Millimeter-wave Imaging Radiometer Brightness Temperatures, Wakasa Bay, Japan, Version 1

USER GUIDE

How to Cite These Data

As a condition of using these data, you must include a citation:

Wang, J. 2004. *Millimeter-wave Imaging Radiometer Brightness Temperatures, Wakasa Bay, Japan, Version 1*. [Indicate subset used]. Boulder, Colorado USA. NASA National Snow and Ice Data Center Distributed Active Archive Center. https://doi.org/10.5067/IYSC9GYQHXTY. [Date Accessed].

FOR QUESTIONS ABOUT THESE DATA, CONTACT NSIDC@NSIDC.ORG

FOR CURRENT INFORMATION, VISIT https://nsidc.org/data/NSIDC-0193

National Snow and Ice Data Center

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1 DATA DESCRIPTION

This data set includes calibrated brightness temperatures measured over Wakasa Bay in the Sea of Japan.

1.1 Parameters

The parameter for these data is brightness temperatures.

Table 1. The following table describes the format of the data.

1	Record Number		
2	Month	Real time clock (RTC)	
3	Day	Real time clock (RTC)	
4	Hour	IRIG	
5	Minute	IRIG	
6	Second		IRIG
7	Julian Day	Navigation	
8	Hour	Navigation	
9	Minute	Navigation	
10	Second	Navigation	
11	Latitude	Degrees	
12	Longitude	Degrees (-West, +East)	
13	Air Temperature	Degrees celsius	
14	Altitude	Feet	
15	Pitch	Degrees (+ for nose down)	
16	Roll	Degrees (+ for roll right)	
17	Heading	Degrees	
18- 26	Housekeeping Temperatures		
27	Hot average temperature for this scan		
28	Cold average temperature for this scan		
29	Hot temperature, 8-scan moving average		
30	Cold temperature, 8-scan moving average		
31- 39	Hot average counts for this scan		
40- 48	Cold average counts for this scan		
49- 57	Hot counts, 8-scan moving average		
58- 66	Cold counts, 8-scan moving average		
67-123	57 Brightness temperatures	Degrees Kelvin	89 GHz

124-180	Brightness temperatures	Degrees Kelvin	150
181-237	Brightness temperatures	Degrees Kelvin	183.3 +/-1
238-294	Brightness temperatures	Degrees Kelvin	183.3 +/-3
295-351	Brightness temperatures	Degrees Kelvin	183.3 +/-7
352-408	Brightness temperatures	Degrees Kelvin	220
409-465	Open		
466-522	Brightness temperatures	Degrees Kelvin	340
523-579	Open		

1.1.1 Sample Data Record

Figure 1 shows brightness temperature (K) distribution measured on January 14, 2003 in the Sea of Japan for the seven MIR channels. The width of the images is about 14 km and the length is about 90 km. The dark blue areas (low brightness temperature) in the 150, 183±7, 220, and 340 GHz diagrams correspond to snowfall. The blue area in the 89 GHz diagram mostly reflects the ocean surface. The water vapor channels (183±a) strongly respond to water vapor below the aircraft.

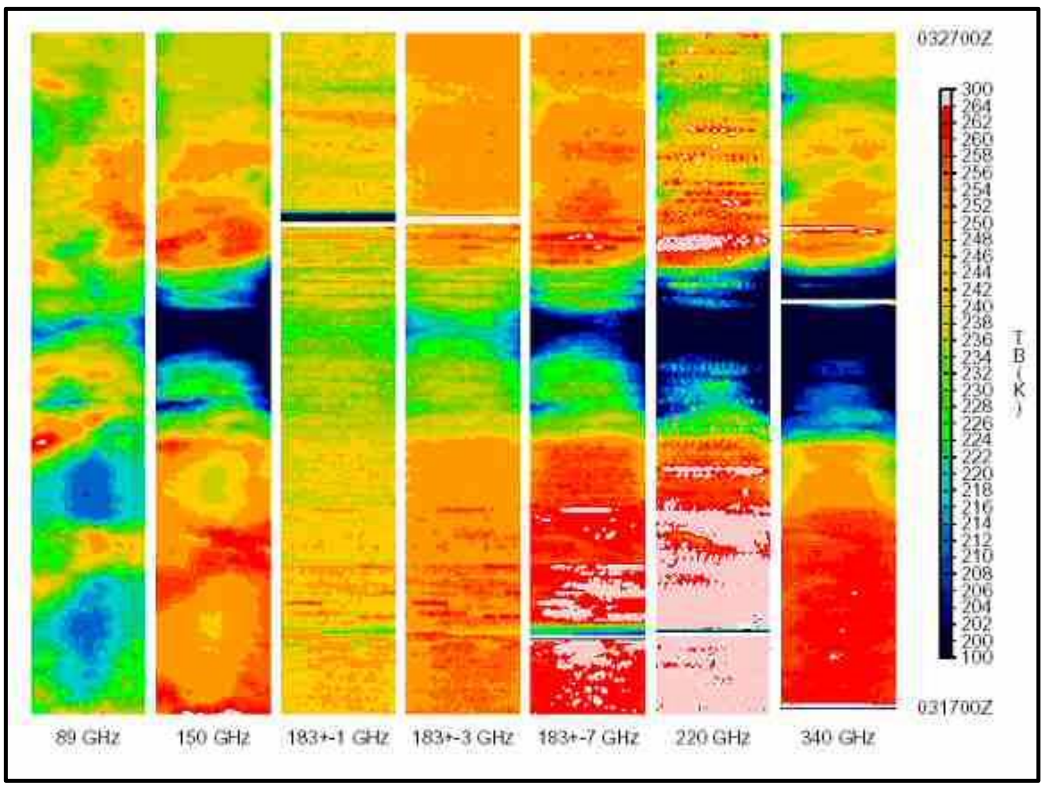

Figure 1. Brightness temperature (K) distribution measured on January 14, 2003 in the Sea of Japan for the seven MIR channels.

