

24th International TOVS Study Conference (ITSC-24)

(16 - 22 March 2023, Tromsø, Norway)

Status of the **Direct Broadcast Network (DBNet)** for globally coordinated real-time acquisition, processing and fast delivery of satellite direct readout data, coordinated by the World Meteorological Organization



WMO OMM

World Meteorological Organization

Organisation météorologique mondiale

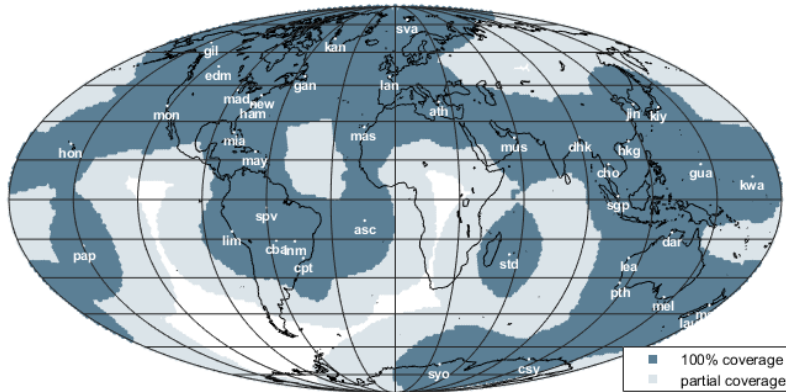
Zoya Andreeva and Mikael Rattenborg,

DBNet coordinators

WMO Space Programme

DBNet CONCEPT AND OBJECTIVES

- Global availability of near real-time LEO data received by a collection of Direct Broadcast stations distributed around the world
- Ensuring global consistency by using common software (i.e. AAPP, CSPP SDR, FY3PP) consistent with global processors, standardized coding and file naming, and quality monitoring
- Dissemination by the WMO Information System (primarily GTS)
- Coordinated by WMO Space Programme, supported by CGMS



DBNet-ATOVS coverage in October 2022

- Initial target established 2004: NOAA and Metop ATOVS_a (L1b) from 90% of the globe available on the GTS in 30 min
- Latency goal revised 2015 to 20 minutes to reflect evolving SRNWP needs
- Goal achieved for ATOVS (2017)

a - ATOVS= HIRS, AMSU-A, AMSU-B, MHS

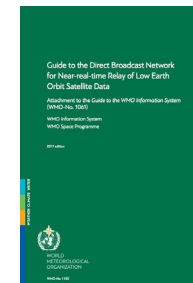
DBNet COMPONENTS

- DBNet is composed of regional networks coordinated by regional or sub-regional nodes and the global DBNet Coordination Group (<https://community.wmo.int/direct-broadcast-network-dbnet>)
- Global monitoring of product consistency is performed by the NWPSAF (<http://nwpsaf.eu/site/monitoring/dbnet/>)
- Last hybrid DBNet-CG meeting in Geneva, October 4-6, 2022

