Department of Atmospheric Science

Wyoming Cloud Radar

UNIVERSITY OF WYOMING

University of Wyoming Airborne Polarimetric Doppler Radar*

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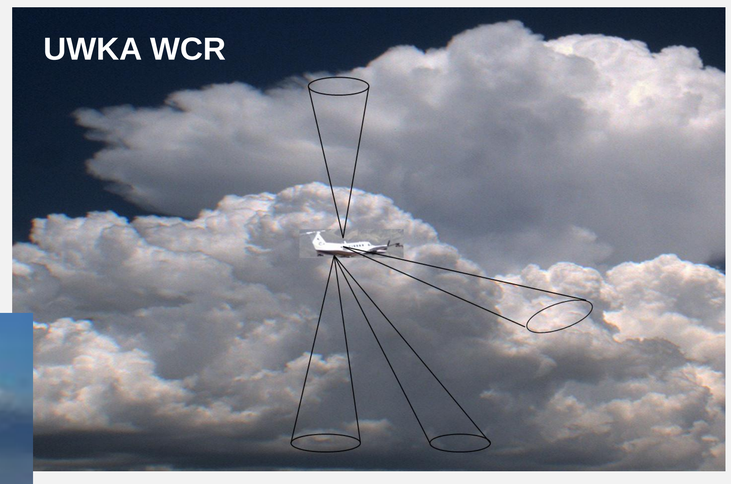
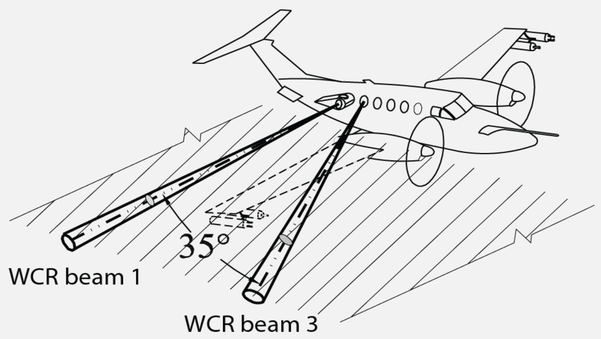
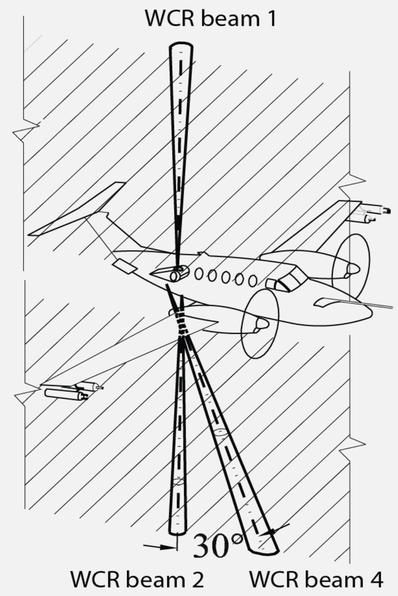






