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 OTREC (Organization of Tropical East Pacific Convection). The data were collected during 22 research flights which took place between August 7 and October 2, 2019, over the East Pacific and extreme SW Caribbean Ocean. For more information on OTREC, see https://www.eol.ucar.edu/field_projects/otrec.

Flight	Date	Start time UTC	End time UTC
RF01	2019 08 07	12:15	17:40
RF02	2019 08 11	12:15	18:15
RF03	2019 08 12	12:15	17:40
RF04	2019 08 13	12:15	18:40
RF05	2019 08 17	12:15	18:00
RF06	2019 08 18	13:15	18:45
RF07	2019 08 22	13:15	19:20
RF08	2019 08 23	12:15	17:35
RF09	2019 08 25	12:30	18:55
RF10	2019 09 03	12:10	18:20
RF11	2019 09 04	12:10	17:10
RF12	2019 09 09	14:00	20:25
RF13	2019 09 17	14:25	19:55
RF14	2019 09 21	12:05	18:10
RF15	2019 09 22	12:15	17:55
RF16	2019 09 24	12:05	17:30
RF17	2019 09 25	12:10	17:30
RF18	2019 09 27	12:10	17:40
RF19	2019 09 28	14:15	19:10
RF20	2019 09 30	12:05	17:25
RF21	2019 10 01	12:05	17:45
RF22	2019 10 02	12:05	16:25

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/590.010. If you do not know what radar time series data is, you probably want the cfRadial 10Hz moments data available at http://data.eol.ucar.edu/dataset/590.009.

Data processing and quality control

Time series data is the raw collected field data. It is not quality controlled and will 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

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HIAPER Cloud Radar
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