

THE UNIVERSITY OF WISCONSIN ARCTIC HIGH-SPECTRAL RESOLUTION LIDAR (AHSRL)

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The University of Wisconsin - Madison



2nd Antarctic Meteorological Observation, Modeling and
Forecasting Workshop, 26-28 June 2007



Instrument Description



- Dimensions/Statistics:
 - 82.1" x 85" x 29.5" (208.53 x 215.9 x 74.93 cm)
 - Will fit through standard doorway
 - ~800 lbs.

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Available Data

- Measured
 - Attenuated Backscatter
 - Aerosol Backscatter Cross-Section
 - Particulate Circular Depolarization Ratio
 - Optical Depth
 - Retrievals/Estimates
 - Cloud/Area Classification
 - Particle Effective Radius
 - Particle Number Density
 - Water Content
 - Precipitation Rate
- Together with Cloud Radar



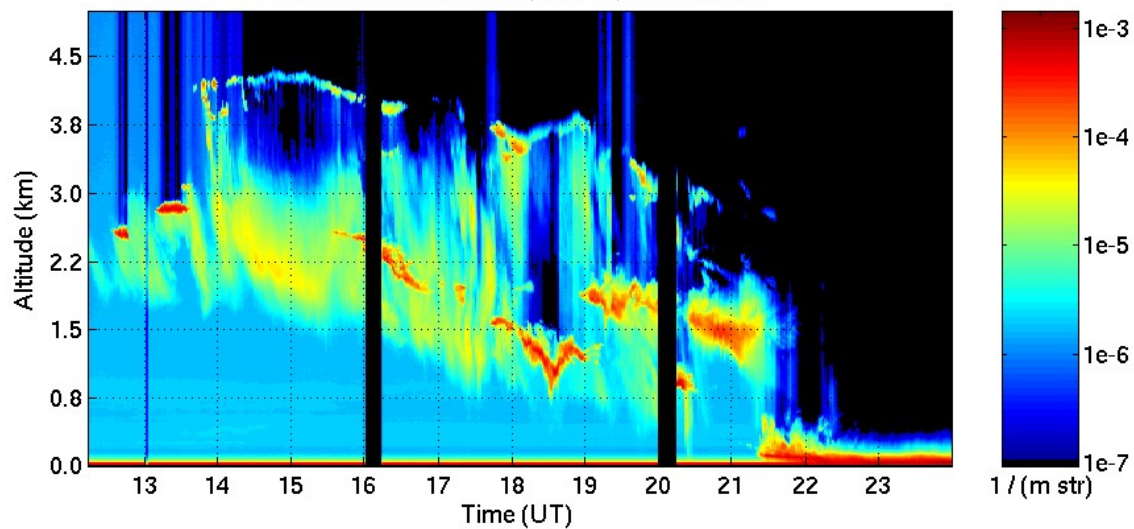
AHSRL Advantages

- Calibrated measurements of aerosol backscatter cross-section and optical depth
- Eye-safe operation
- Large dynamic range
 - Allows for unattended operation under varying atmospheric conditions
 - M-PACE (09/24/04-11/17/04): 1147 hours of data out of 1262 hours of run time (91%)
 - SEARCH (08/05-Present)
- Narrow angular field of view
 - Limits multiple scattering returns
 - Reduces background sky noise
- Automatic data processing

