

NOAA Direct Broadcast Real Time Network (DBRTN): Providing Low Latency Sounder Data for WMO DBNet

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CSPP Users' Group
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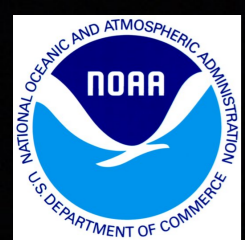




Overview of CIMSS LEO Direct Broadcast Activities



- CIMSS/SSEC owns and operates 5 X/L-band antennas: **Madison, Miami, Mayaguez, Honolulu, and Guam.**
- CIMSS/SSEC develops and distributes the **Community Satellite Processing Package (CSPP)** and **International MODIS/AIRS Processing Package (IMAPP)** for processing data acquired via direct broadcast from SNPP, NOAA-20, Metop-B/C, NOAA-18/19, Terra, Aqua, and other LEO satellites.
- CIMSS/SSEC provides DB images and derived products to **NWS forecast offices** in CONUS, Hawaii, and Guam for **AWIPS2** display and to other clients (government, education, commercial).



NOAA Direct Broadcast Real Time Network (DBRTN) Overview

- NOAA (via CIMSS) receives JPSS, Metop, NOAA, and Aqua Level 0 sounder data from NOAA and partner antenna sites (**22** total) and processes the data centrally to create Level 1B and BUFR products.
- Goal is to deliver infrared and microwave sounder data to NWP centers with < 30 minute latency (wrt start of overpass) as part of WMO DBNet.
- ATMS, CrIS, IASI, ATOVS, and AIRS sounder data in DBNet BUFR format are delivered to NCEP and disseminated to NWP centers around the world via GTS.



DBNet: Facilitated by WMO



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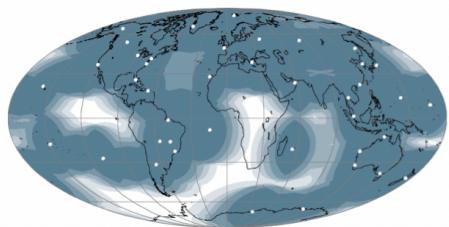
LEGACY CONTENT

Home > Activity areas > Wmo space programme wsp > Dbnet

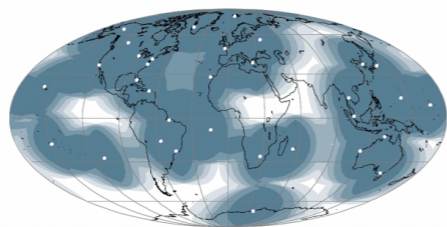
Data Access and Use

DBNet Implementation Status

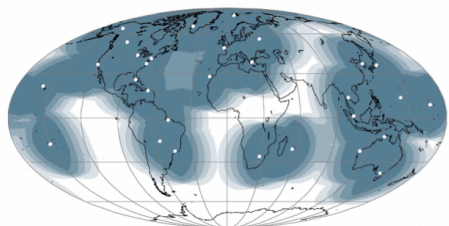
The status of implementation of the main DBNet services is shown in the following diagrams:



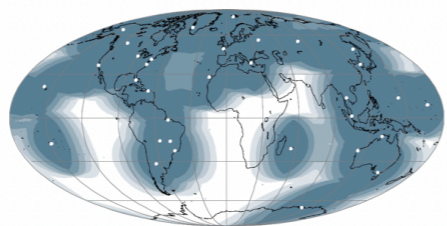
DBNet-ATOVS coverage in November 2020



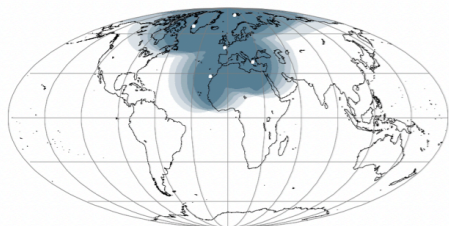
DBNet-ATMS coverage in November 2020



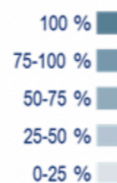
DBNet-CrIS coverage in November 2020



DBNet-IASI coverage in November 2020



DBNet-VASS coverage in November 2020



Legend

Direct Broadcast Network (DBNet)

The Direct Broadcast Network (DBNet) is a set of operational arrangements for the real-time acquisition of Low Earth Orbit (LEO) satellite data through a worldwide network of local, Direct Broadcast receiving stations and the rapid delivery of these data to the global user community after pre-processing and formatting in accordance with agreed standards.

Motivation

Sounder data from LEO satellites (in particular from the ATOVS suite of instruments) are among the most important sources of observation used by Numerical Weather Prediction (NWP) models. A brief description of the benefits they bring can be found in [ATOVS-impact-on-assimilation-JMA-2007](#). Like all NWP model inputs, their assimilation is constrained by their time of availability. While locally received data (via Direct Readout reception systems) can be available in a timely fashion for the NWP models, the availability of global data is delayed by the storage time on-board the spacecraft and the procedures involved for the data collection, processing and distribution. The DBNET concept enables the delivery of LEO data, in particular sounder data, collected from a regional network of HRPT stations within the timeliness constraints imposed by NWP models.