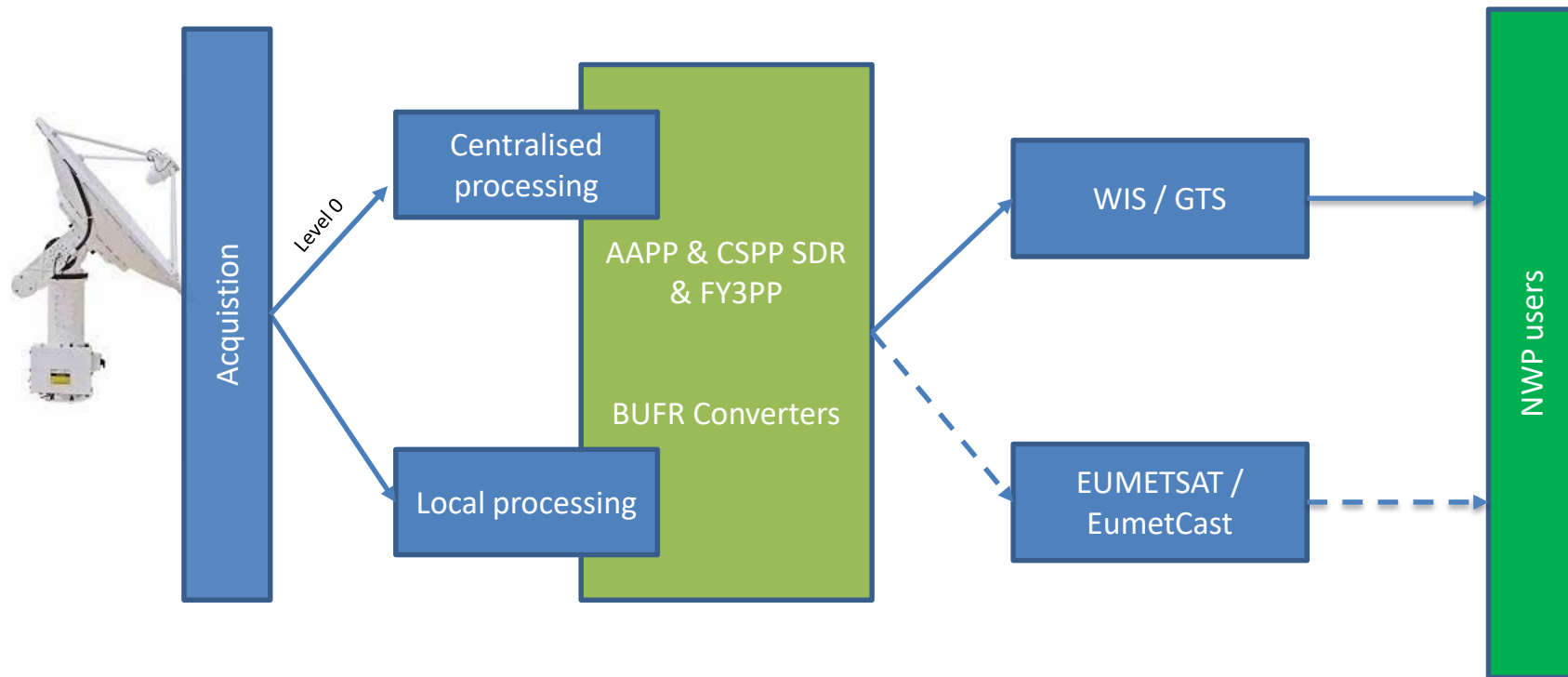
| Regional Network | Regional or Sub-regional Node |
|-------------------------|-------------------------------|
| DBNet - EUMETSAT (EARS) | EUMETSAT |
| DBNet - Asia-Pacific | JMA |
| | BoM |
| DBNet - South America | INPE |
| | SMN Argentina / CONAE |
| DBNet - NOAA | NOAA / CIMSS |



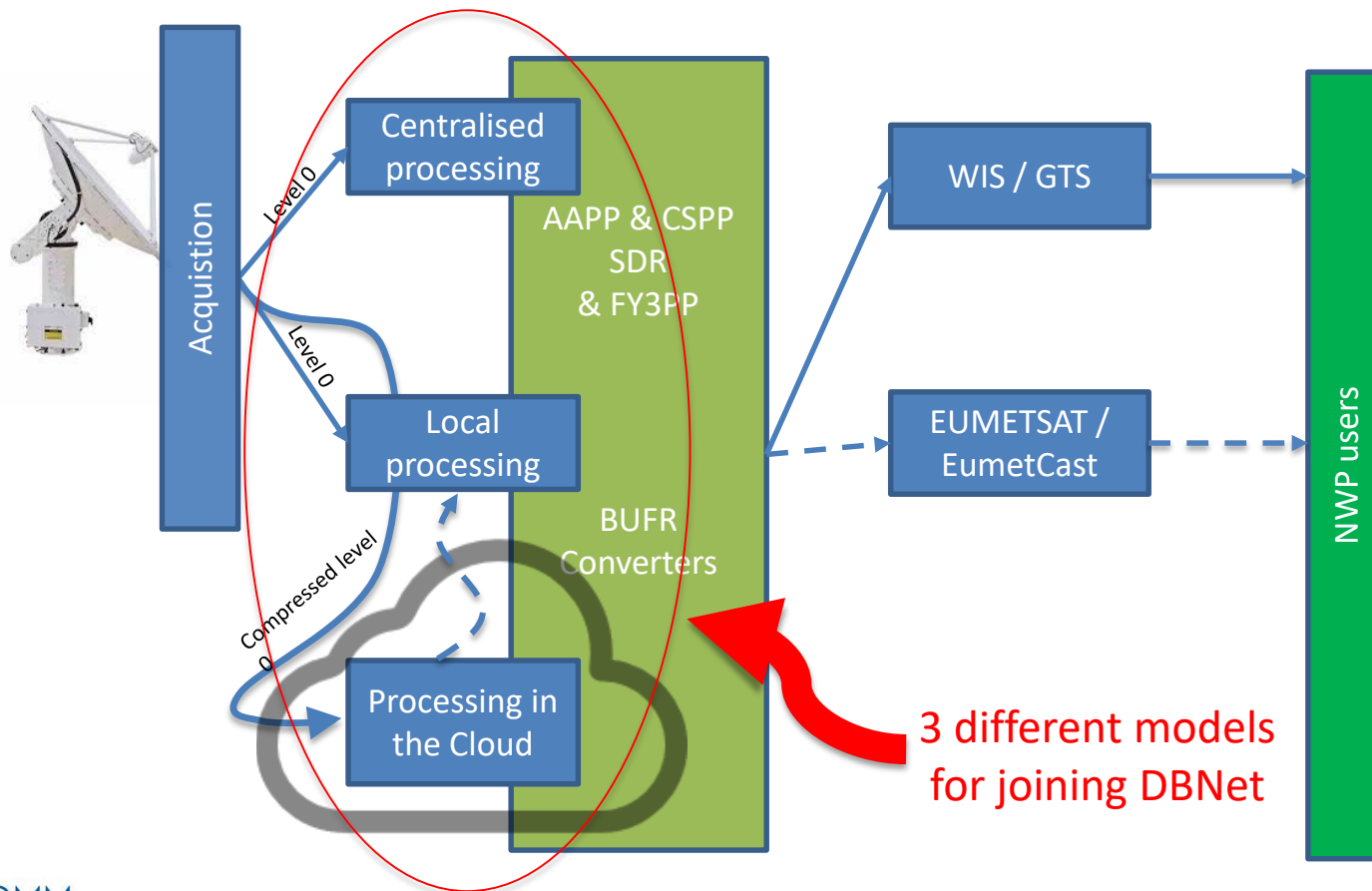
Guide endorsed by WMO Commission for Basic Systems in Nov 2016 (currently under revision)