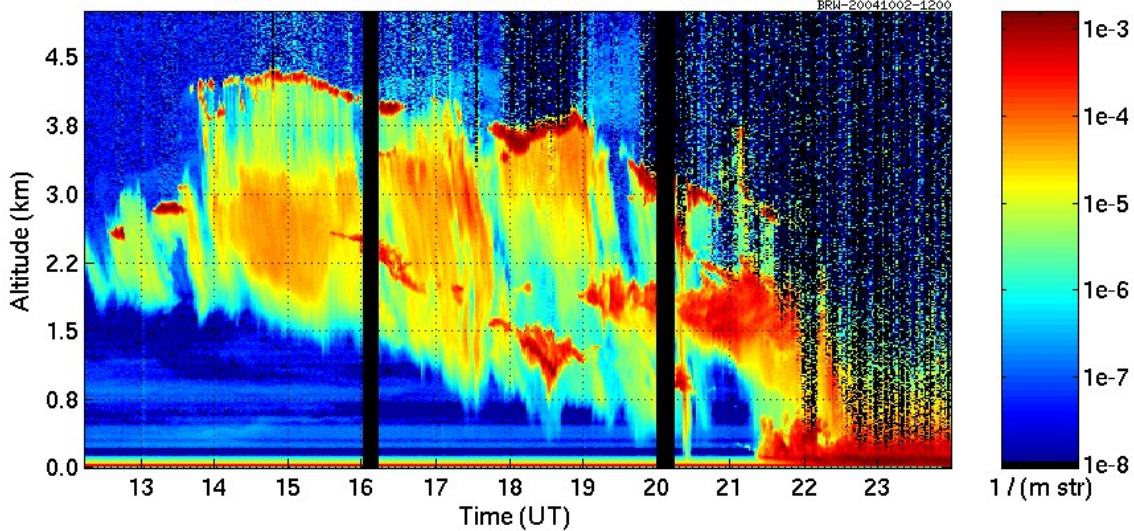


Data Examples

Attenuated backscatter ($\text{m}^{-1}\text{str}^{-1}$) 02-Oct-2004



Aerosol backscatter cross section $\text{m}^{-1}\text{str}^{-1}$ 02-Oct-2004

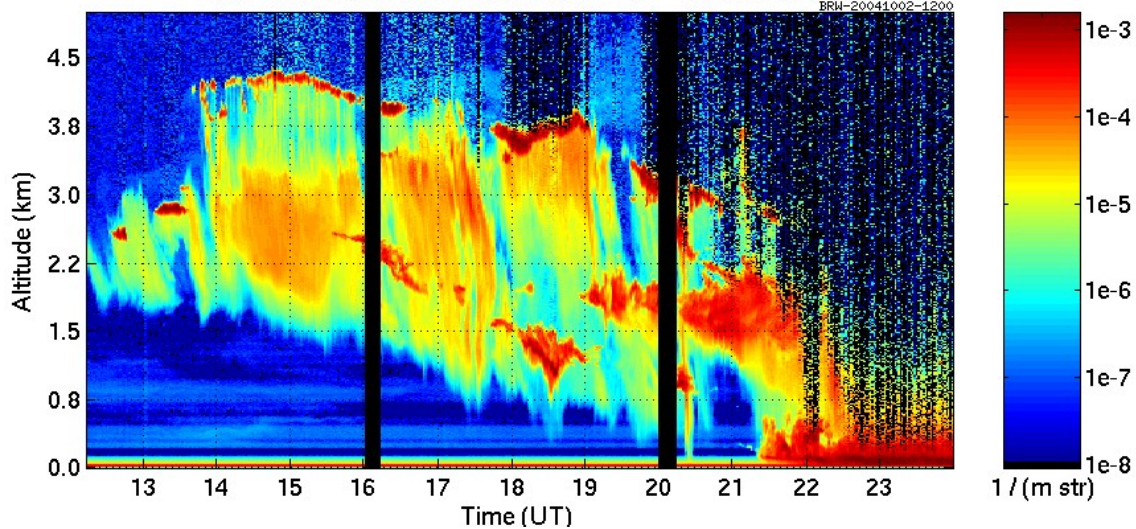


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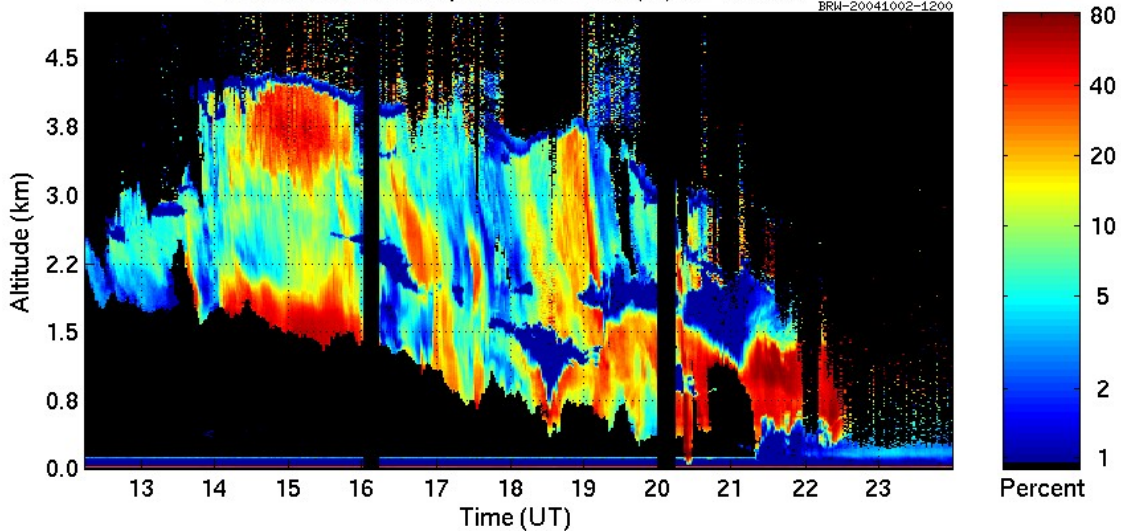