DB Antennas operated by CIMSS/SSEC



Madison, Wisconsin

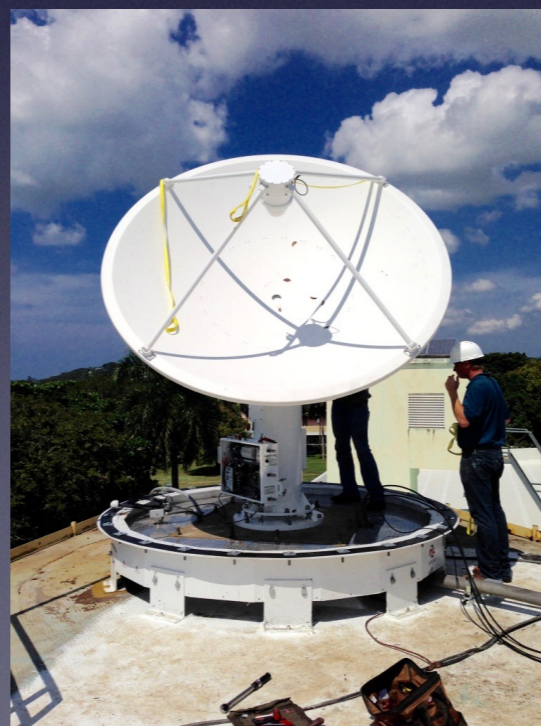


Honolulu, Hawaii

All antennas are
Orbital Systems
X/L-band



Miami, Florida



Mayaguez, Puerto Rico



Guam, Mariana Islands

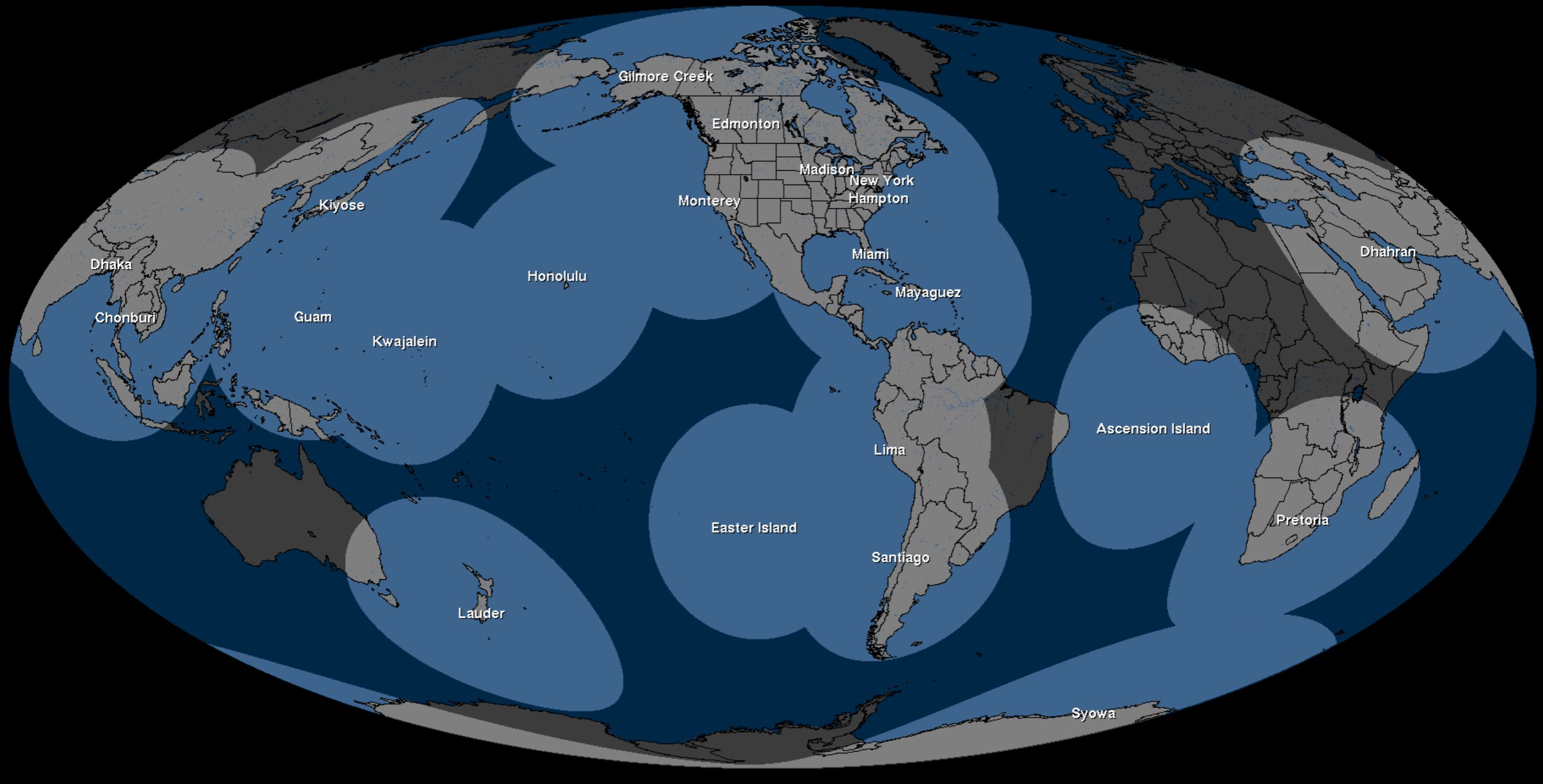


DBRTN Antenna Operators

- SSEC antennas (5) at Honolulu, Madison, Miami, Mayaguez, and Guam are owned and operated by CIMSS/SSEC on behalf of NOAA.
- NOAA antennas (2) at Fairbanks and Monterey are owned and operated by UAF and NOAA NWS, respectively.
- Partner antennas (15) are owned and operated by other groups including JMA, ECCO, CLS/KINEIS, CSIR, GISTDA, ATSC, and Hampton Univ.



DBRTN Antenna Sites & Coverage (Jun 2022)



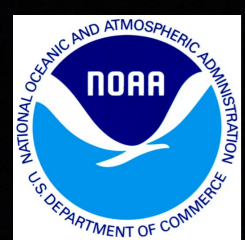


NOAA DBRTN Antenna Sites



Area	Regional Centre	Station Name	Latitude	Longitude	Operator	DBNET Station Identifier	Processing centre ID <i>Originating Centre</i> (Code Tables C-1 and C-	Sub-centre ID <i>Originating Sub-centre</i> (Code Table C-	Location Indicator in GTS Bulletin (CCCC)	Status of operational or planned services								
										NOAA 18/19 ATOVS	Metop B/C ATOVS	Metop B/C IASI	SNPP NOAA20 CrIS	SNPP NOAA20/ATMS	AQUA AIRS	FY-3/D VASS	JPSS-2 Ready	Metop-SG ready
North-America (NOAA-DBRTN)	UW-Madison (SSEC/CIMSS)	Guam	13.47°N	144.78°E	SSEC	gua	176	26	KWBC	OP	OP	OP	OP	OP	OP		PL 2022	PL 2023
		Honolulu	21.30°N	157.86°W	SSEC	hon	176	20	KWBC	OP	OP	OP	OP	OP	OP	RX	PL 2022	PL 2023
