Title – NOAA PSL Microwave Radiometer Brightness Temperature and Surface Meteorology Data

Authors

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1.0 Data Set Description

This dataset contains data from two Radiometrics MP-3000A Microwave Radiometers (MWRs) (Solheim et al., 1998) that were deployed during the Propagation, Evolution and Rotation in Linear Storms (PERiLS) experiment in Columbia, LA, and Courtland, AL. Brightness temperatures data at 35 frequencies as well as near-surface temperature, humidity, and pressure data are included in the lv1 data files. The MWRs are operated continuously between the middle of February 2022 and the middle of May 2023. In this dataset, data between September 1 2022 until the end of the deployment are available. From the observed brightness temperatures, temperature and humidity profiles as well as liquid water path can be retrieved with the optimal estimation physical retrieval (TROPoe). The retrieved thermodynamic quantities will be available in a separate dataset.

- Data status: Final
- Time period:
  Columbia, LA: 1 September 2022 – 20 May 2023
  Courtland, AL: 1 September 2022 – 18 May 2023
- Physical location:
  Columbia, LA: 32.124322 N, 92.055569 W, 20 m above mean sea level
  Courtland, AL: 34.66 N, 87.35 W, 187 m above mean sea level
- Data Frequency: continuous
- Data set restrictions: none

2.0 Instrument Description

The two MWRs observed brightness temperatures at 21 frequencies in the K-band (22 to 30 GHz) and at 14 frequencies in the V-band (51 to 59 GHz). It is equipped with a surface sensor measuring temperature, relative humidity, and barometric pressure and an upward pointing infrared thermometer. For details on the instrument specifics, see the manufacturer manual.

3.0 Data Collection and Processing

Data are collected continuously. No data processing outside of the Radiometrics software was performed for the lv1 data. The scan strategy consists of four low-elevation angle scans followed by a zenith scan and is repeated continuously. The repetition frequency of the 5 scan angles is about 2.5 minutes.

The lv1 data are based on lv0 data which contain raw, unprocessed data in engineering units. lv0 files contain all the information needed to reprocess the raw data with alternative calibration information or algorithms and are available on request.
The serial number of the MWR deployed at Columbia is MP3058A and at Courtland MP3297A. At the beginning of the deployment and then every 6 months, the instrument is calibrated with liquid nitrogen. To calibrate the K-band channels, tip calibrations are performed under clear sky conditions.

Unit	LN2 calibration	Tip calibration
MP3058A (Columbia, LA)	9/1/2022	9/1/2022
	2/7/2023	2/16/2023
		4/20/2023
MP3297A (Courtland, AL)	8/30/2022	08/30/2022
		10/26/2022
	2/8/2023	2/16/2023
		4/21/2023

Data availability is given in Fig. 1 for the period September 1 2022 to May 20 2023. Short data gaps occurred due to power failures and laptop issue.

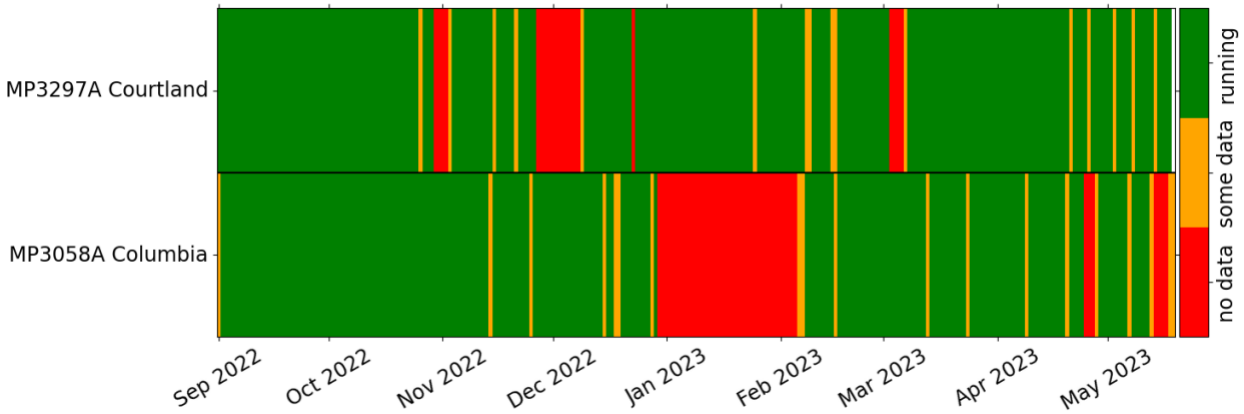

Figure 1: Data availability for the MWR MP3297A at Courtland and for the MWR MP3058A at Columbia.

4.0 Data Format

The lv1 files are available in ascii format provided by the instrument manufacturer. For a description of the files see the manufacturer manual.

The file naming conventions for the lv1 are as follows:
NOAA_PSL_MWR_Columbia_yyyymmdd_HHMMSS_lv1.csv
NOAA_PSL_MWR_Courtland_yyyymmdd_HHMMSS_lv1.csv

with
yyyy: Year
mm: Month

dd: Day
HHMMSS: The time stamp in hour, minute, and second when the first sample was written to the file

The time stamp of all data is in UTC.

5.0 Data Remarks

We noticed changes in calibration after power failures when the instrument restarted. This will be considered in the retrieval of thermodynamic profiles.

6.0 References

Solheim, F., J. R. Godwin, and R. Ware, 1998: Passive ground-based remote sensing of atmospheric temperature, water vapor, and cloud liquid profiles by a frequency synthesized microwave radiometer, Meteorol. Z., 7, 370–376, https://doi.org/10.1029/97RS03656

Turner, D. D., and U. Löhnert, 2014: Information content and uncertainties in thermodynamic profiles and liquid cloud properties retrieved from the ground-based atmospheric emitted radiance interferometer (AERI). J. Appl. Meteor. Climatol., 53, 752–771, https://doi.org/10.1175/JAMC-D-13-0126.1.

Turner, D. D., and W. G. Blumberg, 2019: Improvements to the AERIoe thermodynamic profile retrieval algorithm. IEEE Journal of Selected Topics in Applied Earth Observations and Remote Sensing, 12, 1339–1354, https://doi.org/10.1109/JSTARS.2018.2874968.

Turner, D. D., and U. Löhnert, 2021: Ground-based temperature and humidity profiling: Combining active and passive remote sensors. Atmos. Meas. Tech., 14, 3033–3048, https://doi.org/10.5194/amt-14-3033-2021.

7.0 Appendix

GCMD keywords

EARTH SCIENCE	SPECTRAL/ENGINEERING	INFRARED WAVELENGTHS	THERMAL INFRARED				68c2baba-b9b9-41d4-89bf-07488728bc4f
EARTH SCIENCE	SPECTRAL/ENGINEERING	MICROWAVE	BRIGHTNESS TEMPERATURE				d8525750-2ca4-4b1f-a717-08fda61fd547
EARTH SCIENCE	ATMOSPHERE	ATMOSPHERIC PRESSURE	SURFACE PRESSURE				b54de5cd-4475-4c7b-acbc-4eb529b9396e
EARTH SCIENCE	ATMOSPHERE	ATMOSPHERIC TEMPERATURE	SURFACE TEMPERATURE	AIR TEMPERATURE			f634ab55-de40-4d0b-93bc-691bf5408ccb
EARTH SCIENCE	ATMOSPHERE	ATMOSPHERIC WATER VAPOR	WATER VAPOR INDICATORS	HUMIDITY	RELATIVE HUMIDITY		a249c68f-8249-4285-aad2-020b3c5aefc3