DBNet PROCESSING



DBNet PROCESSING, POTENTIAL FLEXIBLE ARCHITECTURE



DBNet STATION DATA RECEPTION AND CONSISTENCY STATUS

Can select a specific satellite

Can show last pass received

Network Status

EARS

| Network | Country | Station | AMSU-A | MHS | HIRS | IASI | Any satellite data | ATMS | MWHS-2 | MWTS-2 |
|---------|----------------|---------------------|--------|-----|------|-------|---------------------|------|--------|--------|
| EARS | Oman | Muscat (mus) | | | | | Any satellite data | | | |
| | Newfoundland | Gander (gan) | | | | | All satellite data | | | |
| | Greenland | Kangerlussuaq (kan) | | | | | All ATOVS/IASI data | | | |
| | Greece | Athens (ath) | | | | | All CrIS/ATMS data | | | |
| | France | Lannion (lan) | | | | | METOP-B | | | |
| | France | St Denis (std) | | | | | METOP-C | | | |
| | Canaries | Maspalomas (mas) | | | | | NOAA-18 | | | |
| | Canada | Edmonton (edm) | | | | | NOAA-19 | | | |
| | Canada | Edmonton (edm) | | | | | S.NPP | | | |
| | Canada | Edmonton (edm) | | | | | NOAA20 | | | |
| Arctic | Svalbard (sva) | | | | | FY-3D | | | | |