		Madison	43.07°N	89.40°W	SSEC	mad	176	22	KWBC	OP	OP	OP	OP	OP	OP	RX	PL 2022	PL 2023
		Miami	25.73°N	80.15°W	SSEC	mia	176	23	KWBC	OP	OP	OP	OP	OP	OP		PL 2022	PL 2023
		Mayaguez	18.20°N	67.14°W	SSEC	may	176	24	KWBC	OP	OP	OP	OP	OP	OP	RX	PL 2022	PL 2023
		Monterey	36.60°N	121.89°W	NOAA	mon	176	25	KWBC	OP	OP	OP	OP	OP	OP			
		Hampton	37.02°N	76.34°W	HU	ham	176	28	KWBC	OP	OP	OP	OP	OP	OP	RX		
		Gilmore Creek	64.97°N	147.51°W	NOAA	gil	176	21	KWBC	OP	OP	OP	OP	OP				
		New York	40.71°N	74.00°W	CCNY	new	176	29	KWBC	OP	OP	OP	OP	OP	OP			
		Kwajalein	8.72°N	167.73°E	ATSC	kwa	176	30	KWBC	OP	OP	OP	OP	OP				
		Edmonton	53.33°N	113.5°W	ECC	edm	176	31	KWBC				OP (1)	OP (1)				
		Pretoria	25.75°S	28.28°E	CSIR	pre	176	32	KWBC				OP	OP				
		Kiyose	35.78° N	139.53°E	JMA	kiy	176	34	KWBC				OP	OP				
		Syowa	69° S	39.55° E	NIPR	syo	176	35	KWBC					OP				
		Easter Island	27.16 S	109.43 W	KINEIS	eas	176	33	KWBC	OP	OP			OP				
		Ascension Island	7.94°S	14.35°W	KINEIS	asc	176	36	KWBC	OP	OP			OP				
		Chonburi	13.36°N	101.02°E	GISTDA	cho	176	37	KWBC	OP	OP (2)	OP (2)	OP (1)	OP (1)	OP			
Lauder	45.038°S	169.682°E	NIWA	lau	176	38	KWBC	OP	OP	OP	OP (1)	OP (1)						
Santiago	33.26° S	71.40° W	DGAC	ets	176	39	KWBC	OP	OP	OP (2)								
		Dhahran	26.31° N	50.14° E	KFUPM	dha	176	40	KWBC	OP	OP	OP	OP	OP				
		Dhaka	23.73° N	90.40° E	DU	dhk	176	41	KWBC	OP	OP	OP	OP	OP			Ready	
		Lima	12.05° S	77.12° W	KINEIS	lim	176	42	KWBC	RX	RX	RX	RX	RX			Ready	

