

Atmospheric Emitted Radiance Interferometer (AERI)- ABB Bomem

- Measures infrared/terrestrial radiance over a wide range of wavelengths
- Houses an infrared spectrometer to monitor passive terrestrial radiation; data are consistently calibrated with onboard hot and cold blackbody targets; we use the data to retrieve boundary layer temperature and relative humidity profiles, which can help us understand the day we receive from active radar systems
- **Spectral range:** 3–20 μm (500–2000 cm^{-1} & 1800–3000 cm^{-1})
- **Website:** <http://www.abb.com/>

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Ceilometer (CL51) - Vaisala

- Measures multiple cloud base/boundary layers heights and backscatter profiles
- Emits a laser beam from the surface and measures the returned backscatter to create a vertical profile; we can use CL51 data to verify cloud heights from active radar data systems
- **Wavelength:** 910 nm
- **Website:** <http://www.vaisala.com/>

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Micro Rain-Rate Radar (MRR2)- Biral/Metek

- Measures radar reflectivity, Doppler fall-velocity, and liquid water content profiles of small (drizzle) rain droplets
- Uses a frequency-modulated continuous wave (FMCW) radar signal to estimate ranges and velocities of small rain particles; we can use MRR information to estimate above-ground rain rates and for intercomparison with other active radar systems
- **Microwave frequency:** 24 GHz (K-band)
- **Website:** <http://www.biral.com/>

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Optical Rain Gauge (ORG)- Optical Scientific

- Measures precipitation rate and totals at the surface
- This instrument uses scintillation to measure raindrops as they pass through an open-air infrared receiver and transmitter; we use the information from ORG to cross-compare with the TRG and as ground-truth to verify rainfall rates estimated by our active radar systems
- **Website:** <http://www.opticalscientific.com/>

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Scanning Microwave Radiometer (SMiR-7) - NASA/GSFC

- Measures downwelling atmospheric microwave radiance
- SMiR-7 measures at specific microwave bands to determine column-integrated water vapor, liquid and ice water in the atmosphere, as well as retrieval of water vapor profiles; these profiles help to constrain the retrieval algorithms we use to process our W-band radar data
- **Frequencies:** 20.735 ,21.485, 22.235, 22.985, 23.735, 36.5, 89.0 GHz

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Scanning W-Band Doppler Radar (T-RECS)- ProSensing

- Measures radar reflectivity and Doppler fall-velocity profiles of cloud droplets
- This active radar sends out an active pulse to scan inside clouds and determine their internal structure; we use this instrument as the foundation for cloud-aerosol interaction studies, and we can operate it alongside other active radars for intercomparison
- **Frequency:** 94 GHz (W-band)
- **Website:** <http://www.prosensing.com/>

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Tipping Bucket Rain Gauge (TRG)- Novalynx

- Measures physical precipitation totals and rain rates at the surface
- Houses a small bucket which tips whenever a predetermined amount of rain is collected; we use the TRG to cross-compare the ORG and to provide ground-truth for radar-derived rain rates
- **Website:** <http://www.novalynx.com>

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UV EZ-Lidar- Leosphere

- **Usage:** designed for aerosol and cloud detection and ranging, with depolarization
- **Wavelength:** 355 nm
- **Remarks:** used additionally for particle shape information and boundary layer height retrievals; EZ-lidar has a smaller overlap range than does MPL

Website: <http://leosphere.com/>

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Weather Transmitter (WXT520)- Vaisala

- Measures pressure, temperature, relative humidity, wind speed, wind direction and precipitation
- We can use this ancillary data to characterize the atmosphere during a campaign, where reliable meteorological measurements may not be available
- **Website:** <http://www.vaisala.com/>

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X-band Radar

- Measures radar reflectivity and Doppler fall-velocity profiles of rain drops
- This radar uses a frequency-modulated continuous-wave (FMCW) signal to determine both the range and the velocity of raindrops within clouds or near the surface. Combined with W-band and K-band radar data, we can characterize a full range of rain/cloud droplet information
- **Microwave frequency:** 10 GHz

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