Data Examples

Aerosol backscatter cross section $\text{m}^{-1}\text{str}^{-1}$ 02-Oct-2004



Particulate circular depolarization ratio(%) 02-Oct-2004



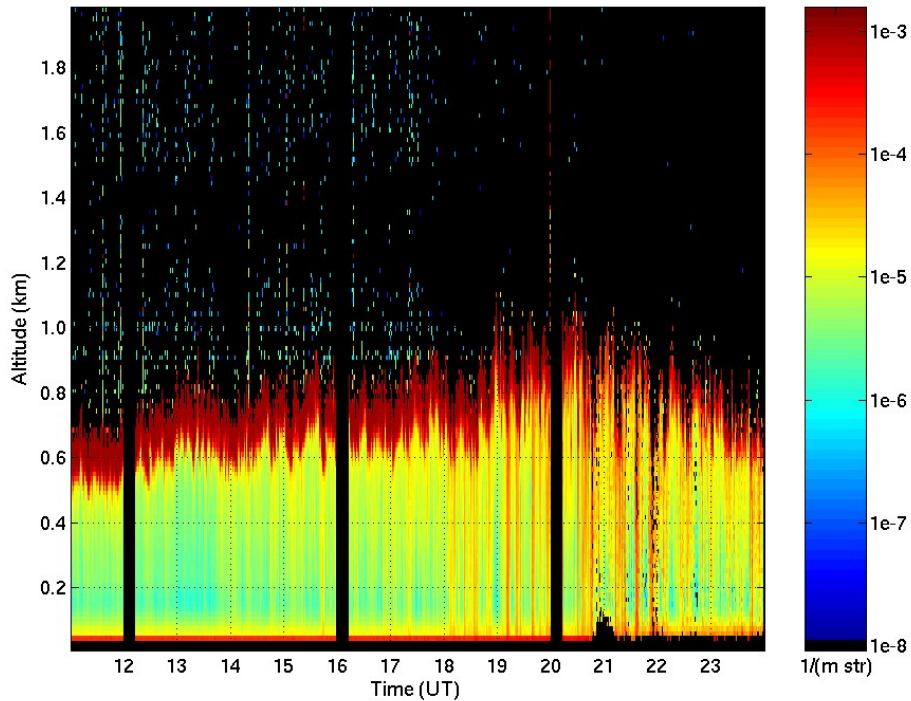
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Data Examples