1. SNPP only
2. Metop B only



Changes since DBNet-CG-4 (2020)

Antennas added to DBRTN:

Lauder (NIWA; X/L-band): NOAA-18/19 ATOVS, Metop-B/C IASI and ATOVS, SNPP CrIS and ATMS

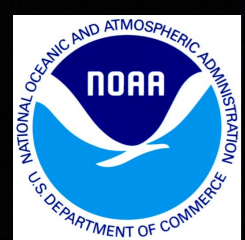
Santiago (DMC; L-band): NOAA-18/19 ATOVS, Metop B IASI and ATOVS

Dhahran (KFUPM; X/L-band): SNPP/NOAA-20 CrIS and ATMS; Metop-B/C IASI and ATOVS; NOAA-18/19 ATOVS

Dhaka (DU; X/L-band) SNPP/NOAA-20 CrIS and ATMS; Metop-B/C IASI and ATOVS; NOAA-18/19 ATOVS

Lima (KINÉIS; X/L-band): SNPP/NOAA-20 CrIS and ATMS; Metop-B/C IASI and ATOVS; NOAA-18/19 ATOVS

Metop-A AHRPT processing ended on Nov. 15, 2021



Data Processing Software

NOAA DBRTN datasets are processed centrally at CIMSS/SSEC. Software versions in operation are:

- ATMS and CrIS: CSPP SDR v3.3
- ATOVS and IASI: Metopizer 3.51.1, AAPP v8.8, OPS-LRS v8.0 20180118
- BUFR conversion: AAPP v8.8 ecCodes scripts



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DBNet

Overview Station Status AMSU-A MHS HIRS IASI CrIS ATMS MWRI MWHS-2 MWTS-2

DBNet

For background on the DBNet project, see the [WMO DBNet page](#).

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

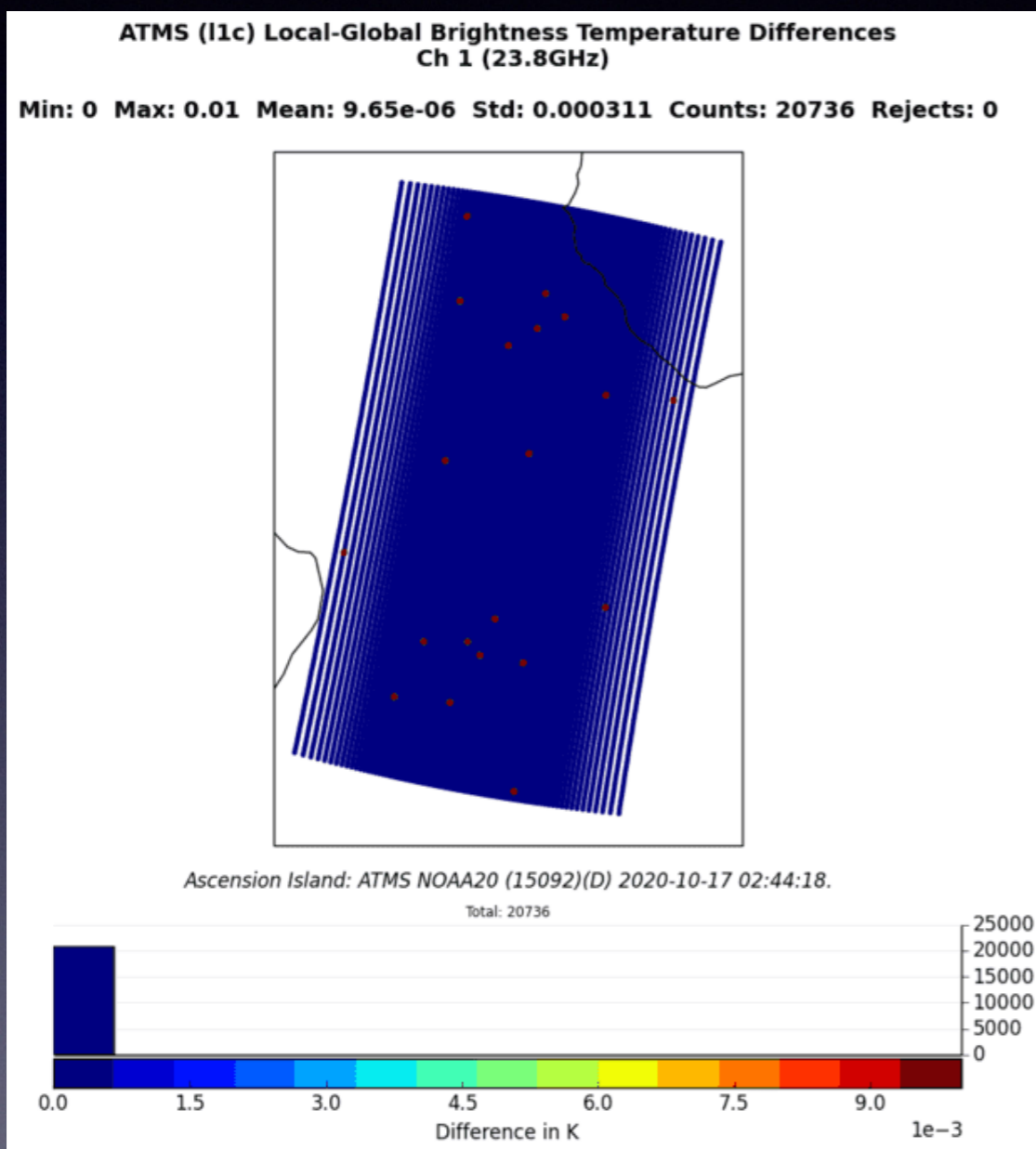
When satellites have a Direct Broadcast capability, which is the case of most LEO meteorological satellites, an alternative data access route is the acquisition of the Direct Broadcast data stream at a local ground station, which allows real-time acquisition, albeit with coverage limited to the portion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

