HIAPER Cloud Radar (HCR) data (time series), Version 1.0

Overview

This dataset contains HIAPER Cloud Radar (HCR) data collected aboard the NSF/NCAR GV HIAPER (Gulfstream-V High-performance Instrumented Airborne Platform for Environmental Research, HIAPER) (N677F) during SPICULE (Secondary Production of Ice in Cumulus Experiment). The data were collected during 10 research flights which took place between May 29 and June 25, 2021, over the US Great Plains. For more information on SPICULE, see https://www.eol.ucar.edu/field_projects/spicule.

Flight	Start date	Start time UTC	End date	End time UTC
RF01	2021 05 29	14:30	2021 05 29	20:00
RF02	2021 06 01	16:20	2021 06 01	21:20
RF03	2021 06 02	19:45	2021 06 03	01:25
RF04	2021 06 05	12:05	2021 06 05	22:00
RF05	2021 06 09	19:30	2021 06 09	23:35
RF06	2021 06 11	17:00	2021 06 12	00:05
RF07	2021 06 17	17:45	2021 06 18	00:45
RF08	2021 06 20	17:45	2021 06 21	04:05
RF09	2021 06 24	19:45	2021 06 24	23:50
RF10	2021 06 25	18:20	2021 06 25	22:50

Instrument description

HCR is an airborne, polarimetric, millimeter-wavelength (W-band) radar that serves the atmospheric science community by providing cloud remote sensing capabilities to the NSF/NCAR G-V (HIAPER) aircraft. HCR detects drizzle, thin ice, and liquid clouds and collects Doppler radial velocity measurements, which at vertical incident include the vertical wind and particle fall speed.

In a pod-based design, a single lens antenna is used for both transmit and receive. The transceiver uses a two-stage up and down conversion super-heterodyne design. The transmit waveform, from a waveform generator, passes through the two-stage up-conversion to the transmit frequency 94.40625 GHz. It is then amplified by an extended interaction klystron amplifier (EIKA) to 1.6 kW peak power. System performance on transmit and receive paths are closely monitored using a coupler and a noise source. Raw in-phase and quadrature information are archived in HCR. For more information, see Vivekanandan et al. (2015) and www.eol.ucar.edu/instruments/hiaper-cloud-radar-hcr

HIAPER Cloud Radar Specifications	
Parameter	**Specification**
Antenna	0.3 m, lens
Antenna gain	46.21 dB
Antenna 3 dB beam width	0.72°
Transmit Polarization	Linear (V)
Transmit frequency	94.40625 GHz
Transmitter	Klystron
Peak transmit power	1.6 kW
Pulse width	0.2 – 1.0 μs
PRF	10 kHz
System noise power	-101 dBm
Receiver noise figure	8.9 dB
Receiver Bandwidth	20 MHz
Receiver Dynamic Range	76 dB
First IF	156.25 MHz
Second IF	1406.25
Range resolution	20 - 180 m
Unambiguous range	15 km
Along-flight track resolution	60 m
Typical reflectivity uncertainty	0.4 dB
Sensitivity	-31.5 dBZ at 1 km
Unambiguous velocity	±7.75 m/s
Typical radial velocity uncertainty	0.2 m/s at W=2 m/s
Dwell time	100 ms

Data description

Time series data is available at http://data.eol.ucar.edu/dataset/605.012. It contains the raw in-phase (I) and quadrature (Q) information archived as time series. If you do not know what radar time series data is, you are probably better served with the processed CfRadial 10Hz moments data available at http://data.eol.ucar.edu/dataset/605.011. For more information on HCR data see Romatschke et al. (2021).

Data processing and quality control

Time series data is the raw collected field data. It will always remain unchanged.

References

Vivekanandan, J., Ellis, S., Tsai, P., Loew, E., Lee, W.-C., Emmett, J., Dixon, M., Burghart, C., and Rauenbuehler, S., 2015: A wing pod-based millimeter wavelength airborne cloud radar, Geosci. Instrum. Method. Data Syst., 4, 161-176, https://doi.org/10.5194/gi-4-161-2015

Romatschke, U., M. Dixon, P. Tsai, E. Loew, J. Vivekanandan, J. Emmett, R. Rilling, 2021: The NCAR Airborne 94-GHz Cloud Radar: Calibration and Data Processing. Data, 6, 66. https://doi.org/10.3390/data6060066.

Citation

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HIAPER Cloud Radar
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