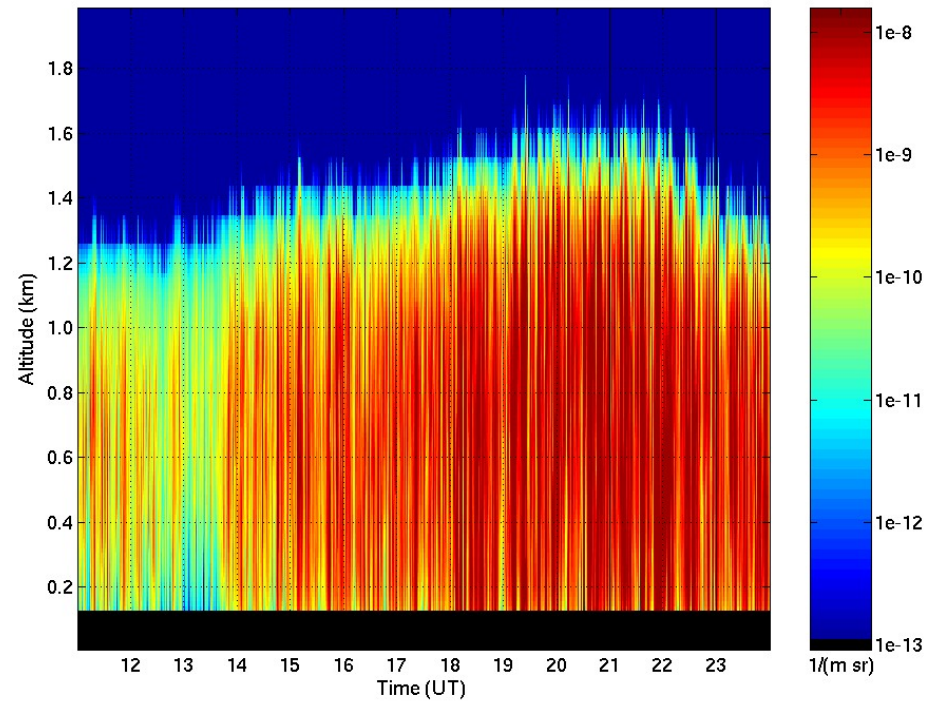
Lidar Backscatter Cross-Section

Aerosol backscatter cross section $\text{m}^{-1}\text{sr}^{-1}$ 09-Oct-2004



Radar Backscatter Cross-Section

Radar backscatter cross section 09-Oct-2004

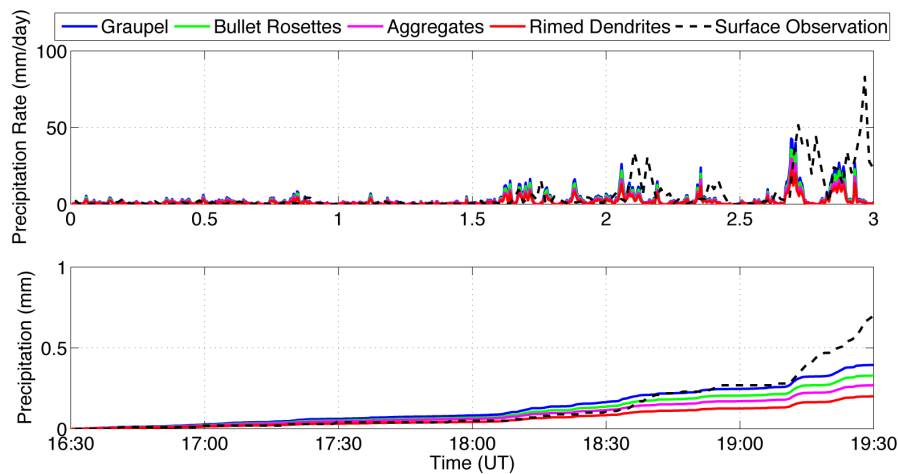
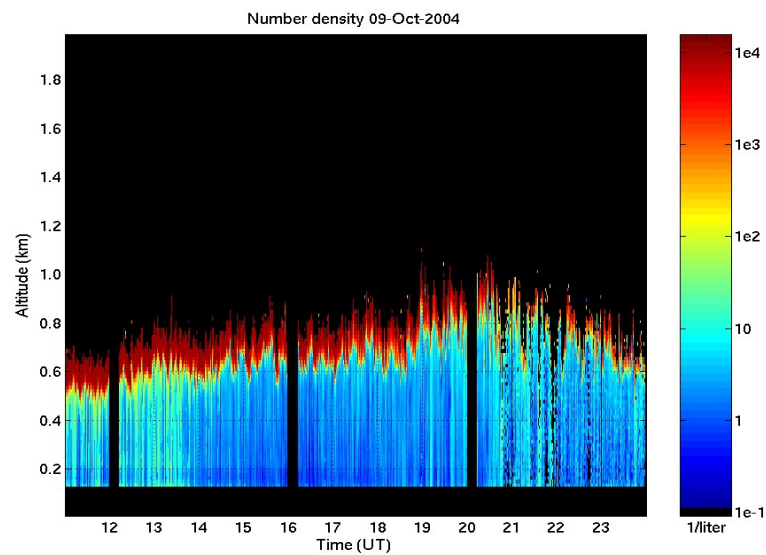
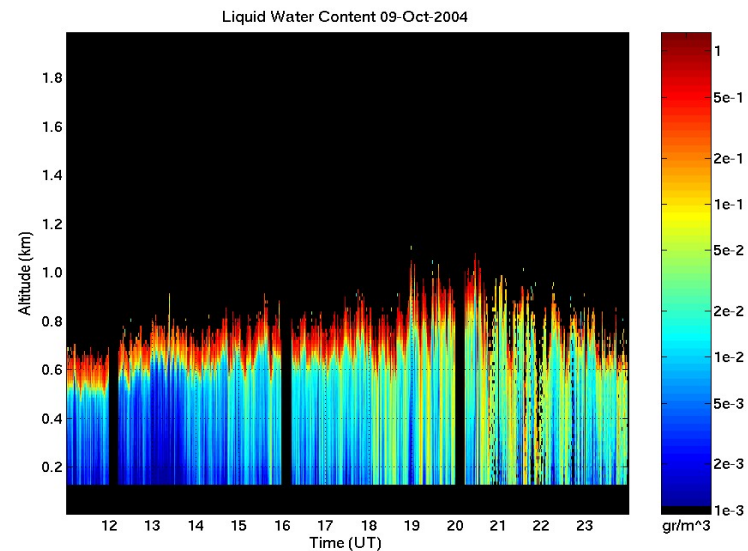
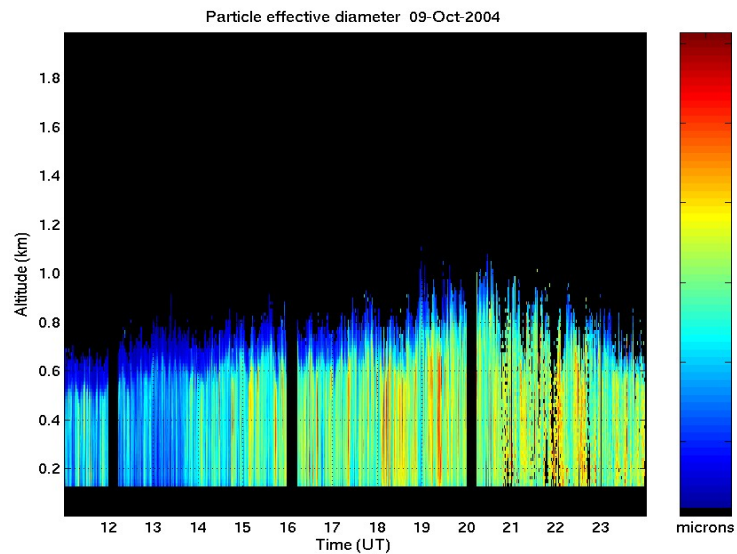