The Direct Broadcast Network for Near Real-Time Relay of LEO satellite data (DBNet) 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 Broadcast receiving stations, their processing in accordance with agreed standards, and their rapid delivery to the global user community through appropriate telecommunication systems.

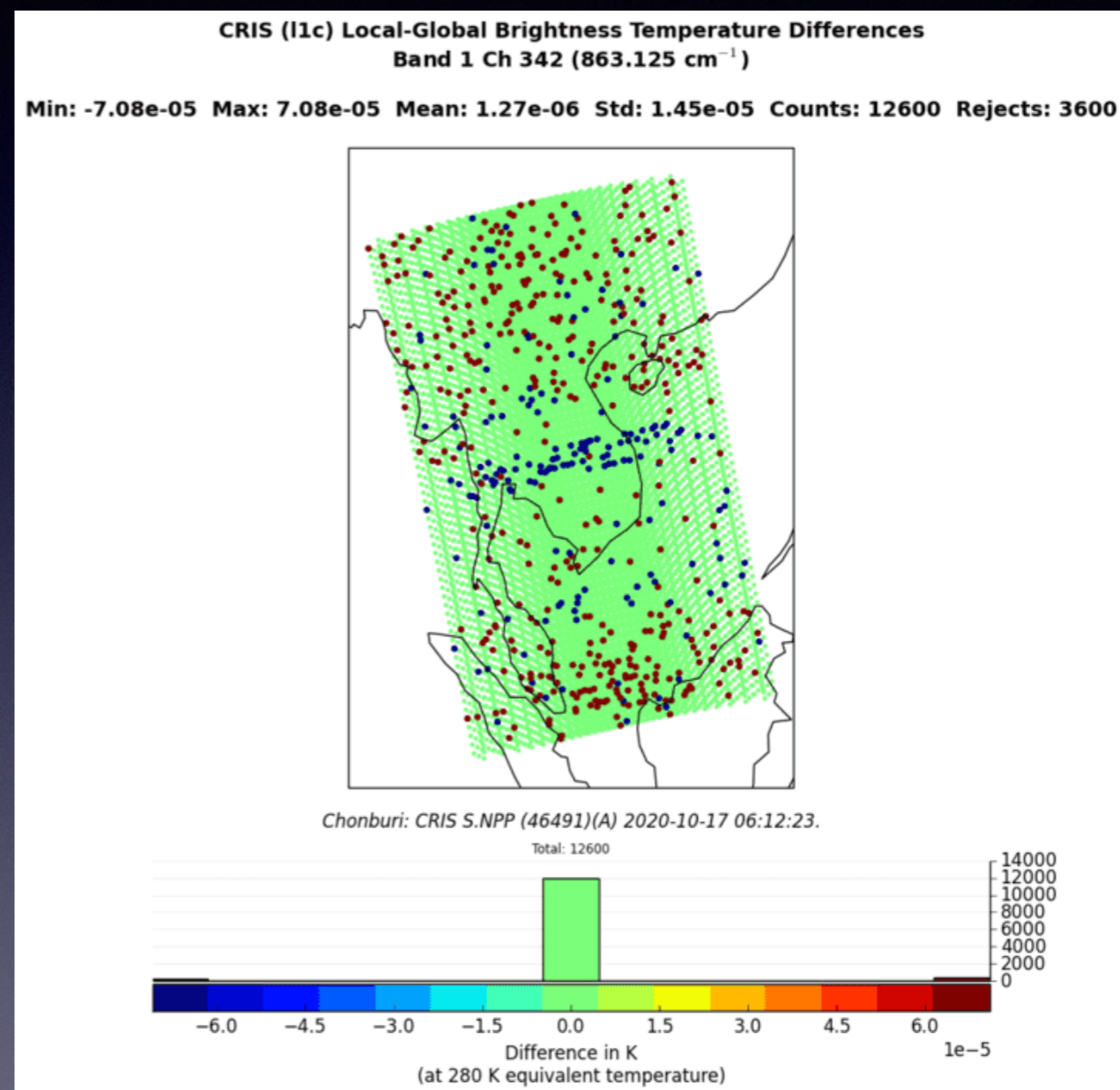
Source: [Guide to the Direct Broadcast Network, WMO](#)



