Radar regional mosaic Quantitative Precipitation Estimates (QPE), Version 1.0

Overview

This data set contains mosaic radar data collected during the extended PECAN (Plains Elevated Convection at Night) period of 12 May to 22 July 2015. The mosaic included QPE data calculated with 0.01° x 0.01° (~1 km x 1 km) spatial and 1-hourly temporal resolution from a composite of 21 WSR-88D radars from the Next Generation Weather Radar (NEXRAD) system and the NCAR S-Pol radar. For more information on PECAN, see www.eol.ucar.edu/field_projects/pecan.

Instrument descriptions

NEXRAD

A standard WSR-88D operates in the S band, at a frequency of around 2800 MHz, with a typical gain around 53 dB using a center-fed parabolic antenna. The pulse repetition frequency (PRF) varies from 318 to 1300 Hz with a maximum power output of 700 kW at Klystron output, although dependent on the volume coverage pattern (VCP) selected by the operator. All NEXRADs have a dish diameter of 9.1 m (30 ft) and an aperture diameter of 8.5 m (28 ft). Using the predetermined VCPs, NEXRADs have a traditional elevation minimum and maximum ranging from 0.1 to 19.5 degrees, although the non-operational minimum and maximum spans from −1 to +45 degrees. For more information on NEXRAD see www.ncdc.noaa.gov/data-access/radar-data/nexrad.

S-Pol

NCAR/EOL's S-PolKa radar is an advanced, transportable, ground-based dual-polarized, dual-wavelength, Doppler weather radar. S-PolKa transmits 10 cm wavelength (S-band). The transmitter is identical to the NEXRAD WSR-88D transmitter and is supported by the NWS National Reconditioning Center in Kansas City, MO. The S-band transmitter operates at dual RF pulse widths of 1.5 and 5.0 μs and variable PRF (pulse repetition frequency) ranging between 300 and 1300 p.p.s. The transmitter has demonstrated a phase stability of better than 57 dB. The performance is achieved with a klystron amplifier cathode pulsed by an all-solid-state line-type modulator. Special attention is given to modulator pulse regulation, output regulation and inverter timing in the filament supply, and spectral conditioning in the solid-state RF driver. The peak modulator power level of 1.5 MW is capable of producing a peak RF output in excess of 750 kW. The transmit pulse is tapered and filtered for minimum RF interference. The 28 foot reflector is a high-compliance aluminum structure providing -28 dB first sidelobes and at least -31 dB integrated cross polar isolation.

Polarization switching is done by an NCAR built mechanical switch which will provide 49 dB transmit isolation. For alternating H/V pulses, this isolation is comparable to a dual transmitter configuration. A separate receiver for each channel provides 40 dB receive isolation. Copolar and crosspolar receivers are used to provide high data quality differential reflectivity and differential phase measurements.

Pulse pair and dual polarization processing is performed by a Vaisala RVP8 receiver. The processor is PC based and ingests the I/Q time series from the RVP8. Real time ground clutter mitigation is accomplished with the NCAR developed CMD (Clutter Mitigation Decision) algorithm. The spectral based clutter filter provides about 50 dB clutter rejection.

For more information on S-Pol see www.eol.ucar.edu/instrumentation/remote-sensing/s-pol.

Data description

The radar mosaic included QPE data calculated with 0.01° x 0.01° (~1 km x 1 km) spatial and 1-hourly temporal resolution from a composite of 21 WSR-88D radars from the Next Generation Weather Radar (NEXRAD) system and the NCAR S-Pol radar. The data is in Meteorological Data Volume (MDV) format (for more info on MDV see www.eol.ucar.edu/system/files/MDV_format_ICD.pdf).

Data fields are:
ACCUM_PID (mm)
ACCUM_HYBRID (mm)
ACCUM_Z_ZDR (mm)

QPE data processing and quality control

QPE was derived with the NCAR method using a hydrometeor classification algorithm to determine which rain rate relationship was appropriate at each location. The NCAR particle identification (PID) algorithm was used to distinguish between hydrometeor types at each radar gate. A beam blockage algorithm was used to account for the propagation effects and the convolution of the beam pattern with the terrain features. Prior validation with rain gauges showed a high correlation coefficient of 0.834, providing confidence in this enhanced QPE algorithm. For details see https://ams.confex.com/ams/37RADAR/webprogram/Manuscript/Paper275705/AMS_20150917.extended_abs.dixon.9A.1.pdf

The rectangular radar mosaic was constructed using the maximum QPE value closest to the grid point in overlapping radar domains.

Contact

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