Last received any instrument data at: 2023-03-04 03:52:42.684000

Stations currently not contributing to DBNet

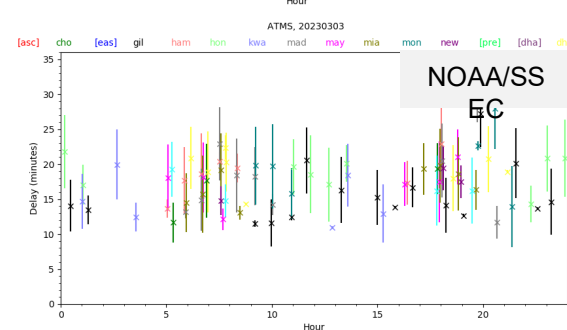
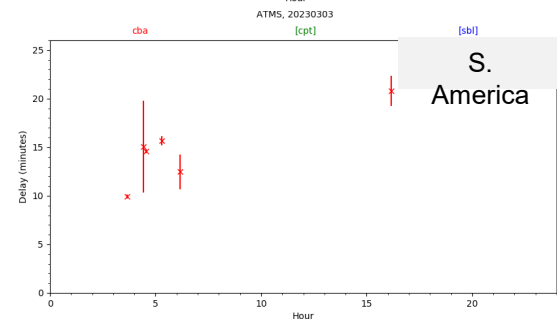
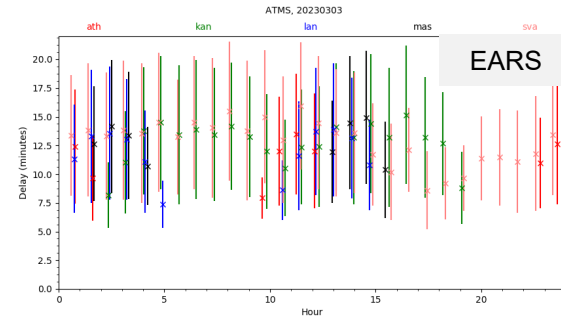
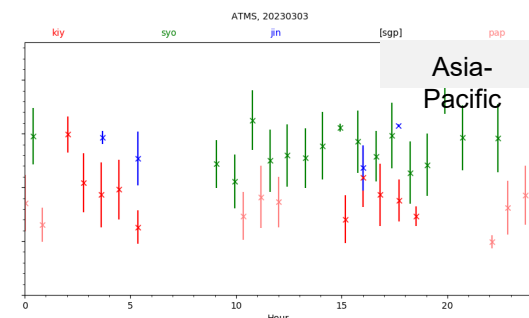
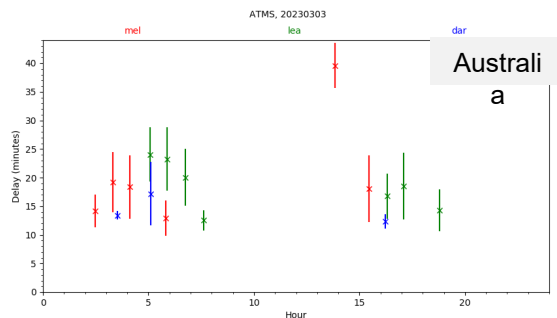
| Network | Country | Station |
|---------|----------|-------------|
| EARS | Russia | Novosibirsk |
| EARS | Russia | Moscow |
| EARS | Russia | Khabarovsk |
| SAWIDRA | Niger | Niamey |
| SAWIDRA | Gabon | Libreville |
| SAWIDRA | Kenya | Nairobi |
| SAWIDRA | S Africa | Pretoria |

| Key for table icons: | |
|----------------------|--|
| | No data received over past week |
| | No data received over past three days |
| | Data received during past three days |
| | Data failing consistency comparison with global feed |

https://nwp-saf.eumetsat.int/monitoring/ears_mon/DBNet_station_status.html

DBNet STATION TIMELINESS MONITORING

ATMS: 3 March 2023



atms 20230303 EARS (core)

| station | passes | 0% | 50% | 90% | 100% |
|---------|--------|----|-----|-----------|------|
| ath | 8 | 6 | 12 | 16 | 19 |
| kan | 21 | 5 | 13 | 18 | 21 |
| lan | 12 | 5 | 12 | 17 | 20 |
| mas | 8 | 6 | 13 | 18 | 21 |
| sva | 28 | 5 | 13 | 18 | 22 |

overall latency from 16 to 18 min (for 90% of data)

<https://nwp-saf.eumetsat.int/downloads/dbnet/timeliness/>

CURRENT DBNet SERVICES

- Each DBNet regional network contributes to one or more “Services”
- A DBNet Service consists of Direct Broadcast acquisition, processing and relay of a category of satellite data

*Latencies should be reviewed
based on NWP user requirements*

| Categories of services | Services/Instruments | Data latency goal/threshold | Status |
|---------------------------|-------------------------------|-----------------------------|--|
| IR/MW sounding | ATOVS (AMSU-A, MHS, HIRS) | 20 min/ 30 min | Operational |
| | ATMS, VASS (MWTS, MWHS, IRAS) | | |
| Hyperspectral IR sounding | CrIS, IASI, HIRAS | 20 min/ 20 min | Operational |
| IR/VIS imaging | VIIRS, AVHRR, MERSI | 10 min/ 30 min | Implemented only by EARS (Considered globally) |
| Scatterometry | ASCAT | 20 min/ 30 min | Implemented only by EARS (Considered globally) |
| MW imagery | MWRI, AMSR-2, MTVZA-GY | 20 min/ 30 min | Implemented only by EARS (Considered globally) |