1.2 File Information

1.2.1 Format

The data are stored in binary files. All values are in four-byte, little-endian IEEE floating point. Each logical record contains one calibrated MIR scan. Each logical record of size 2316 bytes (4 x 579) contains one calibrated MIR scan comprising temporal, spatial, and aircraft attitude information for the nadir position (beam position 29) of the scan, followed by a brightness temperature value for each of 57 beam positions at all seven MIR frequencies.

File sizes range from 1.3 to 15.9 MB.

Volume of data files is 180 MB.

1.2.2 Naming Convention

The file naming convention is "miryyddd.00n", where "yy" and "ddd" denote the year and Julian day the data was acquired. The "n" in the extension can be either 1 or 2; multiple files exist only if the processed data for a given day is larger than 15.8 MB. (Note: for 28 January, there is a file "mir03028.nad." During this flight, the MIR operated in a stare (non-scanning) mode for one segment of the flight. So the data file for this segment ends with ".nad" (nadir).)

1.3 Spatial Information

1.3.1 Coverage

Southernmost Latitude: 30° N
Northernmost Latitude: 40° N
Westernmost Longitude: 130° E
Easternmost Longitude: 150° E

1.4 Temporal Information

1.4.1 Coverage

Selected dates between 14 January 2003 to 3 February 2003. Table 1shows the dates for which data are available.

Table 2. Dates of Available Data

Day of year	Date
14	1/14

Day of year	Date
15	1/15
19	1/19
21	1/21
23	1/23
26	1/26
27	1/27
28	1/28
29	1/29
32	2/1
34	2/3
38	2/7

2 DATA ACQUISITION AND PROCESSING

2.1 Acquisition & Processing

The Millimeter-Wave Imaging Radiometer (MIR) is an airborne, total power, cross-track scanning radiometer that measures radiation at seven frequencies: 89, 150, 183.3±1, 183.3±3, 183.3±7, 220, and 340 GHz. Researchers can infer brightness temperatures, water vapor profiles, and cloud information from the data gathered by these frequencies. The sensor has a 3 dB beam width of 3.5 degrees at all frequencies. It can cover an angular swath up to ±50 degrees with respect to nadir. In every scan cycle of about 3 seconds, it views two external calibration targets in addition to the 100-degree scene scan; one of these targets is heated to a temperature of 330 K and another remains at the ambient temperature of the aircraft cruising altitude. The temperatures of these calibration targets are closely monitored to within ±0.1 K. The temperature sensitivity for all frequencies is on the order of 0.5 K and the calibration accuracy is about ±1 K in the brightness temperature range of 240-300 K. The measurement accuracy at the low end is less certain; based on the calibration studies in the laboratory, the accuracy near the liquid nitrogen temperature of 77 K is estimated to be ±3 K.

2.2 Quality, Errors, and Limitations

A quicklook of the data sets acquired in the Wakasa Bay experiment indicates deterioration in the performance of the 183.3±3 GHz and 340 GHz channels in the latter part of the experiment.

3 SOFTWARE AND TOOLS

View the data with an appropriate application. The investigators have provided a C routine for viewing these data. The routine is named "rdmir.c" and requires the "mir.h" file to run. Both files are included in the data directory.

4 RELATED DATA SETS

- AMSR-E Validation Data
- AMSR-E Data at NSIDC
- Wakasa Bay Weather Forecast Maps
- TEFLUN MIR Data

5 CONTACTS AND ACKNOWLEDGMENTS

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6 REFERENCES

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Racette, P., R.F. Adler, A.J. Gasiewski, D.M. Jackson, J.R. Wang and D.S. Zacharias. 1996. An airborne millimeter-wave imaging radiometer for cloud, precipitation and water vapor studies. *J. Atmos. Ocean. Tech*. 13(3), 610-619,

7 DOCUMENT INFORMATION

7.1 Publication Date

March 2004

7.2 Date Last Updated

February 2021

APPENDIX A - MILLIMETER-WAVE IMAGING RADIOMETER (MIR) DESCRIPTION

The Millimeter-Wave Imaging Radiometer (MIR) is an airborne, total power, cross-track scanning radiometer that measures radiation at seven frequencies 89, 150, 183.3±1, 183.3±3, 183.3±7, 220, and 340 GHz. Researchers can infer brightness temperatures, water vapor profiles, and cloud information from the data gathered by these frequencies. The sensor has a 3-db beam width of 3.5 degrees at all frequencies. It can cover an angular swath up to ±50 degrees with respect to nadir. In every scan cycle of about 3 seconds, it views two external calibration targets in addition to the 100-degree scene scan; one of these targets is heated to a temperature of 330 K and another remains at the ambient temperature of the aircraft cruising altitude. The temperatures of these calibration targets are closely monitored to within ±0.1 K. The temperature sensitivity, for all frequencies, is on the order of 0.5 K and the calibration accuracy is about ±1 K in the brightness temperature range of 240-300 K. The measurement accuracy at low end is less certain; based on the calibration studies in the laboratory, the accuracy near the liquid nitrogen temperature of 77 K is estimated to be ±3 K.