

The UAH Vertical X-Band Radar (XPR)

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The XPR is a Vertically Pointing X-Band Radar that will be dedicated to acquiring high resolution vertically-pointing Doppler data. The XPR is sensitive primarily to Rayleigh scatter from cloud droplets, hydrometers, and insects; whereas the 915 is sensitive to both Rayleigh and Bragg Scatter. The latter property will allow estimation of differential reflectivity between the 915 and XPR measurements, that will provide physical insights on Bragg scattering (refractive index), hydrometer, and insect scattering properties.



Specification of the XPR

- X-Band magnetron transmitter peak power: 25 kW peak (nominal).
 - Polarization: Horizontal
- Antenna: Andrew HP6-102-P3A microwave antenna, single polarization).
 - Pulse duration range: Selectable between 1.0, 0.5, or 0.2 μ s.
- Range to first gate: The Gamic system starts taking data right after sending the transmit pulse, so the first sample comes from the 0 to 50 m range (assuming 50 m range gate spacing). Second gate would come from the 50 to 100 m range, and so on.
 - Range gate spacing (selectable) values: Set to 0.050 km by default 0.100 km, or 0.150 km, or 0.500 km.
 - Pulse repetition frequency (range): Set to 1,000 Hz (1.0 μ s PW), 1,250 Hz (0.5 μ s PW), and 2,000 Hz (0.2 μ s PW).
 - Antenna diameter: 1.8 m.
 - Beam width: 1.2 degrees according to the Andrew HP6-102-P3A specifications
 - Transmit frequency: 9.410 GHz.
 - Number of range gates: number of range gates = (maximum range) / (range spacing)
number of range gates = 50 km / 50 m = 1,000 4,096 is the maximum number of range gates.
- Number of points in the Doppler spectrum: Set to 50. Doppler spectrum is calculated using the DFT algorithm. Can change this value along with the data processing algorithm (DFT, FFT, or PPP).
- Recorded parameters: Corrected and uncorrected reflectivity. Mean velocity. Spectral width. In-phase and quadrature time series.
 - Dwell times (minimum, maximum): dwell time = (number of time samples) / PRF
 - PRF = 1,000 Hz: dwell time = 50 ms
 - PRF = 1,250 Hz : dwell time = 40 ms
 - PRF = 2,000 Hz: dwell time = 25 ms

Joint Project With UAHuntsville and DeTect Inc.
Operational November 1, 2009

The XPR Will Compliment The Mobile Integrated Profiling System (MIPS)



915 MHz Doppler wind profiler

- Profiles of
- horizontal wind
 - vertical motion
 - SNR (reflectivity factor or C_n^2)
 - supplement to T, r_v retrievals
 - Doppler spectra

Surface instrumentation

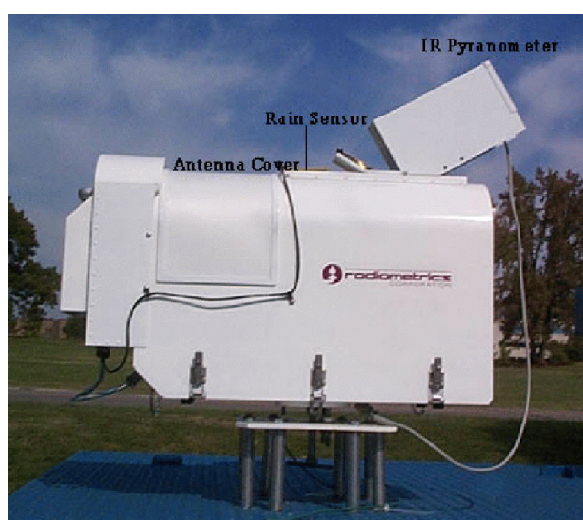
wind at 4 m and 10 m
T, RH at 3.5 m
pressure
rainfall
solar radiation
electric field



MIPS setup during a severe weather experiment

12 channel microwave radiometer

- T(z), $r_v(z)$, $r_c(z)$ to 10 km
- cloud base temperature
- integrated water vapor
- integrated cloud water
- CAPE (external calculation)



0.905 μ m lidar ceilometer

- profile of lidar backscatter
- cloud properties
 - aerosol characteristics
 - precipitation information
- cloud base measurements
extinction in cloud and precipitation