

THE ATOVS RETRANSMISSION SERVICE

This paper describes the draft specification for a new EUMETSAT ATOVS Retransmission Service and summarises the related operational services available to users.

CGMS Members are invited to take note.

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1 INTRODUCTION

It will be recalled that image data from NOAA satellites can normally be received in two different ways:

- Via direct broadcast from the satellite to a High Resolution Picture Transmission (HRPT) station. This mechanism provides data close to real time, however, the geographical coverage is limited to the region around the HRPT station.
- Via the satellite data dump (once per orbit) to the central NOAA ground station. This mechanism provides global coverage data to users, but with delays with respect to the time of observation. In the case of data dumps once per orbit, the delay can be up to 120 minutes. In the case of a blind orbit, where the satellite has no visibility of the central ground station, there can be an additional delay of 100 minutes. Further delays could occur depending upon the means of communication from the central ground station to the user.

The EUMETSAT ATOVS Retransmission Service, described in this document, has been established to collect data from a pre-selected set of HRPT stations and to retransmit the data to users via a satellite broadcast system. The Service is expected to evolve in response to operational experience, availability of NOAA satellites/instruments, user feedback and developments in meteorological processing.

Initial limited trials of the Service are expected to begin late 2001 and it is currently expected that the Service will continue to be provided until at least the end of 2004. Any extension of the Service beyond this date would require the approval of the EUMETSAT Council.

2 REFERENCE DOCUMENTATION

Reference 1 General Specifications for the AAPP Preprocessing Package Related to NOAA Polar Orbiting Weather Satellites, Meteo France, CMS/R&D/AAPP/SA, Version 1, 1 April 1999

Reference 2 ATOVS and AVHRR Processing Package (AAPP) / V3.0, S/W CD, EUMETSAT, 2001

Reference 3 AAPP declaration file, hrs1d.h, Level 1D Data Set (ATOVS on HIRS grid), R.J.Renshaw, extract from RD.1

3 ATOVS RETRANSMISSION SERVICE BASELINE

3.1 Overview of Services

Overview of ATOVS Retransmission Service Baseline	
Objective	To provide the European Meteorological Community with ATOVS data covering data-sparse areas.
Timeliness	30 min.
Instruments	AMSU-A, AMSU-B, HIRS/3, AVHRR for local cloud information AVHRR data will not be distributed
Processing Level of Retransmitted Products	AMSU-A AAPP level 1d on HIRS/3 grid AMSU-B AAPP level 1d on HIRS/3 grid HIRS/3 AAPP level 1d on HIRS/3 grid Cloud info. AAPP level 1d on HIRS/3 grid from AVHRR
Satellites	All operational NOAA satellites
Geographical Coverage of ATOVS data	Geographical coverage over primarily the Atlantic Ocean North of 20°N and Arctic Region North of 70°N as cover by the HRPT stations located in: Tromsø (Norway), Maspalomas (Spain), Søndre Strømfjord (Greenland), Bedford, Halifax (Canada) and Gilmore Creek, Alaska (USA)
Geographical Coverage of Retransmission	EUMETSAT Member and Co-operating States
Method of Retransmission	Commercial satellite broadcast service
Equipment for Retransmission Reception	Low cost commercially available equipment, typically a 60-80 cm antenna dish, a LNB, a DVB-PCI card and a standard PC
Product Reception Format	Binary computer files in AAPP level 1d format with big endian integer representation
Archiving	Retransmitted data will not be archived by EUMETSAT
Admission to Service	Freely available to all users within the EUMETSAT Member and Co-operating States after registration with the EUMETSAT User Service. The data is also freely available to EUMETSAT and its data providing partners within the ATOVS Retransmission Service.

3.2 Instruments and Data Processing

The instrumentation on the operational NOAA KLM series satellites includes the Advanced High

Resolution Radiometer (AVHRR) and the Advanced TIROS Operational Vertical Sounder (ATOVS) consisting of the Advanced Microwave Sounding Units (AMSU-A/B) and the High Resolution Infrared Radiation Sounder (HIRS/3).