October 9/10, 2004

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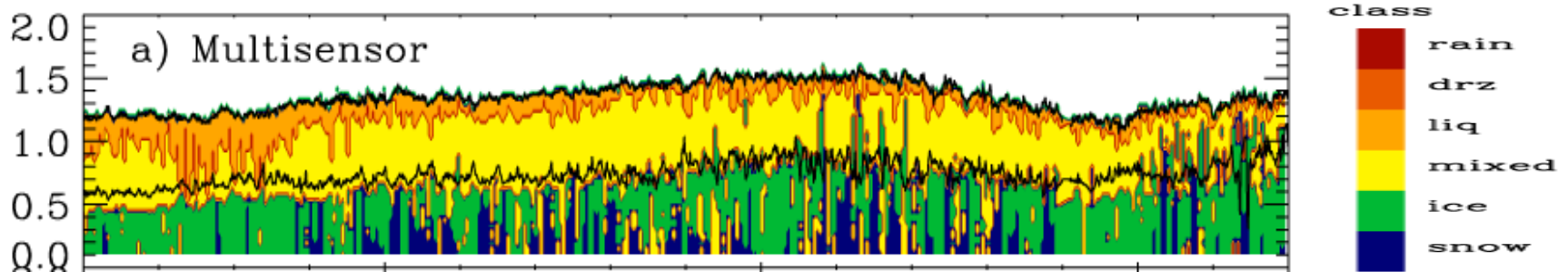
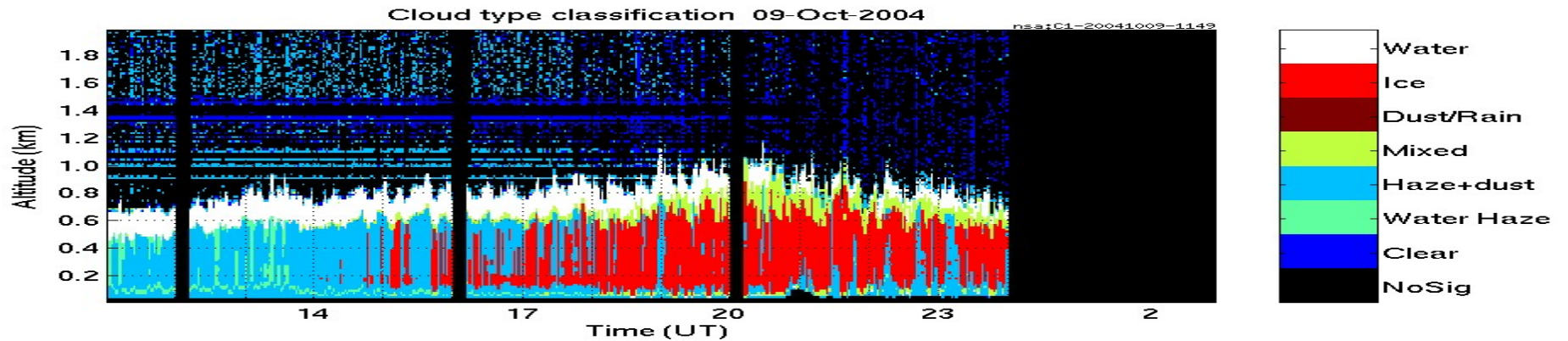
Data Examples



