Status Report on the Global Regional ATOVS Retransmission Service (RARS)

Presented by David Griersmith (ABoM) on behalf of RARS participants and contributors
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Acknowledgements

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• Gary Weymouth, Ian Grant, Xihong Li, Mike Willmott (ABoM)
• Colleagues in China, Korea, Singapore, USA, Sth America, NZ
Talk outline

• What is RARS?
• Status
• Developments
• Input and feedback required
What is RARS?

- RARS is the Regional ATOVS Retransmission Service
- It comprises operational arrangements for rapid delivery of satellite data to the global community (especially NWP Centres). Purpose is to improve availability and timeliness of time-critical polar-orbiting satellite data for the global domain to meet global and regional requirements
- RARS involves acquisition of polar-orbiting satellite data from a global network of NOAA/METOP ground reception stations.
- NOAA ATOVS data are locally processed and passed to a regional Processing Centre that handles coordination, and rapid delivery to users, regionally and worldwide.
- Impact of global RARS system has been significant via improvements in NWP modelling since much larger quantities of sounder data have become available for assimilation.
- Better availability and use of satellite data – a WMO Space Programme priority
Global RARS – 27 HRPT receiving stations

- Global RARS comprises three RARS regional networks that distribute ATOVS data:
  - Asia-Pacific RARS: ~12 HRPT stations in Australia, NZ, Antarctica, Japan, China and Singapore - coordinated by Australian Bureau of Meteorology.
  - South American RARS: ~5 stations in Brazil and Argentina - coordinated by National Institute for Space Research (INPE) and Argentina.
Global effort: WMO, CGMS, ITSC, satellite operators

- **EARS**: EUMETSAT, NOAA, KSAT, DMI, HNMS, INTA, MSC/CMC, Météo-France
- **Asia-Pacific RARS**: JMA, ABoM, KMA, CMA, MSS, MetService/NIWA
- **South American RARS**: INPE/CPTEC, INMET, SMN, CONAE
RARS model of operation

Real time HRPT data sent to processing centre which distributes files globally to NWP centres

ATOVS data

HRPT station

Regional processing and distribution centre

HRPT station

HRPT station

HRPT station

Data retransmission DVB-S or GTS
Background

• The global RARS network had its origins in the EUMETSAT ATOVS Retransmission Services (EARS) with satellite broadcast (2001-02)
• WMO CBS & EC, ITSC and CGMS, requested the implementation of a global network of RARS
• The global RARS network implementation and expansion are monitored and assisted by the RARS IG
RARS characteristics

• RARS data content:
  – AMSU-A
  – AMSU-B or MHS for NOAA-N or MetOP
  – HIRS
  – AVHRR on HIRS grid (20.3 km) for local cloud information

• Global NWP requirement for soundings requires 30 min timeliness, BUFR format and consistency of data calibration.
RARS characteristics

- **Timeliness**: target is 90% global coverage available within 30 minutes (instead of 3-6 hrs) in NWP centers through GTS and/or Alternative Dissemination Methods (ADMs)

- **Data quality and consistency**:
  - Use of common pre-processing software (AAPP)
  - Standardisation of products formats, quality tagging and service management
  - Data monitoring with support of EUMETSAT SAF on NWP

- **Cost effectiveness**
  - Relatively inexpensive HRPT stations ensure near-global coverage
  - comms costs are decreasing
  - GTS or ADMs allow low-cost access e.g. satellite broadcast systems
  - Initially doubled satellite data for NWP centres (highly cost-effective)
EUMETSAT RARS (EARS)

- ATOVS retransmission from ~10 HRPT stations
- AVHRR retransmission from 5 stations
  ‘1 minute’ segments disseminated within 10 min
- capability for ASCAT and IASI
- Info via www.eumetsat.int
EUMETCast Overall Coverage
EARS ATOVS

Satellites: NOAA KLM, NOAA NN’, Metop

Instruments: HIRS, AMSU-A, AMSU-B, MHS

Data Rate: ~10 kb/s

HIRS data visualised using EPSView
RARS NWP SAF monitoring: daily summary emailed to RARS operators (see www.nwpsaf.org)

