the coordinates of the collection stations that form part of the DRARS data collection network, together with the associated geographical coverage maps;
- the processing software version that is used to generate the products (the version used locally at the stations shall be identical to the version used centrally);
- the target timeliness of the service;
- the target availability of the service, expressed along the structure used in the EARS Operational Service Specification (see open point on the need to be prescriptive concerning availability);
- details of the data distribution mechanism and any associated user reception equipment requirements (e.g., for receiving data from a satellite direct broadcast system);
- file naming and structure;
- the administrative procedures to be followed by a user in order to gain access to the data;

- the scheduling strategy that is used to produce the acquisition schedule (including any instrument/satellite priorities);
- operational points of contact for users to report problems with the service (including email addresses and telephone numbers);
- planned acquisition schedule with a 3-day horizon;
- acquired passes in the last 24 hour period compared to the planned acquisition schedule (referenced to the planned acquisition schedule);
- long-term planning information that may affect the service in the future (e.g., planned outages, upgrade of software version, etc).
- quality monitoring results

4. STANDARDS FOR SPECIFIC DRARS SERVICES

These standards and best practices are applicable to the provision of individual DRARS services. The DRARS services are defined in terms of groups of equivalent or similar instruments, potentially flying on different satellites. A particular DRARS operator may only provide a subset of the defined services. Currently the scope of the overall DRARS includes the services listed in the Table 2 (copied below):

Copy of TABLE 2

Service	**Instruments**
IR/MW sounding	AMSU-A, MHS, HIRS, ATMS, MWTS, MWHS, IRAS
IR/VIS imaging	VIIRS, AVHRR, MERSI
HiRes IR sounding	CrIS, IASI, HIRAS
Scatterometry	ASCAT
MW imagery	MWRI

The areas covered by these standards are service-specific aspects of product processing, formats, quality control and monitoring.

4.1. IR/MW SOUNDING SERVICE

This service is provided for the ATOVS suite of instruments flying on NOAA/POES and EUMETSAT/Metop satellites as well as from equivalent instruments flying on CMA/FY-3 and NOAA/Suomi-NPP satellites.

[*Note: It is assumed, but needs to be confirmed that ATMS and FY-3 IRAS and MWHS/MWTS can be accommodated in the same standards as ATOVS*]

4.1.1. Product Processing Software

To ensure global consistency of the DRARS dataset, the DRARS operator shall make use of the AAPP (ATOVS and AVHRR Pre-processing Package) software for product processing for the ATOVS suite of instruments, of CSPP for ATMS and of the FY-3 L0/L1 pre-processing software package for MWTS, MWHS and IRAS.

The AAPP package is supplied and maintained by the EUMETSAT's Numerical Weather Prediction Satellite Application Facility (NWP SAF). The package is freely available (subject to the signing of a licence agreement) and the process for obtaining the package is fully described on the NWP SAF AAPP web pages that are linked from http://www.nwpsaf.eu .

General background information on the AAPP software is also available on this web-page. The version of the AAPP software to be used shall be the latest release as defined on the AAPP release web-page

For changes affecting the data output, this latest release shall be implemented operationally within 1 month of release by the NWP SAF, otherwise the latest release shall be implemented operationally within 3 months.

For Suomi-NPP ATMS, The product processing shall be performed by AAPP and CSPP software. CSPP performs Level 1 processing which delivers Sensor Data Records (SDR) in HDF5 format for ATMS. AAPP has been updated to ingest these SDRs, and BUFR encoding. CSPP can be downloaded from: http://cimss.ssec.wisc.edu/cspp/

FY-3 pre-processing software: FY-3 data are pre-processed by the FY3L0/L1pp software packages distributed by CMA, see http://satellite.cma.gov.cn/portalsite/ "Tools".

AAPP can ingest the SDRs of MWTS, MWHS and IRAS, and can BUFR encode them..

4.1.2. Processing Level

Any products exchanged inter-regionally shall be at level 1c (brightness temperatures)

4.1.3. Quality Checking and Quality Flags

The pre-processing software includes quality checking, and any products distributed shall include quality flags.

4.1.4. Product Quality Monitoring

Routine monitoring of DRARS IR/MW sounding data quality is performed by the NWP SAF. Monitoring results are available on the “Monitoring reports” section of the NWP SAF web site http://www.nwpsaf.eu.