Data from Ascension Island and Chonburi



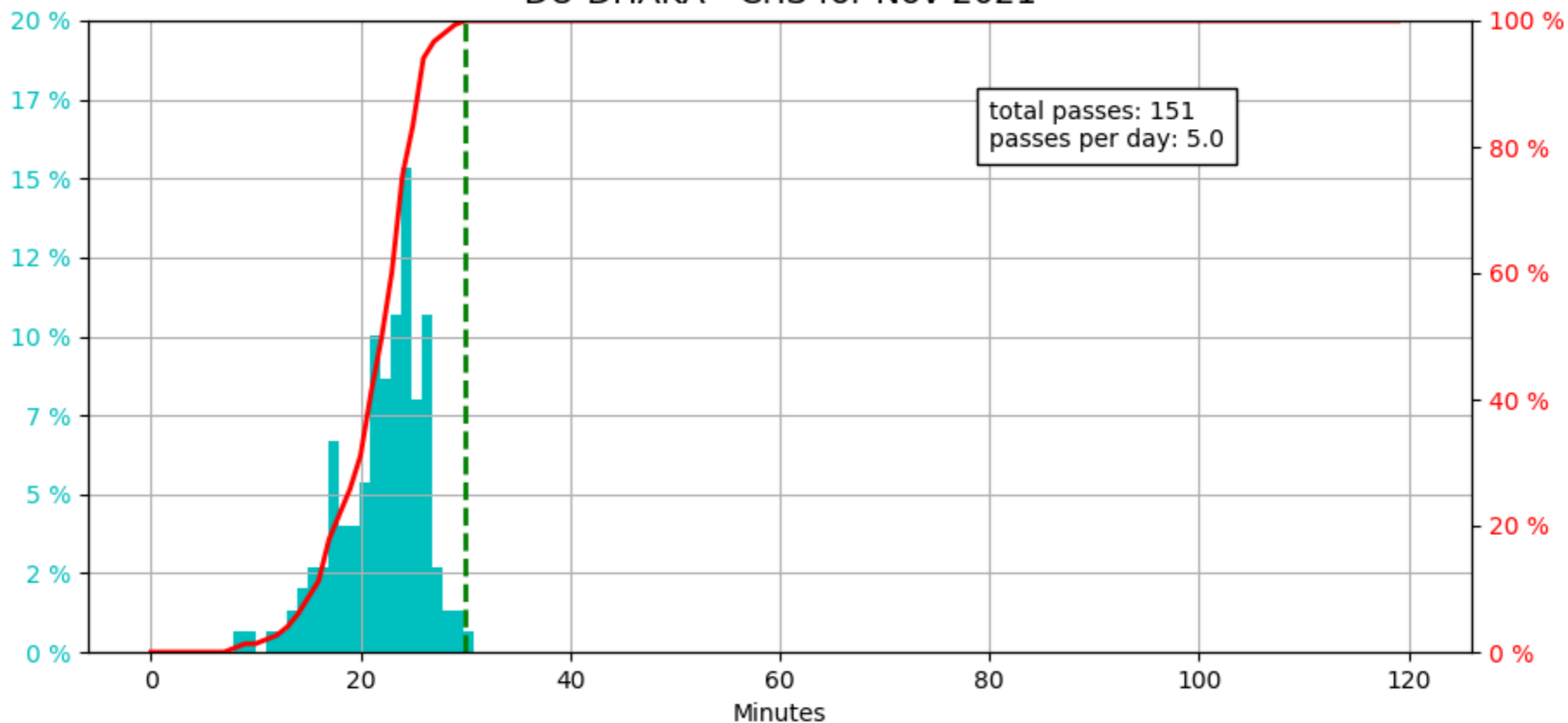
NOAA-20 ATMS from Ascension Island compared to global data (NWP-SAF)



SNPP CrIS from Chonburi compared to global data (NWP-SAF)

