Army Research Lab’s Meteorological Sensor Array, White Sands Missile Range

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20th Annual George Mason University Conference on Atmospheric Transport and Dispersion Modeling
Vision
The Nation’s Premier Laboratory for Land Forces.

Mission
DISCOVER, INNOVATE, and TRANSITION Science and Technology to ensure dominant strategic land power

Making today’s Army and the next Army obsolete
UNCLASSIFIED

The Nation’s Premier Laboratory for Land Forces

S&T Campaign Plans

Open Campus Business Model

Transformation Principles
Flow, Agility, Quality, Efficiency & Effectiveness

ATTRACT AND RETAIN BEST & BRIGHTEST
OPEN CAMPUSES
SHARED MODERN FACILITIES
INNOVATION PRACTICES

Extramural Basic Research
Human Sciences
Information Sciences
Sciences for Lethality & Protection
Sciences for Maneuver

Computational Sciences
Materials Research
Assessment and Analysis

http://www.arl.army.mil/publications

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ARL’s New Research Centers

Aberdeen Proving Ground, MD

Intelligent Systems Research Center (ALC/APG)

Center for Additive Manufacturing and Materials Processing Science

Soldier Adaptive Systems Center

High Performance Computing Center

Center for Novel Energetics Research

Adelphi, MD

Army Cyber Research Center

Intelligent Systems Research Center (APG/ALC)

Battery Materials Research Center

Network Science Research Center

Specialty Electronics Center

White Sands Missile Range, NM

Atmospheric Sciences Center

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Environmental Understanding

Basic and Applied Research

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Actionable Env. Intelligence

- **Charterization**: Develop novel sensing techniques of important environmental variables
- **Modeling**: Simulate microscale and mesoscale flow and verify with observations
- **Decision Aids**: Quantify important boundary layer processes
- **Atmospheric Boundary Layer Exploitation**: Develop new modeling algorithms and parameterizations
- **Use current and forecast information for mission planning**: Use current information to communicate tactical impacts to the soldier
- **Research environmental impacts on Army operations**: Enhance modeling capability in Army relevant settings
• Bring together government, industry, and academia to advance atmospheric science and its application to critical defense technologies through a collaborative, innovative research ecosystem.

• Primary Focus
  – Boundary Layer Processes
  – Complex and Urban Terrain

• Shared Resources
  – Meteorological Sensor Array
  – Mobile Instrumentation
  – High-performance Computing Resources
Multiple Doppler Wind Sensing LiDARs
Distributed Temperature System
Portable radiosonde
Resource Effective Bio-Identification System (REBS)
Soil and Dust particle counters
etc.
• Address Army and larger community need for reliable and persistent fine-scale observational datasets especially in areas of complex terrain.
• Verify Army meso-γ and microscale models.
• Validate systems based on environmental state information
• Develop and verify new sensing technology and strategies.
• Characterize boundary layer processes through detailed observation.
• Provide an augmentable community resource for collaborative advancement of boundary-layer meteorology.
Located on WSMR

Peak is 6200 ft MSL.

Surrounding valley ~5000 ft MSL.

Organ Mountain range to the West is 6600-7000 ft MSL.

Tularosa Basin to the east ~4000 ft MSL.

36 Towers

- 8 30-m towers
- 20 10-m towers
- 8 simplified towers for lateral boundary conditions
- 10-m tower configuration
- 2m & 10m: 3D Sonic Anemometer; Temperature
- 2m RH; pressure
- Pyranometer
- Precipitation
- Wireless connection
- For LBC tower, only sonic and temp at 10 m.
- 2m, 10m & 30m: 3D Sonic Anemometer; Temperature
- ~4m, ~29m: propeller anemometer
- 2m RH; pressure
- Wireless connection
- 10 Paroscientific nanobarometer with quad-disk pressure probe.
- 3 Halo Doppler Wind-sensing LiDAR.
- Ozone monitor
- 20 Stevens Hydra Probe for soil moisture.
- Tethered Lifting System (TLS)
- Intermet Systems portable Radiosonde system.
- DTS 2km and 4km fiberoptic temperature sensor.
- 2 Infrared cameras for surface temperature.
• Owned by USDA with NMSU collaborators.
• Relatively flat at 4400 ft MSL
• Organ Mountain range to the East is 6600-7000 ft MSL.
• 36 Towers
  – 8 30-m towers
  – 28 10-m towers
• 10-m tower configuration
• 2m & 10m: 3D Sonic Anemometer; Temperature
• 2m RH; pressure
• Pyranometer
• Precipitation
• Wireless connection
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JER: Additional Instrumentation

- Outdoor Dome camera
- 4 Battelle REBS
- 5 Grimm Aerosol Size spectrum
- 2 TSI DustTrak aerosol analyzer.
- 2 TSI NanoScan/Optical particle sizer
- Unmanned Aerial Systems (runway on site)
- Scintillometer
- Nephelometer
MSA Operations

- Set of persistent sensors that will be maintained year round
- Other instruments are available for planned campaigns
- All towers powered by solar panels
- Additional equipment, such as LiDARs will use generators or tie in to power lines if available.
- Wireless connections back to the data center at WSMR
- Excess capacity in both power and wireless bandwidth
- Possible to install additional data logging ports
- Working to get data hosted by NCAR
A Few Currently Planned Experiments

Mineral Hill

- Mountainous Slope Transport and Diffusion– MASTODON (with Teachnion-Israel Inst. Tech. and Notre Dame)

- Slope flow transitions (with Univ. Utah)

JER

- Turbulence measurements using coordinated doppler LiDARs (with Notre Dame)

- Acoustic tomography (internal)