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Data Examples



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Data Availability

- System data is available on our group's website at: http://lidar.ssec.wisc.edu/syst/ahsrl/ahsrl_data.htm

- Archives are available "on demand", with dates, times, altitude range and plot types specified by user.

AHSRL Processed Data Retrieval

http://lidar/cgi-bin/processeddata/retrievedata.cgi

To generate a Downloadable NetCDF Dataset, select UTC time and averaging intervals for data

From: year 2007 month June day 22 hour 17 minute 25

To: year 2007 month June day 22 hour 19 minute 25

Min altitude: 0 km Time Resolution: 30 seconds/record
 Max altitude: 15 km Altitude Resolution: 30 meters/point

Continuous Time Axis
 Minimum Signal to Noise Ratio

under construction

[Documentation](#)

Select your desired datasets:

<p>Derived Quantities</p> <p><input checked="" type="checkbox"/> Particulate Backscatter Cross Section</p> <p><input checked="" type="checkbox"/> Particulate Optical Depth</p> <p><input checked="" type="checkbox"/> Particulate Depolarization</p> <p><input checked="" type="checkbox"/> Particulate Extinction Cross Section</p> <p><input checked="" type="checkbox"/> Attenuated Molecular Backscatter</p> <p><input checked="" type="checkbox"/> Error Estimates</p> <p>AERI Quantities</p> <p><input type="checkbox"/> Brightness Temperature</p> <p><input type="checkbox"/> Variability</p>	<p>Raw Data</p> <p><input checked="" type="checkbox"/> Combined Channel Counts</p> <p><input checked="" type="checkbox"/> Molecular Channel Counts</p> <p><input checked="" type="checkbox"/> Cross Polarized Channel Counts</p> <p><input checked="" type="checkbox"/> Radiosonde Profile(s)</p> <p><input checked="" type="checkbox"/> Molecular Scattering Cross Section</p> <p><input checked="" type="checkbox"/> Calibration/System Measurements</p> <p><input checked="" type="checkbox"/> Data Quality Metrics(incomplete)</p> <p>Micro-wave Radiometer Quantities</p> <p><input type="checkbox"/> Brightness Temperature</p> <p><input type="checkbox"/> Water Path</p>	<p>Radar Quantities (MMCR)</p> <p><input type="checkbox"/> Reflectivity</p> <p><input type="checkbox"/> Backscatter Cross Section</p> <p><input type="checkbox"/> Spectral Width</p> <p><input type="checkbox"/> Doppler Velocity</p> <p>HSRL/MMCR Cooperative Quantities</p> <p><input type="checkbox"/> Effective Diameter Prime</p> <p><input type="checkbox"/> Particle Measurements</p>
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BETA Submit *BETA*

