

## CFI Climate Sentinels Arboretum MRR-2 raw data [McGill, UQAM]

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## 1. Data Set Description

- 1.1. **Introduction:** This dataset contains raw data from a METEK vertically profiling K-band Micro Rain Radar (MRR-2) installed at the climate sentinel in the Arboretum forest reserve (ARBO), about 30 km west of Montréal downtown, Québec, Canada. The instrument provides vertical profiles of reflectivity, Doppler velocity, and spectrum width. The site is located near the confluence of the Ottawa River and the St. Lawrence River. Several other sites also collected MRR data during WINTRE-MIX. Data from these other sites will also be made available in the WINTRE-MIX data archive ([https://data.eol.ucar.edu/master\\_lists/generated/wintre-mix/](https://data.eol.ucar.edu/master_lists/generated/wintre-mix/)).
- 1.2. **Data version:** v1.0, September 2022
- 1.3. **Time period covered:** 1 November 2021 – 30 April 2022
- 1.4. **Location:**
  - The MRR-2 is mounted on a short vertical post, co-located with other meteorological instruments. The approximate location is shown in Fig. 2. The MRR-2 is mounted 2 m above the ground.
  - Latitude: 45.430065°
  - Longitude: -73.942156°
  - Elevation: 49 m MSL
- 1.5. **Data frequency:** 10 seconds
- 1.6. **Web address:** <https://doi.org/10.26023/2AB8-K6AX-3D0F>

Preliminary MRR-2 data are visualized as “quick look” plots on the WINTRE-MIX field catalog ( <https://catalog.eol.ucar.edu/wintre-mix/114/date/> ).

- 1.7. **Dataset restrictions:** Please refer to the WINTRE-MIX data policy (<https://www.eol.ucar.edu/content/wintre-mixdata-policy>) as well as the WINTRE-MIX data management plan ([https://www.eol.ucar.edu/system/files/Data\\_Management\\_Plan-1Dec2021.pdf](https://www.eol.ucar.edu/system/files/Data_Management_Plan-1Dec2021.pdf)) for more information regarding dataset restrictions and dissemination.



*Fig. 1. Illustration of the MRR-2 at the Arboretum sentinel.*



*Fig. 2. Approximate location of the Arboretum, QC MRR-2 radar (ARBO).*

## 2. Instrument Description

A METEK K-band FM-CW Micro Rain Radar-2 (MRR-2, <http://metek.de/product/mrr-2/>) is installed at the Arboretum forest reserve (Fig. 1). The attributes of the MRRs are summarized in Table 1. More detailed technical information on the MRR2 is available in METEK (2015, 2018).

*Table 1: Technical specifications and configuration settings for the MRR-2*

<b><u>Parameter</u></b>	<b><u>Value</u></b>
Transmit power	50 mW
Frequency	24 GHz
Number of range gates	32
Antenna heating	230 VAC / 24 VDC, 25 W
Beam width	2 degrees
Range resolution used	35 m (before 1900 UTC 9 Feb 2022) 200 m (after 1900 UTC 9 Feb 2022)
Raw data collection frequency	10 s

### 3. Data Collection and Processing

The MRR-2 was configured to collect data every 10 seconds with range gate spacing of 35-m (before 1900 UTC 9 Feb 2022) and 200-m (after 1900 UTC 9 Feb 2022) (Table 1). Antenna heating was used to prevent accumulation of snow and ice on the dish. MRR-2 raw data (.raw files) was logged onto a Windows PC using the METEK MRR Control Software as described in METEK (2018) and grouped into daily files. A post-processed version of the data is available in a companion dataset: CFI Climate Sentinels Arboretum MRR-2 processed data [McGill, UQAM].

### 4. Data format

Files are daily, containing 24 hours of data, and are named with the following format: *ARBO\_MRR2\_YYYYMMDD.raw* where *YYYYMMDD* is the date of data collection in UTC.

Data is stored as ASCII text according to the METEK *raw spectra* format. As described in METEK (2018), each sample is recorded as a data block.

The first line of each data block contains the following fields:

- Identifier for MRR data
- date/time stamp in UTC: *YYMMDDhhmmss* UTC
- Device version/firmware number (DVS)
- Device serial number (DSN)
- Bandwidth (BW)
- Calibration constant (CC)
- Micro Rain Radar Data (MDQ) quality: (percentage of valid spectra, number of valid spectra and number of total spectra)
- Identifier for data type (RAW)

According to METEK (2018):

*“The next data lines contain the measuring heights. It begins with the capital letter H (H means height) and two space characters. The following numbers (9 digits decimal each) represent the measuring heights in meters.*

*The height line is followed by the line of the transfer function. It starts with the capital characters TF (Transfer Function) and one space character. The rest of that line represents the values of the transfer function for each height step ( 9 digits decimal each).*

*The line of the transfer function is followed by 64 data lines. Each one starts with the capital character F and a 2-digit number of the spectra line (0 to 63). The rest of these lines represent the received spectral signal power in engineering units for each height step (9 digits decimal each).*

*The raw spectra include the receiver noise floor.”*

## 5. Data Remarks

No major data artifacts were noticed in review of the data. Some spurious weak echos are occasionally found above 5 km MSL in the data, perhaps associated with local sources of microwave interference. Table 3 summarizes MRR-2 interruptions > 1 h. No interruption occurred during the field campaign period.

*Table 2: Summary of missing data*

<b><u>Length of interruption [hours]</u></b>	<b><u>Start</u></b>	<b><u>End</u></b>
5.7	2021-11-30 12:27	2021-11-30 18:07
1.3	2021-12-12 04:21	2021-12-12 05:39

## 6. Acknowledgment

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## 7. References

Maahn, M., 2020: IMProToo Improved Mrr Processing Tool. Version 0.102, <https://github.com/maahn/IMProToo>.

Minder, J., et al. 2022. NYSM Chazy, NY MRR-2 Raw Data. Version 1.0. UCAR/NCAR - Earth Observing Laboratory. <https://doi.org/10.26023/SWRV-99Y4-VC0C>. Accessed 20 Sep 2022.

\*METEK, 2018: MRR-2 Micro Rain RADAR User Manual. *METEK GmbH*.

\*METEK, 2015: MRR Physical Basics. *METEK GmbH*.

\* *Metek MRR manuals are provided as attachments.*

## 8. Appendix

Suggested GCMD keywords to accompany this dataset are provided below in no particular order:

- Solid precipitation
- Frozen precipitation
- Precipitation profiles
- Melting layer height
- Rain
- Freezing rain
- Drizzle
- Freezing drizzle
- Ice pellets
- Snow
- Ice storms
- Snow storms
- Extratropical cyclones
- Radar
- Doppler velocity
- Radar reflectivity
- Spectrum width