The EUMETSAT ATOVS and AVHRR Processing Package (AAPP) V3.0 will be used to process the AMSU-A, AMSU-B, HIRS/3 and AVHRR, instrument data to the level 1d (a detailed definition of AAPP processing can be found in Section 2, **Reference 1**). However, the first level of processing of data from the Gilmore Creek HRPT station may be based on NOAA standard software.

The AAPP level 1d contains geo-referenced and calibrated measurements processed in a non-reversible manner: calibration coefficients are applied to the numerical data. All data are mapped to the HIRS/3 grid. The AAPP level 1d include cloud information derived from the AVHRR data (fraction of clear AVHRR pixels in HIRS FOV and AVHRR parameters in the HIRS FOV).

3.3 Geographical Data Coverage

The objective of the ATOVS Retransmission Service is to provide the European Meteorological Community with ATOVS data primarily covering data-sparse areas over:

- The Atlantic Ocean North of 20°N
- The Arctic Region North of 70°N

The Service will be based upon data provided by five HRPT ground stations:

Station Name	Country	Operator	Latitude	Longitude
Tromsøe	Norway	TSS	69.67	18.99
Maspalomas	Spain	INTA/INSA	27.78	-15.63
Søndre Strømfjord	Greenland	DMI	66.98	-50.67
Bedford (Halifax)	Canada	MSC	44.74	-63.67
Gilmore Creek	Alaska, USA	NOAA	64.97	-147.40

These ground stations together provide the combined geographical coverage shown in fig. 1.

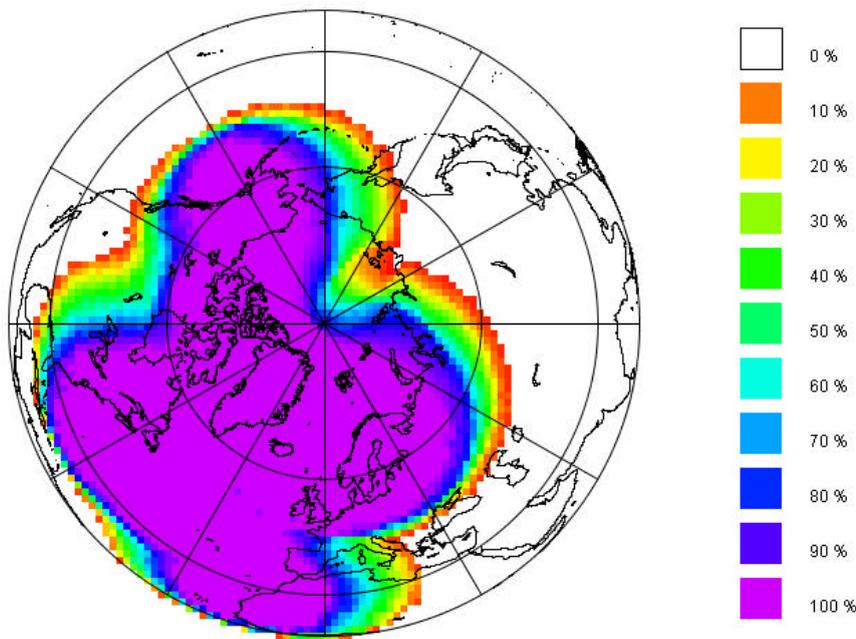


Fig.1. Combined geographical coverage from the five selected stations

3.4 Accuracy

Through co-ordination with the participating HRPT stations, EUMETSAT will ensure that consistent and accurate sets of NOAA orbit data are used for the geo-location of instrument data, and that a consistent AAPP processing environment is used for the processing of the instrument data.

