

Division of Atmospheric Sciences

Winter 2012



Daniel Obrist installing sampling filters and lines for measurement of ambient atmospheric mercury concentrations.



Vic Etyemezian inspecting a sampler in Albuquerque, NM



David Simeral taking snow samples looking for traces of the silver (seeding agent) in the Snow Range, WY.

DRI's Division of Atmospheric Sciences (DAS) conducts fundamental and applied research into the natural atmosphere on a wide range of topics including air quality, cloud and aerosol physics, climate, fire weather, and atmospheric dynamics. This work is conducted in Nevada and around the world in response to the needs of public and private organizations. This research is supported by the development of instrumentation and techniques for ground-based, aircraft, and satellite observational programs. Inorganic and organic chemistry laboratories provide trace analysis of atmospheric pollutants, supporting assessments of human impacts on air quality.

DAS has extensive capabilities in numerical modeling of atmospheric and air pollution processes. This supports basic and applied research in meteorology, atmospheric dynamics, aerosol formation, precipitation processes, atmospheric chemistry, visibility assessments, urban air quality, and transport of pollutants in complex terrain.

The Division includes approximately 55 research faculty, along with a comparable number of technologists, graduate students, and support staff. These personnel operate primarily from office and laboratory facilities in Reno and Las Vegas, Nevada. An additional facility, the Storm Peak Laboratory, is located at Steamboat Springs, Colorado. DAS's research portfolio consists of over 100 active projects, having a total value of approximately \$25 million. Most research funding is obtained from grants and contracts – from a wide variety of federal, state, and local governmental agencies, as well as private industry, universities and foundations.

DAS is home of the Western Regional Climate Center, one of six National Oceanic and Atmospheric Administration – supported regional centers that comprise a climate-services network serving the entire United States. The Climate Center provides data and information products tailored to the individual needs of a wide variety of federal agencies, regional organizations, state and local bodies, and the private sector.

As part of the Nevada System of Higher Education, DAS faculty administer and teach the Atmospheric Sciences Graduate Program, which resides within the Physics Department at the University of Nevada, Reno. Students conduct their research under the supervision of DAS faculty, while working towards an M.S. or Ph.D. degree. Additional graduate program materials are available at: <http://unr.edu/interdis/atms/>

Facilities and Capabilities:

Field Study Design and Coordination

- Air quality program design.
- Quality control/quality assurance.
- Data compilation, validation, analysis and reporting.

Ambient Air Quality Monitoring for Criteria and Toxic Pollutants

- Automated filter-based samplers for size-resolved aerosol and gas sampling.
- Continuous aerosol mass, size distribution, light absorption, light scattering, light extinction and chemical analysis.
- Continuous meteorological parameters (temp., pressure, relative humidity, and wind speed, direction, and flux).
- Personal exposure to pollutants.



John Watson taking data in the Aerosol Research Laboratory



Kent Hoekman in the Renewable Energy Laboratory



Randy Borys and graduate student deicing a cloud probe on the roof of the Storm Peak Laboratory building.

Pollutant Emissions Characterization

- Real-time and remote sensing of motor vehicle emissions.
- Dilution chamber sampling of stationary source emissions.
- Sampling of fugitive and area source emissions.
- Development of emission factors and inventories for air quality modeling.

Chemical Laboratory Analysis

- Inorganic analysis of aerosol mass, filter densitometry, ions, elemental and organic carbon, major and trace elements, and inorganic gases (sulfur dioxide, nitric acid, ammonia).
- Detailed organic analysis for volatile, semi-volatile, and particulate hydrocarbons, polycyclic aromatic hydrocarbons (PAH), nitro- and oxy- PAH, polar organic compounds, and carbonyls.

Basic Meteorological Measurements

- Surface, column (balloon) and aircraft measurements of atmospheric motion and thermodynamic parameters.
- 3-dimensional flows, cloud and precipitation fields by radar.

Aerosol, Clouds and Precipitation Measurements

- Particle size distributions with in-situ microphysical probes, balloon and aircraft mounted video meters.
- Cloud condensation nuclei (CCN).
- Cold and warm cloud droplet, rain and snow chemistry.
- Cloud radiative properties from satellite retrieval and radar measurements.
- Column water vapor concentration using radiometer.

Numerical Modeling of Atmospheric Processes

- Regional scale atmospheric models for studies of airflow, cloud and precipitation formation, and pollutant transport in complex terrain.
- Coupling of atmospheric and hydrologic models.
- Source apportionment and dispersion modeling for air quality issues.
- Photochemical modeling for air quality and global atmospheric chemistry.
- Light extinction modeling for air quality issues and cloud and aerosol radiative properties.

Satellite Meteorology

- Use of satellite radiances to infer atmospheric structure, e.g., temperature, cloud properties, and particle size distribution.
- Development of software to infer cirrus cloud size distributions from satellite radiances.

Weather Modification

- Cloud seeding for snowfall enhancement.
- Chemical analysis of snow.

Climate Information Services

- Provide climate information to public and private clients.
- Archive climate data for the western U.S.
- Utilize data to explore climate variability issues (e.g., El Niño) and natural resource management.
- Wind energy resource mapping.

Climate Change

- Historical climate trends.
- Regional climate modeling.

Wildfire Applications

- Operational decision support tools.
- Wildfire visualization.
- Climate and weather applications.

Renewable Energy Research

- Assessment of renewable energy resources.
- Biomass and biofuels.
- Integrated energy systems.

Other Capabilities

- Development of scientific instruments.
- Engineering support (mechanical, electrical and computer)
- Advice on regulatory issues (NAAQS, SIPs, regional haze, emissions standards, etc.).
- Education/technical training and Computational resources.

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