Dhaka: CrIS latency

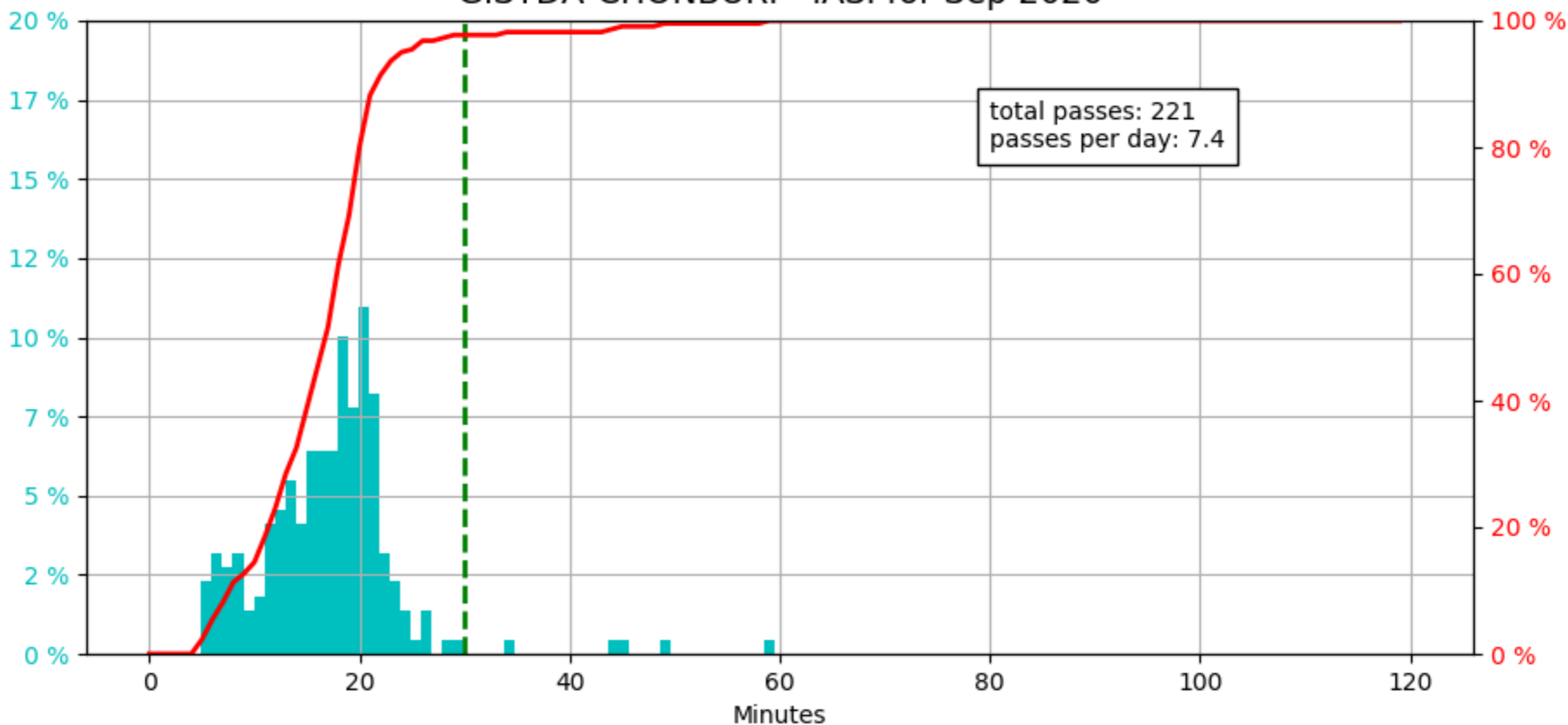
Time Between Pass Start and Delivery (overall latency)
DU-DHAKA - CrIS for Nov 2021



Relative to start of the overpass, average latency is ~ 20 minutes.