4.2. IR/VIS IMAGING SERVICE

4.2.1. Product Processing Software

TBD

4.2.2. Processing Level

The processing level shall be either raw HRPT (NOAA POES / Metop) or at the level of radiances/reflectivities (VIIRS).

The orbit pass shall be segmented to enable on-the-fly transmission of product segments in order ensure low latency and to facilitate handling of large data sets.

As it is important to provide seamless imagery (without missing lines or overlap) the acquisition schedules of the local stations shall be coordinated and where feasible the acquisition source shall be switched from one station to the next one at a defined imagery line.

Data compression is critical, efficient compression procedures shall be used.
[Note: Guidance should be given, e.g. based on lessons learnt from EARS and DBRTN]

4.2.3. Quality Checking and Quality Flags

The pre-processing software includes quality checking, and any products distributed shall include quality flags.

4.2.4. Product Quality Monitoring

TBD

4.3. HIRES IR SOUNDING SERVICE

4.3.1. Product Processing Software

For IASI EUMETSAT has implemented at each station a computer running AAPP together with the IASI Level 1 processor (OPS-LRS). Both AAPP and OPS-LRS are distributed by the NWP SAF (http://www.nwpsaf.org/) and are freely available to any interested user. It was stressed that AAPP requires Metop Level 0 as input (Note: If not already delivered by the receiving station, the Level 0 can be generated by the "Metopizer" freeware available from EUMETSAT:
http://www.eumetsat.int/website/home/Data/DataDelivery/SupportSoftwareandTools/index.html.

For Suomi-NPP CrIS, the product processing shall be performed by AAPP and CSPP software. CSPP performs Level 1 processing which delivers Sensor Data Records (SDR) in HDF5 format for ATMS, CrIS and VIIRS instruments. AAPP has been updated to ingest these SDRs, perform CrIS channel selection, and BUFR encoding. CSPP can be downloaded from: http://cimss.ssec.wisc.edu/cspp/

4.3.2. Processing Level

Any products exchanged inter-regionally shall be at channel subset of level 1cradiances), optionally supplemented with Principal Component Scores *(REF?)*, that allow a reconstruction of the full spectra with minimal loss of information.

[*Note: we should be more precise on the strategy regarding channel selection and principal component scores, with references*]

4.3.3. Quality Checking and Quality Flags

The pre-processing software includes quality checking, and any products distributed shall include quality flags.

4.3.4. Product Quality Monitoring

TBD

4.4. SCATTEROMETRY SERVICE

This service is currently provided by the EUMETSAT EARS network for the ASCAT instrument flying on Metop-A/B

4.4.1. Product Processing Software

[Note: Check with EUM the processing employed for ASCAT]

4.4.2. Processing Level

Any products exchanged inter-regionally shall be at level 1 (backscatter cross-sections) or at level 2 (winds)

4.4.3. Quality Checking and Quality Flags

The pre-processing software includes quality checking, and any products distributed shall include quality flags.

[Note: *Reference?*]

4.4.4. Product Quality Monitoring

TBD

5. CONCLUSION

The requirements contained in this document contain the standards to be followed by DRARS Operators to:

- ensure that an appropriate level of service is provided regionally;
- facilitate the inter-regional exchange of DRARS data;
- ensure the global consistency of the DRARS datasets.

ANNEXES

A. EXTRACT OF THE MANUAL ON CODES: BUFR MESSAGES - (BUFR EDITION 4)

(See: Manual on Codes, I.2 – BUFR Reg — 1)

The octets of a BUFR message are grouped in sections:

Section	Name	Contents
0	Indicator section	Indicator section “BUFR”, length of message, BUFR edition number
1	Identification section	Length of section, identification of the message”
2	Optional section	Length of section and additional items for local use by automatic data processing centres
3	Data description section	Length of section, number of data subsets, data category flag, data compression flag and a collection of descriptors which define the form and content of individual data elements
4	Data section	Length of section and binary data
5	End section	'7777'

Section 1 — Identification section for BUFR edition 4

Octet No.	Contents
1–3	Length of section
4	BUFR master table (zero if standard WMO FM 94 BUFR tables are used — see Note (2))
5-6	Identification of originating/generating centre (see Common Code Table C-11)
7-8	Identification of originating/generating sub-centre (allocated by originating/generating Centre- see Common Code Table C-12)

