Winter Precipitation Type Research Multi-scale Experiment (WINTRE-MIX)
U. of Colorado Micro Rain Radar (MRR) @ COW radar site

1. **Dataset Title**: Radar - CU Micro Rain Radar (MRR) at COW radar site [CU] – raw data

2. **Data Set Description**: This dataset contains raw data from a METEK first generation vertically profiling K-band Micro Rain Radar (MRR) deployed at C-band Doppler radar site (COW site) in support of the WINTRE-MIX field campaign (https://www.eol.ucar.edu/field_projects/wintre-mix). The instrument provides vertical profiles of reflectivity, Doppler velocity, and spectrum width. 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/).

3. **Data version**: v1.0, 8 September 2022. DOI: 10.26023/X4WT-1RPF-7M0J

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5. **Time of Interest** 1 February – 8 March 2022: during IOPs only when the COW was running

6. **Area of Interest** –
    COW radar Site: 45.478247;-72.936154 @ 40 m MSL

Fig. 1: Map showing various instrument location including the MRR location at COW (yellow pin).

Fig. 2: Image of the MRR and disdrometer (left side) located at the COW radar site. Note that the instruments only ran when the COW was operating.

7. **Data Frequency** – 60 s

8. **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) for more information regarding dataset restrictions and dissemination.

9. **Data Spatial Type** –

    a) **Instrument Description**

A METEK K-band FM-CW Micro Rain Radar (MRR, http://metek.de/product/mrr-2/) was deployed at COW site (Figs. 1-2). The attributes of the MRRs are summarized in Table 1. More detailed technical information on the MRR2 is available in METEK (2015, 2021).

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

Parameter	Value
Transmit power	50 mW
Frequency	24 GHz
Number of range gates	32
Antenna heating	230 VAC / 24 VDC, 25 W
Beam width	2 deg
Range resolution	200 m
Raw data collection frequency	10 s
Processed data frequency	60

    b) **Data Collection and Processing**

The MRR-2 was configured to collect data every 10 seconds with a 200-m range gate spacing (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 (2021) and grouped into daily files.

Post-processing of the data is accomplished using version 0.104 of the IMProToo software (Maahn, 2021) and processed netCDF data files are archived separately in a companion dataset.

c) Data Format – readable ascii text (*.raw)

Each data block in a **raw data** file begins with a header line which contains the date, the time and the time zone of the following data block. This line is preceded by the letter T and a colon (T means time). The format of the date/time stamp is YYMMDDhhmmss, which means year, month, day, hour, minute and second with 2 digits each. Date, time and time zone are separated by a space character. The header line is supplemented with the version number of the MRR firmware (following the identifier DVS), the serial number (of the MRR (following the identifier DSN), the calibration constant of the MRR (following the identifier CC) and the percentage of valid spectra (following the identifier MDQ).

The next data lines contains the measuring heights. It begins with the capital letter M, a colon, the small letter h, two space characters, and an equals sign (M means measured value, h means height). 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 character M, a colon, the capital letters T and F 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 M, a colon, the small letter 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.

d) Data Remarks

No major data artifacts were noticed in review of the data. Table 2 summarizes issues with missing or suspect data that affected specific days.

Table2: Summary of missing and suspect data

Name	Time (UTC)	Remarks
WINTRE-MIX_MRR_COW_20220210.raw	0800-1400	Noisy data; no precip
WINTRE-MIX_MRR_COW_20220211.raw	2300-0000	Noisy data; no precip
WINTRE-MIX_MRR_COW_20220212.raw	0000-0600	Noisy data; no precip
WINTRE-MIX_MRR_COW_20220217.raw	2200-0000	Good data
WINTRE-MIX_MRR_COW_20220218.raw	0000-0400	Good data

WINTRE-MIX_MRR_COW_20220222.raw	2100-0000	Swallow clouds, low returns
WINTRE-MIX_MRR_COW_20220223.raw	0000-0600	Swallow clouds, low returns
WINTRE-MIX_MRR_COW_20220301.raw	1530-0000	Swallow returns; noisy data
WINTRE-MIX_MRR_COW_20220302.raw	0000-0000	Good data
WINTRE-MIX_MRR_COW_20220303.raw	0000-0000	Good data
WINTRE-MIX_MRR_COW_20220306.raw	0000-0000	Good data
WINTRE-MIX_MRR_COW_20220307.raw	0000-0000	Noisy data
WINTRE-MIX_MRR_COW_20220308.raw	0000-0100	Noisy data

e) References

Maahn, M., 2021: IMProToo Improved Mrr Processing Tool. Version 0.104,
https://github.com/maahn/IMProToo

*METEK, 2021: MRR-2 Micro Rain RADAR User Manual. METEK GmbH. *METEK, 2015: MRR
Physical Basics. METEK GmbH.

* Metek MRR manuals and tutorial (under Downloads):
https://metek.de/product/mrr-2/