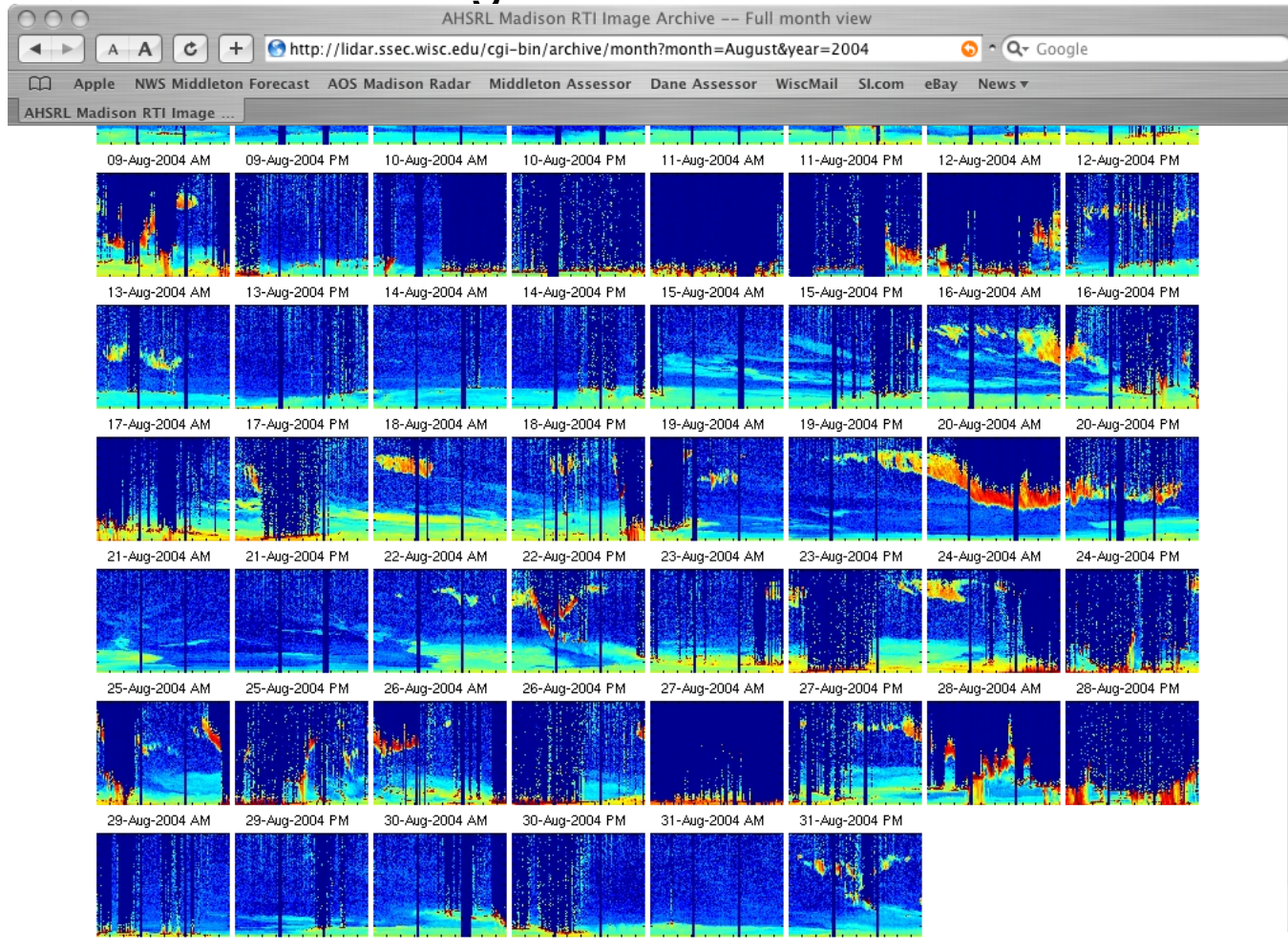
[Back to AHSRL Data homepage](#)

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Data Availability

- Long time periods can be viewed simultaneously in the form of “Quick-Look” images:



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Additional Information

- Website:
 - <http://lidar.ssec.wisc.edu>
- Contact Information
 - Edwin Eloranta
 - eloranta@lidar.ssec.wisc.edu
 - 608-262-7327



Instrument Description

- Intended for unattended use in remote locations:
 - Current System Requirements:
 - Power: 120V, 30A (uses ~25A)
 - Communication: ~16 kb/s avg. data rate (adjustable)
 - Working Space: 82” x 120” to include space for maintenance personnel (can be smaller, but inconvenient)
 - Ceiling Window:
 - Anti-reflection coated thermo-pane window
 - Heat lamp to prevent frost
 - 18” clear aperture
 - 5 degree slope to drain water
 - Flush mounted
 - Temperature: Room temperature (60-75 F, 15-24 C)