9	Update sequence number (zero for original BUFR messages; incremented for updates)	
10	Bit 1 =0 No optional section =1 Optional section follows Bit 2-8 Set to zero (reserved)	
11	Data Category (Table A)	
12	International data sub-category (See Common Table C-13 – see Note (3))	
13	Local data sub-category (defined locally by automatic data processing (ADP) centres – see Note (3))	
14	Version number of master table used - see Notes (2) and (5)	
15	Version number of local tables used to augment master table in use – see Note (2)	
16-17	Year (4 digits)	|
18	Month	|
19	Day	| Most typical time for the BUFR message content – see Note (4)
20	Hour	|
21	Minute	|
22	Second	|
23-	Reserved for local use by ADP centres	

B. EXTRACT OF THE MANUAL ON THE GTS, ATTACHMENT II-5, TABLE C3

(See:
http://www.wmo.int/pages/prog/www/ois/Operational_Information/Publications/WMO_386/AHLsymbols/TableDefinitions.htm)

Data Designators in Abbreviated Headings
Geographical area designator A_1
(when T_1= D, G, H, O, PQ, T, X or Y) and
geographical area designator A2 (when T_1=I or J)

Instructions for the proper application of the data type designator

1. The designator specified in this table should be used to the greatest extent possible to indicate the geographical area of the data contained within the text of the bulletin.

2. Where the geographical area of the data does not correspond exactly with the designator, the designator for the area most approximating that of the data may be used.

3. When the table does not contain a suitable designator for the geographical area, an alphabetic designator which is not assigned in the table should be introduced and the WMO Secretariat notified.

Designator	Geographical Area
A	0^o - 90^oW northern hemisphere
B	90^oW - 180^o northern hemisphere
C	180^o - 90^oE northern hemisphere
D	90^oE - 0^o northern hemisphere
E	0^o - 90^oW tropical belt
F	90^oW - 180^o tropical belt
G	180^o - 90^oE tropical belt
H	90^oE - 0^o tropical belt
I	0^o - 90^oW southern hemisphere
J	90^oW - 180^o southern hemisphere
K	180^o - 90^oE southern hemisphere
L	90^oE - 0^o southern hemisphere
N	Northern hemisphere
S	Southern hemisphere
T	45^oW - 180^o northern hemisphere
X	Global Area (area not definable)

C. EXTRACT OF THE MANUAL ON CODES: EXTRACT OF COMMON CODE TABLE C-13

Link to **Current version:**
http://www.wmo.int/pages/prog/www/WMOCodes/WMO306_vI2/LatestVERSION/WMO306_vI2_CommonTable_en.docx

Data categories		**International data sub-categories**	
BUFR Edition 4 Octet 11 in Section 1		BUFR Edition 4 Octet 12 in Section 1	
Code figure	**Name**	**Code figure**	**Name (corresponding traditional alphanumeric codes are in brackets)**
003	vertical soundings (satellite)	2	ATOVS
		3	AMSU-A
		4	AMSU-B
		5	HIRS
		6	MHS
		7	IASI
		20	IR temperature/humidity sounding
		30	Hyperspectral temperature/humidity sounding
		40	MW temperature/humidity sounding
		50	Radio occultation sounding
12	Surface Data (satellite)	4	SSMI
		7	ASCAT
21	Radiances (satellite measured)	0	Earth radiation budget
		5	Cross-track infrared sounder (CrIS)
		6	Advanced technology microwave sounder (ATMS)
		7	Visible/infrared imager radiometer suite (VIIRS)
101	Image data (satellite)	0	Multi-purpose VIS/IR imagery
		1	Conical scanning MW imagery (intermediate frequencies)
		2	Low frequency MW imagery
		3	Ocean colour imagery
		4	Imagery with special viewing geometry
		5	Lightning imagery
		6	High-resolution shortwave imagery for land observation
		7	SMOS data

D. DETAILED GUIDANCE FOR FORMATTING OF DRARS MESSAGES

1. Format Conversion

In order to ensure that all DRARS products are entirely equivalent, it is important that all DRARS operators use the same implementation of the agreed formats, for instance, for BUFR the same globally defined BUFR Table D sequence descriptors (also known as templates see [AD.1]) shall be used. These templates are embedded within the BUFR tables, which along with the conversion software will be released together with the service specific processing software. All DRARS Operators shall make use of this, or equivalent BUFR conversion software for format conversion.