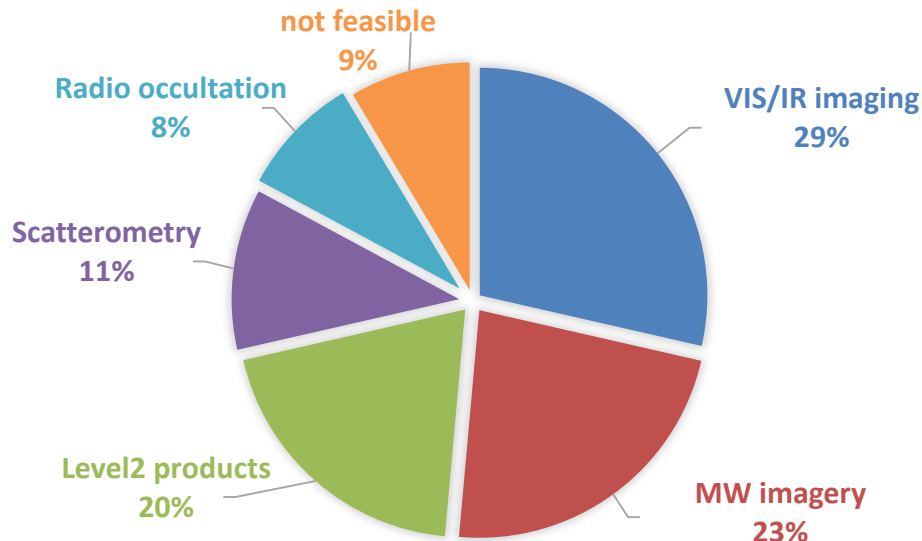
POTENTIAL DBNet SERVICES – DBNet STATION OPERATOR SURVEY

Results of the DBNet Station Operator Survey conducted in Dec 2022 – Jan 2023:

Q. Please indicate which other potential services you will be willing to support via your DBNet infrastructure

Comments from DBNet operators:

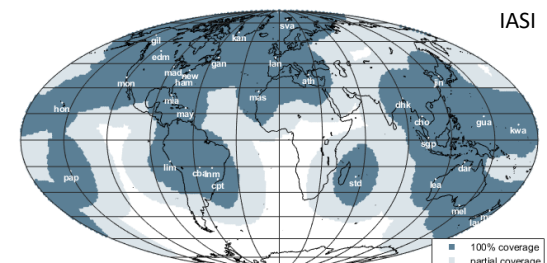
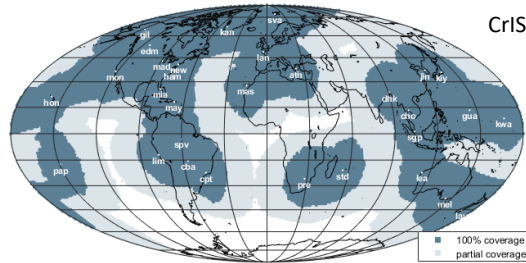
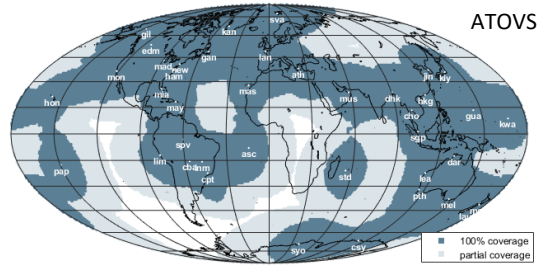
- *User-driven needs*
- *Bandwidth would be the major issue if the data are to be disseminated via GTS*
- *Addition of any new services may require a business case to be put forward and evaluated*
- *Indications of products most of interest to DBNet would be considered and could contribute to setting priorities for development activities.*



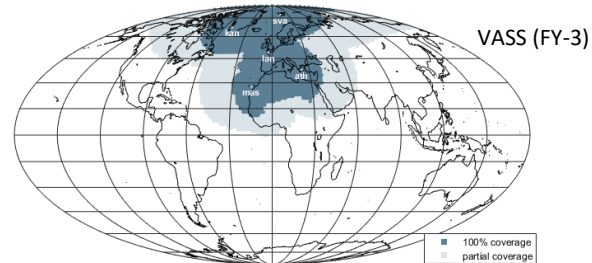
DBNet COVERAGE – OCTOBER 2022

The main areas of concern in terms of coverage:

- Central Asia
- Southern Pacific
- Central and Southern Africa



■ 100% coverage
■ partial coverage



FURTHER DBNet COVERAGE EXTENSION

- South America
 - upgrade of SMN/CONAE high latitude station (Tierra de Fuego)
 - addition of the Cayenne station (French Guiana)
 - reintegration of Isla de Pasqua station
- North America
 - addition of Env. Canada stations in the Northern part of Canada (Inuvik and Iqaluit)
- Asia-Pacific
 - reintegration of CMA stations (Urumqi, Jiamusi and Guangzhou)
 - reintegration of IMD stations (starting with a new Hyderabad station)
- Europe/Africa
 - addition of the four stations of the SAWIDRA project (Libreville, Nairobi, Niamey, and Pretoria)
 - addition of ARC Sodankylä station (FMI)