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EARS AVHRR

Satellites: NOAA KLM, NOAA NN’, Metop

Data Rate: 622 kb/s

NOAA-18 received by EARS
EARS ASCAT

Satellites: Metop

Data Rate: 60 kb/s
EUMETCast User Reception Terminal Costs

- **DVB Standard Hardware**
- **LNB Ku-/C-band & Satellite Dish**: 200/1500 EUR
- **DVB PCI Card**: 100 EUR
- **DVB Multicast Client Software**: 60 EUR
- **EUMETCast Key Unit (EKU)**: 40 EUR
- **PC, Hard Disk, Ethernet**: 1000 EUR

**Total**: 1400/2700 EUR
Asia-Pacific RARS

• Coordinator: D. Griersmith (Australia)
• 12 HRPT stations from Japan, Singapore, NZ, China, Australia.
• Melbourne and Tokyo are the processing/distribution centres that inject ATOVS data into GTS
• feedback is positive impact on NWP e.g. JMA, ABoM, UKMO, ECMWF
• from 2 to 7 more HRPT stations planned by end 2008 e.g. Casey, Davis, Honolulu, Fiji, Guam, Vladivostok, Jincheon.
Asia-Pacific RARS
Available Time at Tokyo

Site ID: CPT (Cribpoint)
Sampling Days: Sep/2-Sep/13, 2006 (12 days)
Total Number of Files: 537
Rate of Files Received within 30 min: 89.2%
50% Files are Received within 26 min
80% Files are Received within 28 min
90% Files are Received within 32 min
Averaged Time: 32.1 min

Elapsed time from compilation of a file to reception at RTH Tokyo: 2 to 5 minutes
ABoM model improvements over Australian region with/without local ATOVS (RARS) data
FengyunCast – ADM for Asia-Pacific Region

China Meteorological Administration
Advantage of ADM using commercial satellite Digital Video Broadcast (DVB-S)

Access to multiple satellite data and products in near real-time using a low-cost single ground antenna
Basic Concept of CMA DVB-S
A revolution: Data Exchange with EUMETCAST
South American RARS

- Coordinators Sergio Pereira (CPTEC/INPE) and Gloria Pujol (SMN, Argentina)
- 5 stations operational, with ~4 more planned by end 2008

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<tr>
<th>Processing and distribution centre</th>
<th>HRPT stations operational</th>
<th>Expected expansion 2008</th>
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Towards global coverage

- EARS covers a large part of the Northern hemisphere
- Asia Pacific RARS and South American RARS are growing

Gaps over Africa, Pacific, Sthn Ocean, W of India and Antarctica
UKMO modeling study at 500 hPa height. RMS difference between analyses with all ATOVS and operationally-available ATOVS. ATOVS data missing cut-off would benefit N Pacific and S Hem
RARS developments

• **Short-medium term**
  - coverage is extending over Pacific, South-America, Africa, and Indian ocean, to fill gaps
  - % of coverage of earth’s surface steadily increasing: ~70 → 80% in 2yrs
  - substantial effort being made towards standardised filenames and headers for global data exchange over the GTS/WIS
  - Improved timeliness, quality, information and availability (see web sites for contacts to access GTS, EARS data)

• **Medium-long term: expansion beyond ATOVS**
  - **Advanced sounders**: Similar requirement for IASI (after suitable data compression/channel selection); NPP under discussion
  - **Scatterometer data**: RARS can provide the wider coverage required for ASCAT data processing
  - **AVHRR imagery**: RARS can provide full resolution AVHRR data compared to 4km NOAA GAC data. EARS already provides AVHRR.
RARS user input required

• feedback from user community is important
• examples of impact of RARS data on NWP
• user requirements concerning coverage, formats, level of data, quality, timeliness, type of data, calibration;
• Feedback from NWP community on overlap of data from stations e.g. Asia-Pacific
• Send feedback to JLafeuille@wmo.int; robert.husband@wmo.int; d.griersmith@bom.gov.au.
Websites for RARS monitoring, information and contacts

• WMO RARS web site (site:http://www.wmo.int/pages/prog/sat/RARS.html)
• EUMETSAT EARS web site http://www.eumetsat.int/Home/Main/What_We_Do/Satellites/EARS_System/index.htm?l=en
• JMA (includes comparisons with global data for all A-P RARS) – http://mscweb.kishou.go.jp/rars/index.htm
• MeteoFrance EARS monitoring http://www.meteo-spatiale.fr/nwpsaf/cgi-bin/index.pl
• ITSC WG on Satellite Sounder Science and Products – http://cimss.ssec.wisc.edu/itwg/sssp/direct_broadcast/ears.html
Thank you
Special thanks to all the contributors to this presentation and to the global RARS