2. Filenames, Bulletin Headings and BUFR Message Encoding

DRARS standards apply to the following three aspects:

- Filenames;
- Bulletin headings;
- BUFR message encoding.

From the perspective of information "wrapping", these three aspects address different levels:

- Harmonization of BUFR message encoding is at the lowest level and focuses on Section 1 of the BUFR Message (the section dealing with identification issues - see Appendix A) and focuses purely on BUFR message encoding;
- Harmonization of the abbreviated bulletin headings is at the level above BUFR message encoding. The bulletin heading information is used by Regional Telecommunication Hubs (RTHs) to organize the routing of the messages over the GTS. The bulletin heading is not generally used by users of the BUFR messages to interpret the information; as all the necessary information to decode the BUFR message is contained within the actual BUFR message (in combination with the associated Code Tables - see the WMO Manual on Codes). Hence there is some duplication of information between section 1 of the BUFR message and the bulletin headings (albeit with different representations);

  As the GTS evolves within the framework of WIS, and the focus progressively shifts from bulletins to files, it is anticipated that this issue will assume less relevance. However, for the time being, bulletins remain a much-used communication mechanism within the GTS, and harmonization of bulletin headings is required within the DRARS network;

- Harmonization of filenames could be considered as the highest-level objective, as DRARS files could typically contain bulletins that include DRARS BUFR messages.

a) Filenames

I) DRARS data files shall follow the GTS file-naming convention (with pflag=W) (see [AD.2]);

ii) A metadata file (which would generally be static) shall be associated with each DRARS data file.

So, for files containing only DRARS data, the filename structure should be of the form:

W_productidentifier_oflag_originator_yyyyMMddhhmmss[_freeformat].type[.compression]

Where:

productidentifier is a variable length field that describes the nature of the data in the file. It consists of 2 parts; a “static part” and an “optional part” – which is not used in the context of DRARS.

The **“static part”** is the product description and consists of**:**

<**location indicator**>, <**data designator**>, <**free description**>

Where <**location indicator**> defines the producer: Country, Organization and the Production Centre

Example: for Brazil <**location indicator**> could be “br-INPE-cp”

Where <**data designator**> specifies the type of data with reference to the categories and sub-categories defined in the Common Table C-13 of the Manual on Codes, with “+” used to indicate composite data.

the <**data designator**> should be the instrument name without a separator and should be selected from one of the following: AMSUA, AMSUB, HIRS, MHS, IASI or ASCAT.

Where <**free description**> should be used to indicate satellite and originating HRPT station, and should be preceded by “DRARS”.

Example: for data from NOAA-17 from Cachoeira Paulista the <**free description**> should read “DRARS+NOAA17+cpt”.

oflag – at this time the only admissable value of **oflag** is “C” – indicating that the <originator> field will be decoded as a standard CCCC country code (and the use of the CCCC value in filenames and bulletins should be consistent).

originator is a variable length field containing information that states where the file originated from (and is decoded according to the value of <oflag>)

Example: “SBBR” for Brasilia Airport

yyyyMMddhhmmss is a fixed length date and time stamp field. The interpretation of this field should be in accordance with the standard rules set for specific data description and types.

[_freeformat] in the context of DRARS should be "_(AAPP filename)_bufr". This usage needs to shared with users of DRARS data.

type in the context of DRARS this value would typically be set to "bin" to indicate file containing data encoded in a WMO binary code form such as BUFR.

So a typical filename for AMSU-A data from NOAA17 provided by CPTEC/INPE in Brazil, from the HRPT station in Cachoeira Paulista, could be:

W_br-INPE-CP,AMSUA,RARS+NOAA17+cpt_C_SBBR_20110701090858_(AAPP filename)_bufr.bin

b) Bulletin Headings

The abbreviated bulletin heading for DRARS data, has the form:

$T_1T_2A_1A_2$iiCCCCYYGGgg(BBB)

Where:

- **T_1T_2** should be set to "IN";
- **A_1A_2ii**: A_1 identifies the instrument (i.e. A=AMSU-A, B=AMSU-B, H=HIRS, M=MHS…..). Harmonisation of instrument identifiers in the bulletin heading and the filename is desirable (i.e. the value of A_1 in the bulletin heading and the <data designator> value in the filename should be harmonised).