EVOLUTION OF DBNet TIMELINESS REQUIREMENTS

- DBNet timeliness targets are to be reviewed by the NWP user community
- WMO Statements of Guidance (SoGs) provide an assessment of the adequacy of observations to fulfill user requirements and suggests areas of progress towards improved use of observing systems (ref. <https://community.wmo.int/rolling-review-requirements-process>)
- SoGs for Global NWP and High-Resolution NWP were updated in 2020
- WMO is currently in the process of revising the Rolling Review of Requirements (RRR) process and its SoGs
- ET-SSU A5.3: ITSC DA/NWP members to provide any information on impact of DBNet data on NWP accuracy and consider studies that will indicate whether reducing latency of DBNet data would provide significant additional value

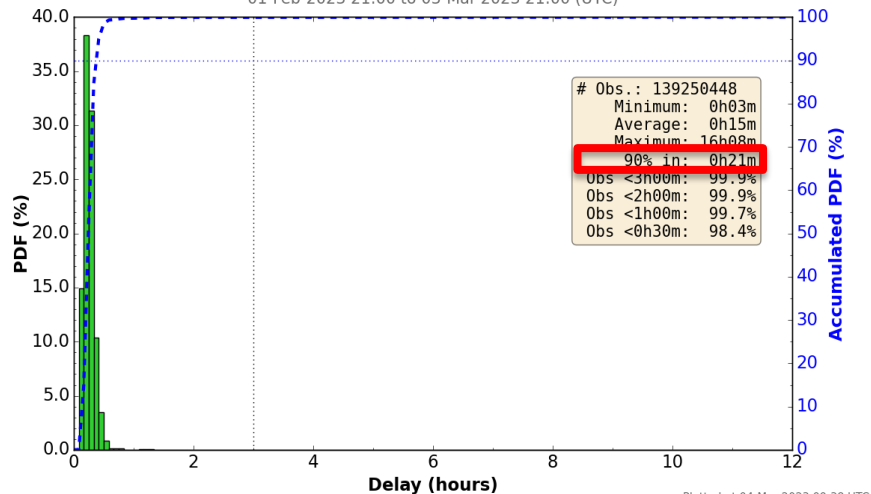


DBNet STATION DATA LATENCY (ATMS)

DWD Delay Statistics for ATMS (DBNet)

NOAA-20, Suomi-NPP

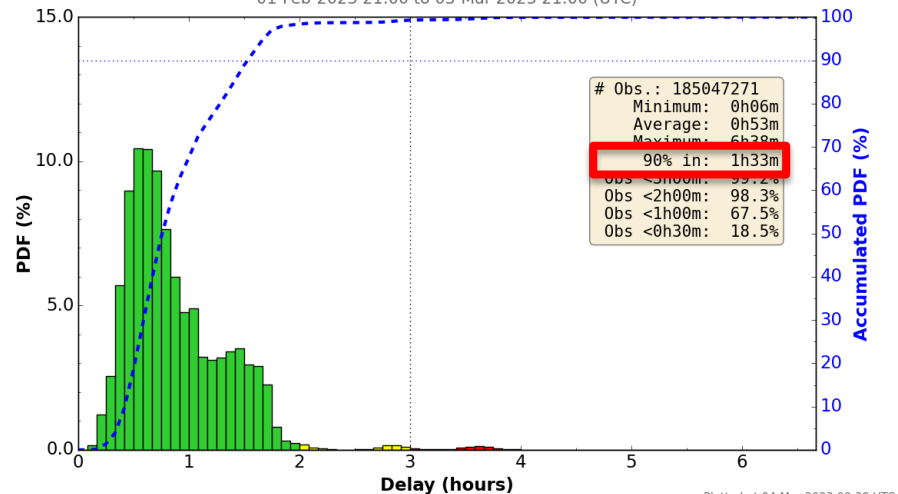
01-Feb-2023 21:00 to 03-Mar-2023 21:00 (UTC)



DWD Delay Statistics for ATMS (all)

NOAA-20, Suomi-NPP

01-Feb-2023 21:00 to 03-Mar-2023 21:00 (UTC)