3.5 Quality Control

EUMETSAT will operate an ATOVS Retransmission Service reception station located at its HQ building in Darmstadt, Germany, and will use this station to continuously monitor the availability and transmission quality of the broadcast. At regular intervals, EUMETSAT will check the accuracy and consistency of instrument data geo-location and calibration.

For reporting purposes and the compilation of statistics, EUMETSAT will maintain a full log of the data product broadcast history. For each data product this includes the time of measurement, time of transmission, HRPT station identifier, satellite identifier, instrument name and processing level, but not the measurement data itself. A rolling archive of measurement data will be maintained by EUMETSAT to assist the monitoring of quality control.

3.6 Timeliness and Availability

The timeliness and availability of the overall Service is clearly a function of the performance of individual HRPT receiving stations and the communication and distribution networks. Whilst

the HRPT stations will not be under the direct operational authority of EUMETSAT,

timeliness and availability requirements will be addressed with individual station operators with the aim of reaching criteria adequate for regional numerical weather prediction. As a target, all data products of the ATOVS Retransmission Service are expected to be available and accessible on a reception station within 30 minutes of the actual measurement.

Service availability is broken down into three components: Schedule Efficiency, HRPT Reception Availability and Communications and Broadcast Availability. The Schedule Efficiency and HRPT Reception Availability are under the responsibility of the individual station operators. The Communications and Broadcast Availability is under EUMETSAT responsibility.

Availability	4 out of 5 HRPT Stations	5 out of 5 HRPT Stations
Schedule Efficiency	98 %	90%
HRPT Reception Availability	98 %	95%
Communications and Broadcast Availability	98 %	98%
End-to-End Availability	94 %	84%

The figures for the Schedule Efficiency and HRPT Reception Availability are indicative. Actual figures will depend on the number of antennas at the HRPT station and other operational conditions.

The effect of any problem with the NOAA satellites and/or instruments is not included in the above availability figures and could lead to a further reduction in the available data sets. The availability figures will be measured over one calendar month and are expressed in percentages of achieved data sets versus a defined reference. Data from one instrument and one pass is defined as a single data set.

3.6.1 Schedule Efficiency

In a situation where there may be a conflict in the use of available resources, such as the simultaneous pass of two satellites over a single antenna HRPT station, the retransmission schedule will not contain all theoretically possible data sets, however, it is expected that the schedule will contain at least 90 % of all those possible.

3.6.2 HRPT Reception Availability

Each participating HRPT station is expected to receive, process and transmit to EUMETSAT at least 95% of the data sets contained in the retransmission schedule.

3.6.3 Broadcast Availability

EUMETSAT plans to broadcast at least 98% of the data sets that have been transmitted by participating HRPT stations.

3.7 Broadcast Area

The geographical area covered by the broadcast transmission will include all EUMETSAT Member and Co-operating States.

3.8 Broadcast Schedule

The interaction between the participating HRPT stations and EUMETSAT is expected to be at the level of scheduling strategy and not at the level of the day-to-day scheduling. Consequently, a broadcast schedule will not be made available to users. Broadcast scheduling will be a dynamic process, continuously being optimised for the best availability and timeliness of data sets. However, as a reference for users, a schedule of predicted passes covering all operational NOAA satellites over each of the HRPT stations participating in the ATOVS Retransmission Service will be provided on the EUMETSAT Web site www.eumetsat.de.

3.9 Broadcast Reception Stations

Since the broadcast of data from EUMETSAT to users will be based on a commercially available satellite broadcast service, the reception equipment will be available at relatively low cost. User equipment will, typically, consist of a 60-80 cm dish antenna, a LNB, a DVB-PCI card and a standard PC.

Depending upon the broadcast service selected, larger dishes may be required in certain regions. Commercially available satellite broadcast services normally encrypt data during transmission, therefore, following registration with EUMETSAT, the reception station will automatically decrypt all data.

Once a broadcast technology has been selected (expected late 2001), EUMETSAT will provide a more detailed technical specification of reception station requirements.