  A_2 is the geographic area designator - as per Table C3 of the Manual on the GTS (see Appendix B). Concerning the value of A_2, a Regional Indicator or a Global Indicator ("X") can be used, depending on the most appropriate characterisation of the coverage. Where meaningful, the use of regional indicators is encouraged;
- "ii" is used when an operator issues two or more bulletins with the same values $T_1T_2A_1A_2$CCCC - in such cases values of ii are used to make the bulletins unique - the default is ii=01
- **CCCC** is the international four-letter location indicator of the station or centre originating or compiling the bulletin (as defined in WMO-No 9, Volume C1 - Catalogue of Meteorological Bulletins) and, where relevant, should be consistent with the value of CCCC used in the filename;
- **YYGGgg** is the international date-time group
- **BBB** is used for the addition, correction or amendment of an already issued bulletin.

  Example: Bulletin headings from Cordoba:

  INAI01 SACR YYGGgg (for AMSU-A data)

INBI01 SACR YYGGgg (for AMSU-B data)
INHI01 SACR YYGGgg (for HIRS data)
INMI01 SACR YYGGgg (for MHS data)

Example: Bulletin headings from Marambio:

INAI01 SAWB YYGGgg (for AMSU-A data)
INBI01 SAWB YYGGgg (for AMSU-B data)
INHI01 SAWB YYGGgg (for HIRS data)
INMI01 SAWB YYGGgg (for MHS data)

E. EXISTING AND REQUESTED CODE VALUES FOR INSTRUMENTS USED BY DRARS

GTS Headings $T_1 T_2 A_1 A_2 ii$ (Manual on the GTS , WMO No. 386 Vol 1) http://www.wmo.int/pages/prog/www/ois/Operational_Information/Publications/WMO_386/AHLsymbols/TableDefinitions.html		
"A_1" Data type designator WMO No386 Vol 1 Table C6	With $T_1 T_2$ =IN : **A AMSU-A** **B AMSU-B** **H HIRS** **M MHS**	Level 1 sounding products Existing code values
	With $T_1 T_2$ =IN : ***C CrIS (selected channels)*** ***I IRAS*** ***J HIRAS*** ***K MWHS/MWHS-2*** ***Q IASI (PC scores)*** ***S ATMS*** ***T MWTS/MWTS-2***	Level 1 sounding products ***Requested additions***
	With $T_1 T_2$ =IE: *A AMSU-A/METOP* *D IASI L2 products* *H HIRS/METOP* *M MHS/METOP* *Q IASI (PC scores)*	For information only. Used by EUMETSAT with T_2 =E for products from EUMETSAT satellites.

F. PRODUCT IDENTIFIER CONVENTION FOR DRARS PRODUCT FILENAMES

Filenames (w_productidentifier_oflag_originator_yyyyMMddhhmmss[_freeformat].type[.compression])		
product identifier (Data designator)	IASI = iasi CrIS = cris ATMS = atms MWTS = mwts MWHS = mwhs IRAS = iras HIRAS = hiras	DRARS convention: indicate the satellite in the data designator part of the product identifier
product identifier Part of the Free description part	noaaxx metopa metopb npp fy3a fy3b fy3c fy3d jpss1 jpss2	DRARS convention: indicate “RARS” + a satellite identifier + a station ID in the free description part of DRARS product files: rars+(satellite)+(stationID)

[*Note: the convention indicates “rars” not “drars”*]

G. GLOSSARY

DRARS:	Direct Readout Acquisition and Relay System for LEO Satellite Data. It is a system based on the concept of RARS, but expanded to address a broader range of data and products, and a variety of formats and protocols while complying with a set of standards and best practices which are described in the present guide.
RARS:	Regional ATOVS Retransmission Service. It is an arrangement among HRPT station operators to acquire, pre-process, and share satellite sounding data from ATOVS instrument package aboard NOAA and METOP satellites, in near-real time, in accordance with agreed standards, in support of NWP.
DRARS Station:	Facility including a Direct Readout station that acquires the data
DRARS Operator	Organization responsible for data acquisition and pre-processing
DRARS Regional node	Regional coordinator in charge of providing technical guidance to operators, monitoring the timeliness, and maintaining on line information for users, for a regional component of the global DRARS network
DRARS Monitoring centre	Organization in charge of DRARS product quality monitoring at the global scale (Met Office/SAF NWP, UK)
CDA	Command and Data Acquisition station, major ground facility of a Low Earth Orbit satellite programme
RTH	Regional Telecommunication Hub of the Global Telecommunication System (GTS)

