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Polarimetric X-band radar JuXPol

Instrument name: JuXPol
Instrument type: EEC DWSR-2001-X-SDP
Manufacturer: Enterprise Electronics Corporation (EEC)
Location: Sophienhöhe, Jülich
Coordinates: Lat: 50.92750° N, Lon: 6.45626° E, Alt: 310 m asl

JuXPol is an active polarimetric Doppler X-band radar located at a 30 m mast on top of the Sophienhöhe, close to the city of Jülich and the Forschungszentrum Jülich. The Sophienhöhe is an artificial hill from open pit mining. The radar transmits and receives horizontal and vertical polarized electromagnetic waves simultaneously (STAR/SHV-mode). The processed polarimetric moments provided by the signal processor are the backscattered reflectivity at horizontal and vertical polarization Z_H and Z_V, the differential reflectivity Z_{DR}, the differential propagation phase shift Φ_{DP}, the co-polar cross-correlation coefficient $\rho_{HV,}$ and the Doppler velocities at horizontal and vertical polarization, V_H and V_V. The multivariate polarimetric measurements enable quantitative precipitation estimation, microphysical retrievals like particle number concentrations, diameter, liquid water content and ice water content, as well as the detection of precipitation generating microphysical processes in the surrounding monitored volume.

Instrument specifications

Parameter	**Specification**
Frequency (GHz)	9.3
Elevation angles	0° - 90°
Azimuth angles	0° - 360°
3-dB beamwidth	1°
Radial Resolution (m)	25 – 250
Transmit Type	STAR DualPol
Signal Processor	GAMIC Enigma3 (since 2017 Enigma4)
Mamimum Range (km)	150
Temporal resolution	5 min schedule with 10 scans (approx. 30 s per scan)

Instrument time-line

26/06/2010 - 24/08/2017	GAMIC Enigma 3 Signal Processor
14/10/2017 - today	GAMIC Enigma 4 Signal Processor

Available measurement modes

- Range-height indicator (RHI) can be orientated anywhere
- Plan-position indicators (PPIs) can be modified in elevation angle 0.5° < el < 90° and range-gate spacing

JOYCE-CF Standard Operation Procedures

- Standard measurement mode will be repeated at least every 15 min
- Standard measurement mode is a 5 min repeating scan schedule consisting of:
    - 1 RHI scan orientated towards JOYCE-CF Observatory JuCol (Forschungszentrum Jülich)
    - 10 PPIs between 1° and 30° elevation
    - 1 vertical pointing scan (birdbath)

Data quality assurance procedures

- Processed and unprocessed polarimetric moments are available based on GAMIC mbH Enigma signal processor

Available datasets

The following data products are available via JOYCE-CF request sheet. Data is stored in volume data for all PPIs, RHI, or birdbath scan in formatted hdf5 files based on ODIM format. For description and first hands on data please take a look at wradlib python tutorials https://docs.wradlib.org/en/stable/notebooks/fileio/wradlib_radar_formats.html#HDF5
Due to data storage amount and transmittance limitations, level 0 (raw pulses, etc.) and level 1 (I/Q data) are not stored. Only processed level 2 data is available.

Level 2

- Available polarimetric moments as described above: Z_H and Z_V, Z_{DR}, Φ_{DP}, $\rho_{HV,}$, and V_H and V_V
- For Z_H and Z_V uncorrected moments are also available UZ_H and UZ_V
- Resolution:
    - Temporal resolution: approx. 30 s per scan
    - Beam width: 1 deg

    - Horizontal resolution: 25 m to 150 m
- File size:
    - Volume scan per schedule approx. 22 MB
    - RHI per scan approx. 1.5 MB
    - Vertical per scan approx. 2 MB
    - 1 day of data approx. 5.5 GB
- Filename: “DWD-Vol-2_99999_yyyymmddHHMMSS_00”

Contact

Josephin Beer
University of Bonn
Institute of Geoscience and Meteorology
Auf dem Hügel 20
53121 Bonn, Germany
Tel.: +49 (0)228 73-3152
E-mail: jbeer@uni-bonn.de