3.10 Data Formatting

The ATOVS data will be made available at user reception station as files organised and formatted according to the AAPP format specification for level 1d – ATOVS on HIRS/3 grid (see Section 2, **References 2 and 3** for more detailed information).

The AAPP file format is a binary format based on integers. The ATOVS Retransmission Service will distribute files with big endian representation of integer numbers. A single pass of a NOAA satellite over an HRPT station will be distributed as a single file covering the full pass or a set of files each covering a fraction of the pass. (Consideration may be given to making the ATOVS data available on the reception station as BUFR files in due course).

3.11 Interface with Users

The interface between EUMETSAT and the users will be at the level of the broadcast radio signal and EUMETSAT will be responsible for the procurement, management and monitoring of the broadcast service.

Whilst users are responsible for procurement, installation and operation of their reception stations, the Helpdesk of the EUMETSAT User Service can provide initial support to those users wishing to procure and install a reception station, e.g. supply list of manufacturers, technical documentation, access conditions, etc. Should further technical support be required, users should make use of technical service companies.

3.12 Admission to Service

The ATOVS Retransmission Service will be freely available to all users within the EUMETSAT Member and Co-operating States *after* registration with the EUMETSAT User Service.

3.13 Archive and Retrieval Service

Meteorological satellite products collected and broadcast by the ATOVS Retransmission Service will not be archived by EUMETSAT and will, therefore, not be retrievable.

4 EUMETSAT User Service

The EUMETSAT User Service provides information and services associated with the reception of data by users and its subsequent exploitation. In particular, the User Service includes the following elements:

- Dissemination of operational information to users (mainly concerning the status/ planning of operational services);
- provision of a helpdesk function offering a number of off-line services;
- provision/coordination of user training.

User support for the ATOVS Retransmission Service will be the responsibility of the EUMETSAT User Service.

Depending on the context and urgency, two mechanisms are used to provide information to users about EUMETSAT operational services, Web pages and Newsletters.

4.1 WEB Pages

Up-to-date information on all EUMETSAT operational services is provided on dedicated pages within the EUMETSAT Web site www.eumetsat.de. For the ATOVS Retransmission Service, the information provided on the Web pages will include:

- a schedule of predicted passes covering all operational NOAA satellites over each of the HRPT stations participating in the ATOVS Retransmission Service. The schedule will cover at least a week ahead at any point in time.
- ATOVS Retransmission Service specification and manuals
- AAPP reference documents and user manuals

4.2 Newsletters

Around once a year a Newsletter will be issued to all registered users containing information about the current status and long term planning of EUMETSAT operational services. Every two years a customer satisfaction survey is included with this newsletter.

4.3 Helpdesk Function

A helpdesk function is available to:

- respond to requests for admission to the ATOVS Retransmission Service;
- respond to user requests for the provision of user manuals;
- respond to general queries or complaints about EUMETSAT operational services;
- maintain a register of all users of EUMETSAT operational services.

4.4 Admission to the ATOVS Retransmission Service

Users will be admitted to the ATOVS Retransmission Service upon completion of the relevant registration formalities with EUMETSAT. Users will have to install a key within the reception system to allow reception and decryption of the data and products.

4.5 User Manuals

A range of Technical User Manuals is maintained and can be provided to users upon request. These documents provide a wide range of information designed to allow users to exploit all available EUMETSAT operational services. Many of the documents can be downloaded directly from the EUMETSAT web site as PDF files.

4.6 Registration of Users

A register containing contact details of all users of EUMETSAT operational service is maintained and is used as the basis for contact with users and the distribution of Newsletters and other relevant information.

4.7 Response to Queries and Complaints

All queries and complaints concerning the operational services are answered in accordance with specified availability and timeliness requirements.

5 CONCLUSION

CGMS Members are invited to take note of EUMETSAT's implementation plans for the ATOVS Retransmission Service. At the time of writing this document presents the draft specification of the Service, pending formal approval by EUMETSAT Delegations.