WCR Configurations

WCR Specifications

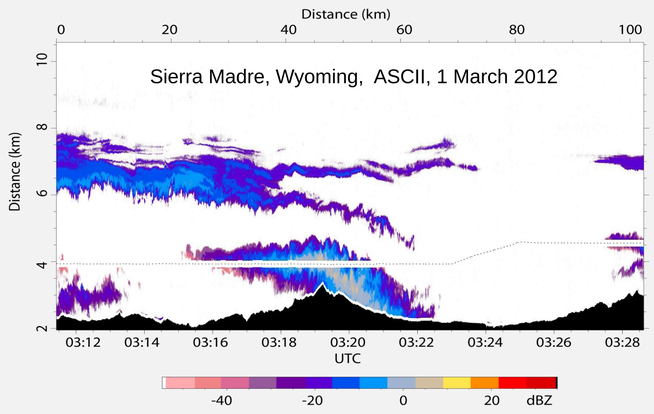
Wyoming Cloud Radar: ▪ platforms: N2UW, N130AR ▪ year placed in service ▪ owned and operated by ▪ home base	**WCR** Wyoming King Air, NSF/NCAR C-130 1995 (September 2009 new radar) University of Wyoming Laramie, Wyoming, U.S.A.
Peak Power | Duty Cycle	1.8 KW | 1%
Transmit Frequency | Wavelength	94.92 GHz | 0.00316 m
Pulse width | Pulse Repetition (PRF)	100-500 ns | 1-20 kHz
Antennas (fixed pointing): **UWKA (N2UW) – 4 antennas** ▪ Up or Side (via external reflector) ▪ Side-fore (~35°) ▪ Down (near nadir) ▪ Down-fore (~30°) **NSF/NCAR C-130 (N130AR) – 3 antennas** ▪ Up (near zenith) ▪ Down (near nadir) ▪ Down-aft (~30°)	*aperture* | *beamwidth* | *polarization* 0.305 m | 0.7° | dual, H and V 0.305 m | 0.7° | single, linear 0.457 m | 0.5° | single, linear 0.381 m | 0.6° | single, linear 0.381 m | 0.6° | single, linear 0.305 m | 0.7° | single, linear 0.305 m | 0.7° | single or dual 45˚
Maximum antenna switching rate	same as PRF
Radar operational/acquisition modes: ▪ pulse-pair (group of up to 12 pulses) ▪ Doppler spectrum	**Beams used**: up to 4 beams, any combination up to 4 beams, any combination
Receiver channels: ▪ receiver outputs ▪ receiver dynamic range ▪ noise figure	2 Digital (12-bit), magnitude and phase 65 dB at 4 MHz bandwidth 5 dB
Min. Dwell time | Along-track sampling	30 ms | 3 m (minimum)
Min. detectable signal : ▪ One St.Dev. above mean noise	for 200 ns pulse, 150 averaged pulses -40 dBZ at 1km
Resolution: ▪ in range | minimum range sampling ▪ volume@1 km, 200 ns pulse, 0.7° antenna	 15 – 75 m | 7.5 m ~ 30 x 12 x 12 m
Doppler radial velocity processor: ▪ pulse pair ▪ FFT spectrum	 1st & 2nd moments 16 to 512 spectral lines
Maximum unambiguous Doppler **Maximum useful range** **First usable radar range gate**	±15.8 $m s^{-1}$ (at 20 kHz PRF) ~ 10 km ~ 100 m

WCR Calibration

- **Reflectivity calibration**
  - received power calibration better than 1 dBm
  - reflectivity calibration better than 3 dBZ
- **Antennas' beam-pointing angle calibration**
  - antenna angle accuracy better than 0.03˚
  - antenna angle precision 0.01˚
- **Aircraft motion contribution removal**
  - absolute accuracy better than 0.1 $m s^{-1}$
  - precision 0.01 $m s^{-1}$

