

Microwave radiometer ADMIRARI

Instrument name: ADMIRARI

Instrument type: DP-RR

Manufacturer: Radiometer Physics GmbH ([RPG](#))

Location: Institute for Geoscience, Section Meteorology, Bonn

Coordinates: Lat: 50.731233° N, Lon: 7.070733° E, Alt: 66 m asl

The ADMIRARI (ADvanced Microwave RAdiometer for Rain Identification) is a unique passive microwave radiometer. It was built by Radiometer Physics, Meckenheim and delivered to the Meteorological Institute at the University of Bonn in summer 2007. It is designed to measure water vapor, cloud and rain liquid water with high temporal (1s) and spatial resolution (5°). The radiometer is mounted on a trailer allowing relatively easy transportation and participation in field campaigns.

Additionally it is permanently equipped with two active instruments, i.e. since 2008 a Micro Rain Radar (MRR) at 24.1 GHz frequency for rain structure observation and since September 2010 with a cloud Lidar at 920 nm wavelength for Cloud base estimation. Both active instruments are fully steerable alike ADMIRARI.

Instrument specifications

ADMIRARI:

Parameter	Specification
System noise temperatures	< 900 K typical for all receivers < 400 K below 60 GHz (including auto-calibration frontend)
Radiometric resolution	0.15 RMS @ 1.0 sec integration time
Channel bandwidth	400 MHz typ.
Absolute system stability	0.5 K
Radiometric range	0 – 400 K
Frequencies	1.4, 6.9, 10.65, 18.7, 21.0, 23.8, 36.5, 37, 89, 90, 150
Polarization	2 linear polarizations (V / H) simultaneously
Absolute calibration	with internal Dicke switch & external cold load, automatic sky tipping
Internal calibration	Gain: internal Dicke switch + noise standard automatic abs. cal.: sky tipping calibration
Receiver and antenna thermal stabilization	Accuracy < ±0.015 K
Gain nonlinearity error correction	Automatic, four point method
Brightness calculation	based on exact Planck radiation law
Integration time	≥0.4 second for each channel

Data interface / rate	Ethernet (TCP/IP), 10 kByte/sec
Instrument control	Industrial PC, Pentium based
Housekeeping	all system parameters, history documentation
Optical resolution	HPBW: 6.1°
Side-lobe level	<-30dBc
Steering / positioner system	elevation: -90° to +90°, azimuth: 0° to 360° < 1° resolution, full software control
Pointing speed	elevation: 3°/sec, azimuth: 5°/sec
Operating temperature range	-40°C to +45°C
Operating humidity range	0 – 100 %
Power consumption	<350 Watts average, 500 Watts peak
Input voltage	100-230 V AC, 50 to 60 Hz
Weight	105 kg for receiver modules, 300 kg for positioner
Modularity (“plug and play”)	any 4 frequencies (8 channels) can be supported by a positioner system, which is providing power supplies and software control

MRR:

Parameter	Specification
Manufacturer	Metek GmbH
Instrument type	MRR-1
Frequency	24.1 GHz
Wavelength	12.4 mm
Radar Type	FM-CW
Transmit Power	50 mW
Receiver	Single Polarization
Power consumption (radar)	25 W
Total power cons. incl heating	525 W
Max. range	6 km
Range Resolution	10 - 200 m
No. of range gates	30
Temporal resolution	10 s
Antenna diameter	0.5 m
Beam width (2-way, 6 dB)	1.5°

Ceilometer:

Parameter	Specification
Manufacturer	BJÖRN ELIASSON INGENJÖRSFIRMA AB
Instrument type	CBME80
Range	0 – 7500 m
Resolution	10 m
Accuracy	Greater of ± 10 m ± 1% of height (against hard target)
Temporal resolution	15, 30, 60, 120 s

Laser safety	Eye safe class 1M (IEC 60825-1)
Operating temperature range	-40 - +55 °C
Weight	15 kg
Power supply	115 V / 230 V, 45 – 65 Hz
Power consumption	Electronics 30 VA Heater 200 VA

Instrument time-line

01/08/2007 – today	ADMIRARI trailer at Institute of Geoscience, Section Meteorology, University of Bonn, Bonn
08/08/2007 – 20/12/2007	COPS campaign at the ARM Mobile Facility on the Murg Valley in the Black Forest, Germany
01/04/2008 – today	ADMIRARI trailer permanently equipped with MRR, Institute of Geoscience, Section Meteorology, University of Bonn, Bonn
01/05/2008 – 01/12/2008	Intensive observation period in EUCAARI campaign at CBAUW, Netherlands
25/02/2010 – 25/03/2010	CHUVA-GPM campaign near Alcântare, Brazil
01/09/2010 – today	ADMIRARI trailer permanently equipped with Ceilometer, Institute of Geoscience, Section Meteorology, University of Bonn, Bonn
15/09/2010 – 20/10/2010	LPVEx campaign, southern tip of Porvoo Emäsalo peninsula, gulf of Finland, Finland
05/05/2011 – 06/06/2011	MC3E campaign at the ARM Southern Great Plains site, central Oklahoma, US
15/01/2012 – 29/02/2012	GCPEX campaign at CARE facility, Ontario, Canada

Available measurement modes

- Fully steerable positioning for scanning or pointing in 1s temporal and 5° spatial resolution, including MRR and Ceilometer pointing same directions

JOYCE-CF Standard Operation Procedures

- Fully used for specific campaigns
- No operational use

Data quality assurance procedures

- Raw data provided by the instrument(s). Quality control by operator.

Available datasets

Quick-looks for mentioned campaigns are available here (<https://www2.meteo.uni-bonn.de/admirari/admirari.html>).

Additional data, measurement time or any campaigns can be requested via the JOYCE-CF request sheets.

ADMIRARI:

Level 1

- Brightness temperature in horizontal and vertical polarization (TB(H) and TB(V)):
 - Temporal resolution 1 second
 - 1 file per hour (whole day approx. 10 MB)
- Polarization difference $PD = TB(V) - TB(H)$:
 - Temporal resolution 1 second
 - 1 file per hour (whole day approx. 10 MB)

Level 2

- Integrated water vapor (IWV):
 - Temporal resolution 1 second
 - 1 file per hour (whole day approx. 10 MB)
- Liquid water path (LWP) :
 - Temporal resolution 1 second
 - 1 file per hour (whole day approx. 10 MB)

MRR:

Level 2

- Available data per scan:
 - measurement height H (m)
 - liquid water content LWC (g m^{-3})
 - path integrated attenuation PIA (dB)
 - rain rate RR (mm h^{-1})
 - transfer function TF (dimensionless)
 - fall velocity W (m s^{-1})
 - radar reflectivity attenuation corrected Z (dBZ)
 - attenuated radar reflectivity z (dBZ)
- Resolution:
 - Temporal resolution: approx. 1 min
 - Beam width: 2 deg
 - range resolution: 10 m to 200 m
- File size per day approx. 35 MB

Ceilometer:

Level 2:

- Available Data:
 - Cloud height (up to 3 layers)
 - vertical visibility
 - Cloud amount / sky condition
 - Status information
 - Backscatter profile
- Resolution:
 - Temporal resolution: 15, 30, 60, 120 s
 - Range resolution: 10 m (0 – 7500 m)

Contact

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