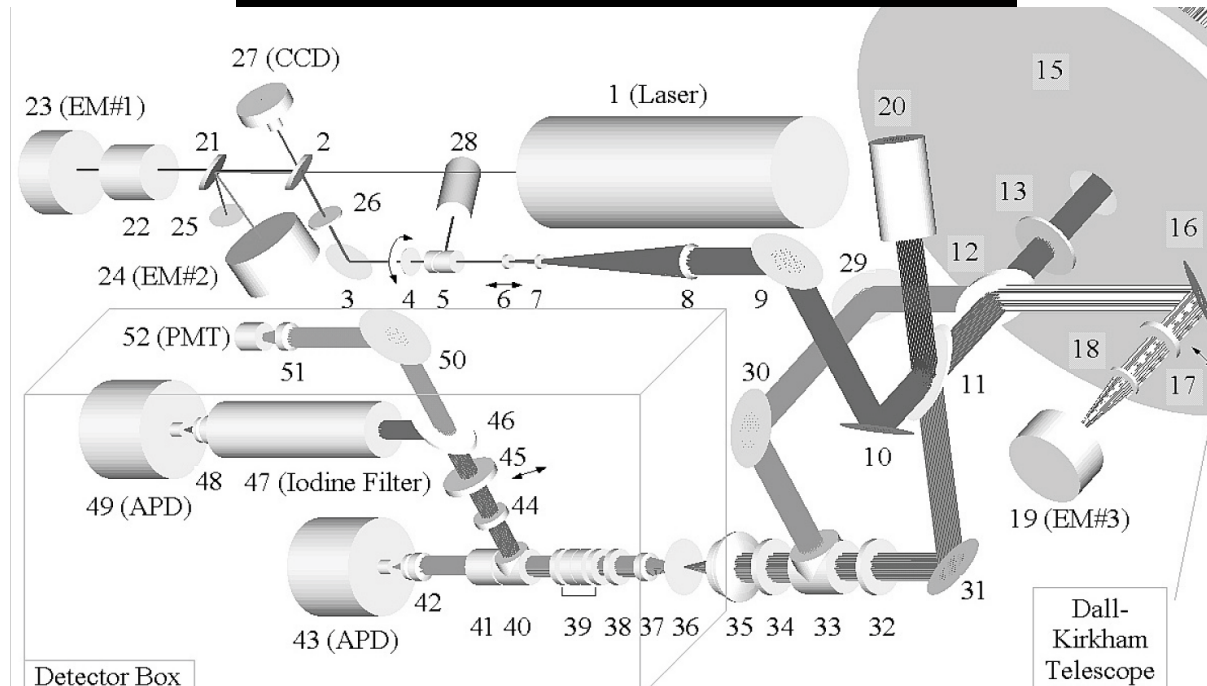


Instrument Description

- Technical Description
 - Transmitter
 - Wavelength: 532 nm (Nd:YAG)
 - Average Power: .6 W
 - Pulse Repetition Rate: 4 kHz
 - Beam Divergence: ~ 10 mrad
 - Receiver
 - Aperture: 40 cm
 - Angular Field of View: 45 mrad
 - APD (Geiger-Mode) /PMT Quantum Efficiency: 60%/5%
 - System
 - Range Resolution: 7.5 m
 - Max. time Resolution: 0.5 sec (normally 2.5 s)
 - Maximum Optical Depth: ~4
 - Observable Range: 75 m - 35 km



AHSRL Design



1 - Laser	19 - Transmitted Energy Monitor	37 - Plano-Convex Lens
2 - Wedged Beamsplitter	20 - Light Trap	38 - Interference Filter
3 - Mirror	21 - Wedge	39 - Air Spaced Etalon, 8 GHz
4 - Motorized Half-Wave Plate	22 - Calibration 4 cm Iodine Cell	40, 41 - Polarizing Beamsplitter
5 - Glan Linear Polarizer	23, 24 - Iodine Locking Energy	42 - Gradium and Meniscus Lens
6, 7, 8 - Beam Expander Lens	Monitors	43 - APD Detector (dia.=170 μ m)
9, 10 - Mirrors	25 - Mirror	44 - Balancing Half-Wave Plate
11 - Thin Film Polarizer	26 - Mirror, R = 0.5 %	45 - Insertable Calibration Filter
12 - Cross Polarized Pick-Up	27 - CCD camera	46 - Beamsplitter
13 - Quarter Wave Plate	28 - Light Trap	47 - 27 cm Long Iodine Cell
14 - Telescope Secondary Mirror	29, 30, 31 - Mirrors	48 - Gradium and Meniscus Lens
15 - Telescope Primary Mirror	32, 34 - Half-Wave Plate	49 - APD Detector (dia.=170 μ m)
16 - Black Glass Flat	33 - Polarizing Beamsplitter Cube	50 - Mirror
17 - Removable Calibration Filter	35 - Gradium and Meniscus Lens	51 - Plano-Convex Lens
18 - Plano-Convex Lens	36 - 50 micron Field Stop	52 - PMT Detector

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