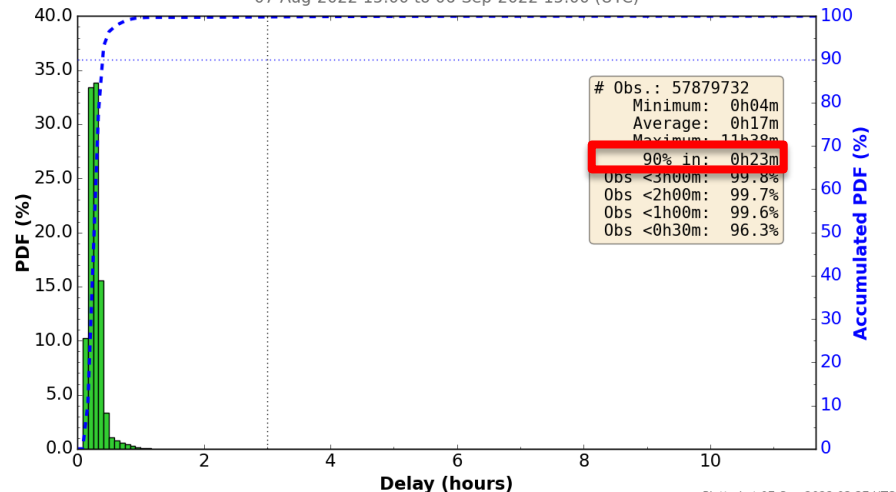


DBNet STATION DATA LATENCY (IASI)

DWD Delay Statistics for IASI (DBNet)

Metop-B, Metop-C

07-Aug-2022 15:00 to 06-Sep-2022 15:00 (UTC)



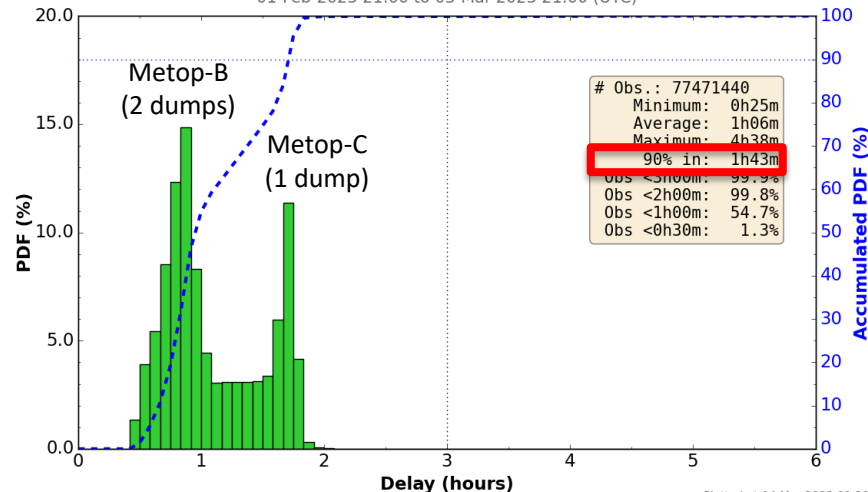
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Plotted at 07-Sep-2022 03:37 UTC

DWD Delay Statistics for IASI (all)

Metop-B, Metop-C

01-Feb-2023 21:00 to 03-Mar-2023 21:00 (UTC)



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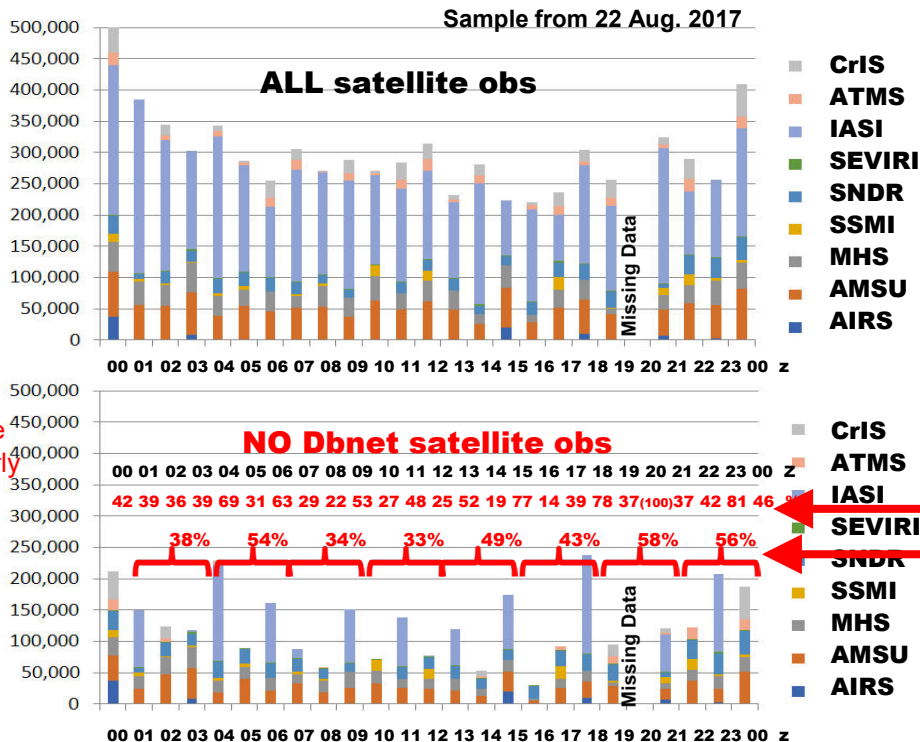
Plotted at 04-Mar-2023 09:38 UTC