WMOSP	WMO Space Programme Office, within the WMO Observing and Information Systems Department (OBS/SAT)
OPS-LRS:	IASI “Operation Software for Local Reception Station”, which processes IASI instrument data from Level 0 (raw instrument data) through to level 1c (calibrated, geolocated, Gaussian-apodised radiances). OPS-LRS is provided by EUMETSAT through the NWP SAF as part of the AAPP deliverable.
CCSDS:	Consultative Committee for Space Data Systems (http://public.ccsds.org/default.aspx); “CCSDS” also designates the data format standard defined by this committee.
CCSDS to L0:	the conversion from CCSDS to EPS level 0 is generally included in the receiving station software. It is also available from EUMETSAT as part of the « Metopizer » software.
RDR:	Raw Data Record
SDR:	Sensor Data Record
CSPP:	Community Satellite Processing Package provided by NOAA through the University of Wisconsin for Direct Broadcast users.
RT-STPS:	Real-time Software Telemetry Processing System, a generalized CCSDS data processing package that ingests telemetry data from a spacecraft transmission in real-time, performs multi-mission protocol processing, and produces output to a file or TCP/IP socket. RT-STPS is provided by the NASA Direct Readout Laboratory.

H. TERMS OF REFERENCE OF THE RARS IMPLEMENTATION GROUP (V1. 16/03/2007)

1. A RARS Implementation Group is established by the WMO Space Programme in order to support the development and implementation of a global network of Regional ATOVS Retransmission Services (RARS) as discussed by the Consultative Meeting on High-level Policy on Satellite Matters[1], the Commission for Basic Systems[2], the Executive Council[3]and the Coordination Group for Meteorological Satellites (CGMS.)

2. Building on the model of the EUMETSAT ATOVS Retransmission Service (EARS) the goal of the global RARS network is to improve availability and timeliness of critical polar-orbiting satellite data from the global domain through the collection and redistribution of data sets acquired from multiple receiving stations that are coordinated and inter-connected. The WMO Space Programme is pursuing RARS activities as part of the Integrated Global Data Dissemination Service (IGDDS) project.

3. The objective of the RARS Implementation Group is to co-ordinate and facilitate:

    - Establishment of new RARS to expand the RARS network towards global coverage;
    - Inter-regional data exchange of RARS data;
    - Standardization in the areas of e.g:
        - product processing software usage;
        - product formats;
        - quality-tagging of data;
        - service management.
    - Ensuring consistency with the IGDDS concept
    - Expansion of data types to be retransmitted as part of the global RARS network
    - Reviewing the RARS concept to ensure it fulfills regional and global requirements for improved timeliness of critical LEO data

4. The RARS Implementation Group shall be composed of technical experts designated by organizations contributing to the global RARS network, planning or considering to contribute to it, and of supporting staff from the WMO Space Programme.

5. The RARS Implementation group meets nominally once a year and report on its activities to CGMS and WMO

[1] CM-5, January 2005
[2] CBS XIII, St Petersburg, February-March 2005, item 6.10
[3] EC 57, Geneva, June-July 2005, item 3.10.7

6. Unless otherwise agreed, the RARS Implementation group will cease its activities when its objectives will be completed or handed over to a new structure ensuring operational coordination of activities in the longer term.

I. REGIONAL NETWORK MANAGERS AND OPERATIONAL POINTS OF CONTACT

Regional Network	**Regional Node**	**Network Manager**	**Operational Point of Contact**
EARS	EUMETSAT	Anders Soerensen anders.soerensen@eumetsat.int	
Asia-Pacific	BOM	Anthony Rea a.rea@bom.gov.au	
South America	N/A		
USA	NOAA		
Sub-regional network	**Sub-regional Node**	**Network Manager**	**Operational Point of Contact**
Asia-Pacific North	JMA		
South America/North	INPE	Sergio Pereira sergio.pereira@cptec.inpe.br	
South America/South	SMN Argentina	Gloria Pujol gpujol@smn.gov.ar	
Global DRARS Network	**Coordination**	**WMO DRARS coordination**	**Global monitoring by NWP-SAF**
	WMO	Jérôme Lafeuille	Nigel Atkinson