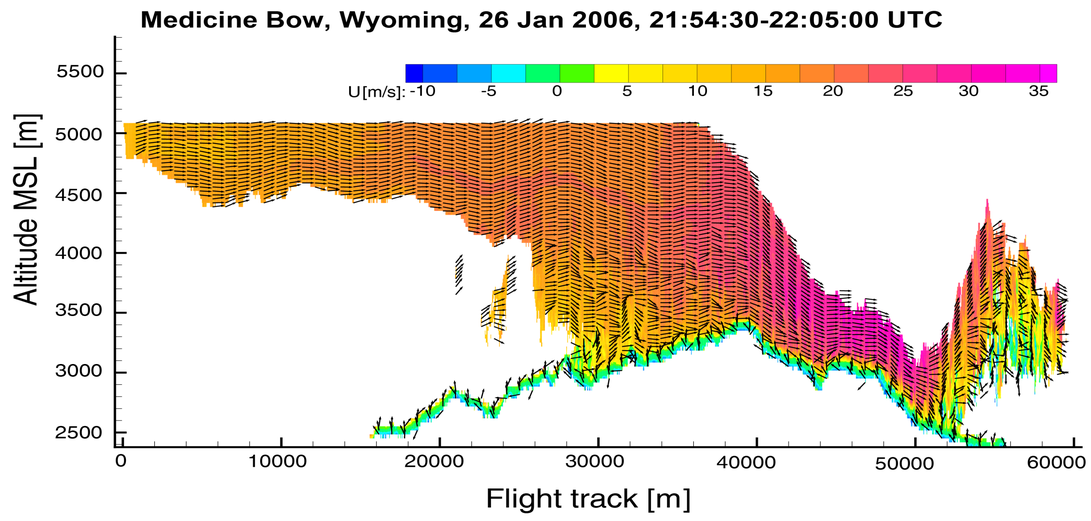
WCR Products and Software

- **Quality Control (*pdf files*)**
- **Quick looks (*ps, png, pdf files*)**

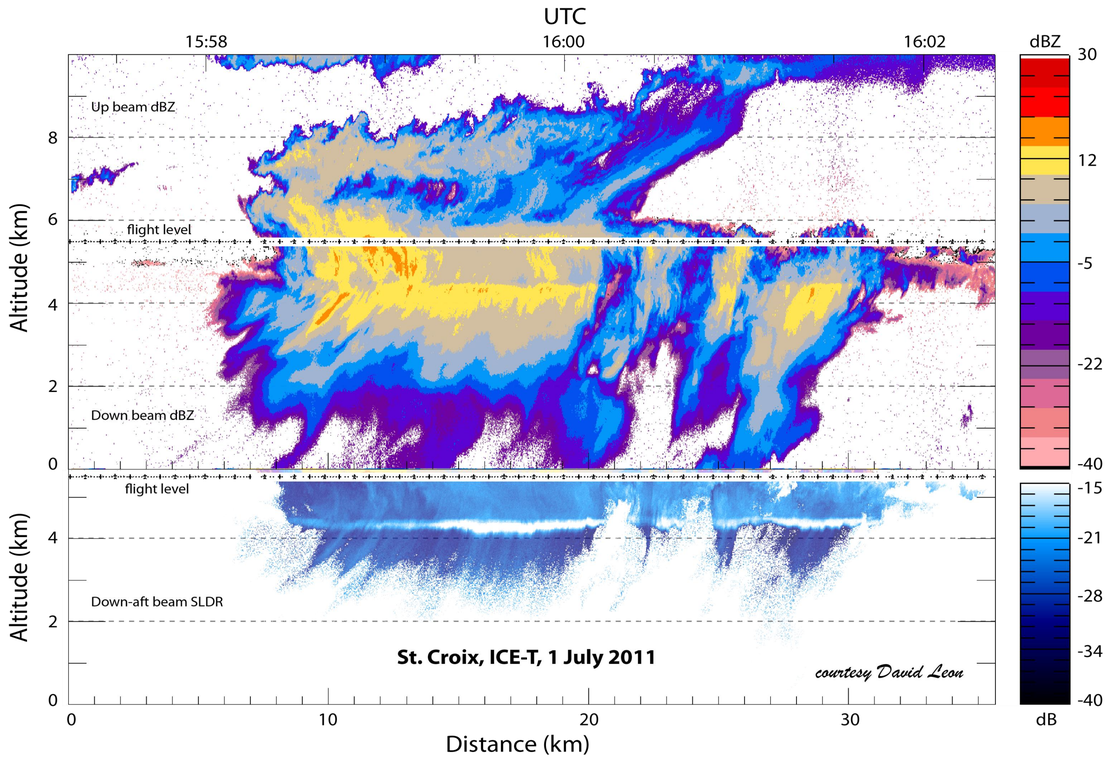


- **Reflectivity, Reflectivity mask, Doppler Velocity products, Polarimetric products (*NetCDF files*)**
- **Product retrieval, signal detection, interpolation and geo-location, visualization (*IDL WCR2TOOLS software*)**
- **Dual-Doppler analysis (*IDL WCRDD software*)**

WCR Dual-Doppler Synthesis



WCR Polarization measurements



** The WCR has been developed over the last 20 years with the inspiration and hard work of Profs. Gabor Vali and Robert Kelly, Drs. Samuel Haimov and David Leon, and the expert staff and leadership of the Wyoming King Air national facility. WCR was manufactured by ProSensing, Inc., USA.

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