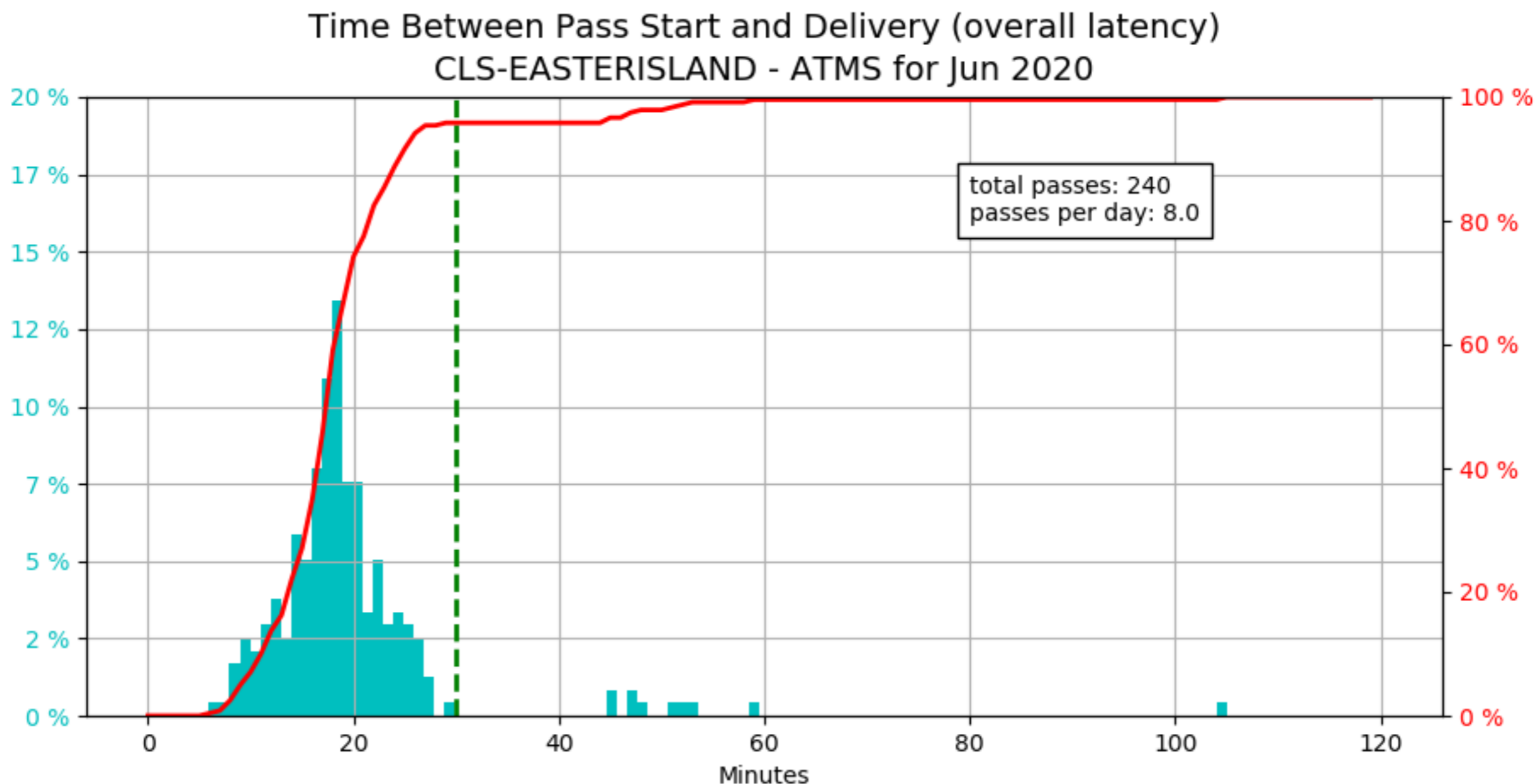
Chonburi: IASI latency

Time Between Pass Start and Delivery (overall latency)
GISTDA-CHONBURI - IASI for Sep 2020



Relative to start of the overpass, average latency is < 20 minutes.
95 percent of files are delivered in < 30 minutes.

Easter Island: ATMS latency



Relative to start of the overpass, average latency is < 20 minutes.
95 percent of files are delivered in < 30 minutes.

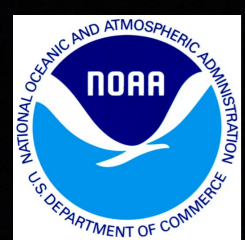


Aqua AIRS Data for DBNet

Aqua AIRS Level 0 data are acquired at 8 antenna sites, processed to Level 1B centrally at CIMSS/SSEC, and converted to DBNet BUFR.

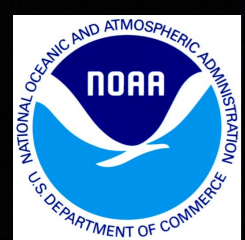
BUFR files are disseminated by NCEP NCO.

Service operational since August 2020.



Other Applications

- Honolulu, Madison, Miami, Mayaguez, and Guam provide real-time imagery from **VIIRS, AVHRR, and MODIS** via onsite processing. Images are converted to AWIPS format and delivered to **National Weather Service Forecast Offices**.
- **ARGOS DCS** data are received from NOAA-18/19, Metop-B/C, and SARAL at Honolulu, Madison, Miami, and Mayaguez, and Guam and delivered to **CLS** in real time. ANGELS reception was added at Madison in Sep 2020.
- **GCOM-W1 AMSR-2** is received and processed in real time at Guam, Honolulu, and Miami (courtesy of JAXA) and provided to local NWS forecast offices.



Summary



- NOAA DB Real Time Network continues to receive ATMS, CrIS, IASI, and ATOVS sounder data from 22 antenna sites.
- SNPP/NOAA-20, Metop-B/C, and NOAA-18/19 are supported at 13 of 22 sites.
- All BUFR datasets are disseminated on GTS (via NCEP).
- AIRS data was added in 2020 and will continue for the remainder of the Aqua mission.
- Planning is underway to support JPSS-2 and Metop-SG.