DBNet DATA DENIAL

Radiance observation counts w/ and w/o DBNet data



Without DB less than half the data would be available to the NOAA Hourly RAP model



% of obs
Retained
Without
DBNet
(hourly)
(3-hourly)

HIGH PRIORITY DBNet ACTIVITIES IN THE COMING YEARS

1. Improve the geographical coverage of DBNet, in particular capitalizing on the following stations which due to their geographical locations would make very important contributions to the DBNet capabilities.
2. Advance the implementation of FY-3 data services.
3. Strengthen the dialogue with the WMO team responsible for the transition from GTS to WIS 2.0, discussing the WIS 2.0 implementation aspects related to DBNet. Develop an understanding of the opportunities offered by WIS 2.0, especially when dealing with high volume datasets and timeliness requirements.
4. Further develop the ground station receiving infrastructure to be compliant with NOAA-21 and Metop-SG (due to new downlink characteristics, hardware and/or software upgrades will be required).
5. Advance the implementation of HSIR sounder services (from IASI and CrIS) by providing full channel sets via DBNet using the WIS 2.0 early infrastructure to increase uptake by the NWEP community.
6. Further enhance the monitoring of the DBNet product tools developed by NWP SAF, including the new station status webpage to display availability and consistency of all DBNet station feeds and the new alert system to alert station operators and regional centres to outages and consistency problems.



WMO OMM

World Meteorological Organization
Organisation météorologique mondiale

Thank you Merci

Acknowledgements

All DBNet Coordination group

All DBNet station operators

SATELLITE ACQUISITION PRIORITIES FOR 2022/23 (ENDORSED BY DBNET-CG-6)

| Orbit | Satellite | ECT (D=descending, A=ascending) | Instrument health | Global data timeliness and availability | Direct broadcast transmission | NWP Impact | DBNet priority (H/M/L) |
|-------|-----------|---------------------------------|----------------------|---|-------------------------------|-----------------------------|------------------------|
| PM | Suomi NPP | 1330A | Good | 1 dump | Global (X-band). | Very high | H ¹ |
| | NOAA-20 | 1330A | Good | 2 dumps | Global (X-band). | Very high | M ¹ |
| | FY-3D | 1330A | Good | 2 dumps | Global (X-band) | TBD | M |
| EM | NOAA-19 | ~0700D | Good | 1 dump per orbit | Global (L-band) | High | H |
| | FY-3E | 0530D | Good | 2 dumps per orbit | Global (X-band) | TBD | |
| AM | Metop-C | 0930D | Good | 1 dump | Global (L-band) | Very high | H |
| | Metop-B | 0930D | Good | 2 dumps | Global (L-band) | Very high | M |
| | NOAA-18 | ~1000D | HIRS deg, MHS failed | 1 dump, blind orbits | Global (L-band) | Medium global, low regional | L |

Will be reviewed after the start of operations of N-21

ITSC-24 (16 - 22 March 2023, Tromsø, Norway)

ACTIONS FROM DBNet-CG-6

**DBNET-CG
A6.10**

ITWG/NWP: TO EXPLORE THE CURRENT USAGE OF AVHRR CLUSTER STATISTICS WITHIN IASI FIELD-OF-VIEW PRODUCT (DBNET OR GLOBAL) IN OPERATIONS BY NWP CENTRES

**DBNET-CG
A6.13**

ITWG/NWP: TO EXPLORE THE CURRENT USAGE OF PC SCORES SUPPLIED BY DBNET IN OPERATIONS BY NWP CENTRES