

Storm Peak Lab Cloud Property Validation Experiment (STORMVEX)

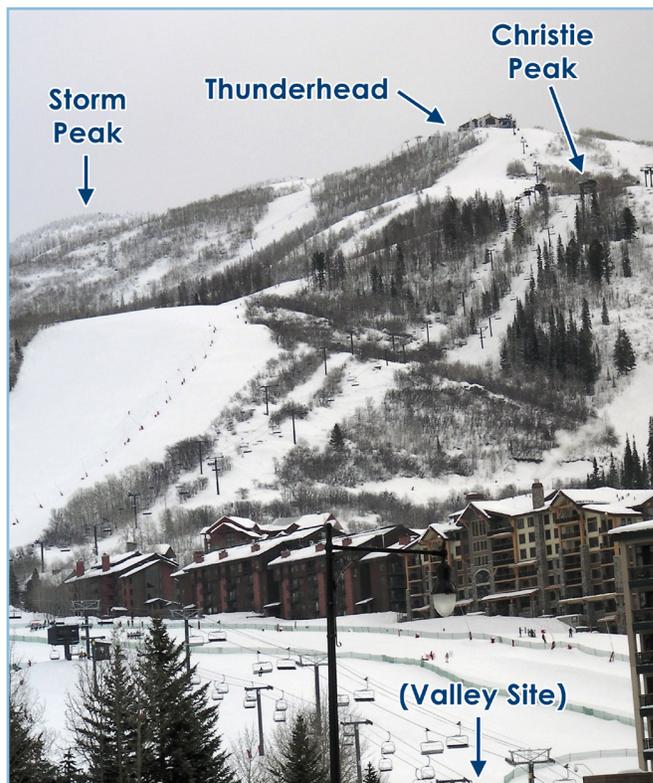
Operated by the Atmospheric Radiation Measurement (ARM) Climate Research Facility for the U.S. Department of Energy, the second ARM Mobile Facility (AMF2) begins its inaugural deployment November 2010 in Steamboat Springs, Colorado, for the **Storm Peak Lab Cloud Property Validation Experiment, or STORMVEX**. For six months, the comprehensive suite of AMF2 instruments will obtain measurements of cloud and aerosol properties at various sites below the heavily instrumented Storm Peak Lab, located on Mount Werner at an elevation of 3220 meters.

The correlative data sets that will be created from AMF2 and Storm Peak Lab will equate to between 200 and 300 in situ aircraft flight hours in liquid, mixed phase, and precipitating cloud systems. These data sets are very important for improving the way these clouds types are incorporated into computer models of the Earth's climate system, called climate models. Measurements of the aerosol properties, such as size and density, will also be obtained for future studies of aerosol-cloud interactions and how they affect the climate system.

Science Objectives and Significance

To improve climate models, scientists must convert measurements of cloud properties from ground-based instruments into mathematical formulas—called retrieval algorithms. The precision of this conversion process has been hampered by a critical shortage of correlative data for validating and developing new retrieval algorithms. Such correlative data sets are typically gained through episodic and expensive aircraft operations over the course of several years. The six-month field deployment of the AMF2 in collaboration with Storm Peak Lab represents a cost-effective approach for obtaining the needed and detailed data sets.

A primary objective of STORMVEX is to obtain the desired data of cloud properties by situating AMF2 instruments at **Thunderhead Lodge**, at an elevation of 2760 meters—a few kilometers upwind of Storm Peak Lab. A secondary objective is to locate the AMF2 aerosol observing system at **Christie Peak** to obtain a comprehensive data set to help characterize the role of aerosols, both natural and manmade, in cloud and precipitation processes.



Additional AMF2 instruments located on the **valley floor**, combined with local surface meteorological observations at several points on the mountain, will enable investigation of the effects of complex terrain on the physical processes that generate clouds and precipitation and provide valuable information for improving the representation of clouds in global climate models.

Collaborations

Storm Peak Lab, managed by the Desert Research Institute, will be augmented with guest instrumentation from Stratton Park Engineering Corporation (SPEC). Staffing support by SPEC and Storm Peak Lab will be provided to assist AMF operations throughout the campaign. Research support for STORMVEX comes from several universities with a wide array of external funding.

An ancillary study, the Colorado Airborne Multi-Phase Cloud Study (CAMPS), will be conducted by the University of Wyoming King Air research aircraft with funding from the National Science Foundation. CAMPS will provide an additional comparison data set of the upper regions of clouds and help document the role of local topography in the variation of clouds and precipitation.

ARM Mobile Facility

Each mobile facility consists of operations shelters, instrumentation, and data and communications systems for climate studies. The AMF2 also provides ocean meteorology and sea state instrumentation to support shipborne deployments. Trained onsite operators monitor and maintain the facility to assure that the best and most complete data set is acquired during each deployment. Data are collected 24/7.

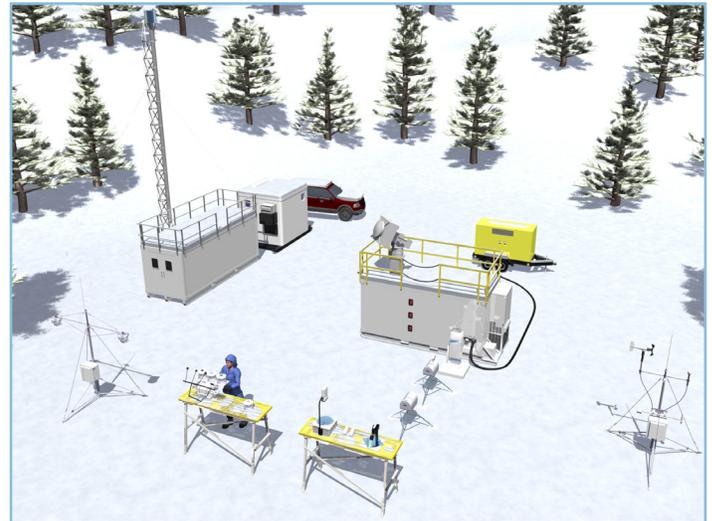
Operations Shelters

Shipping containers serve as operations shelters, hosting a number of instruments and data systems. They also provide working space for onsite personnel and spare parts storage. Other instruments are contained in individual modules with integrated data systems.

Measurement Capabilities

Measurement capabilities include the standard meteorological instrumentation, broadband and spectral radiometer suite, and remote sensing instruments. Additional instruments for measuring ocean meteorology, sea state, bulk aerodynamic fluxes, and ship disposition are available for shipborne deployments.

- W-band Scanning ARM Cloud Radar
- High Spectral Resolution Lidar
- Micropulse Lidar and Laser Ceilometer
- X- and Ka-band Scanning ARM Cloud Radar
- Microwave Radiometer
- Atmospheric Emitted Radiance Interferometer
- Multifilter Rotating Shadowband Radiometer
- Sky Radiation System – a collection of radiometers to measure visible diffuse, global, and direct visible and infrared solar radiation
- Ground Radiation System – a collection of radiometers to measure visible and infrared radiation coming from the ground
- Balloon-Borne Sounding System – sondes launched each day at regular intervals
- Radar Wind Profiler
- Total Sky Imager
- Aerosol Observing System
- Surface Meteorology Station



Data and Communication System

Continuous measurements obtained by the sensors and instruments are collected by integrated data systems. These data are routinely checked for quality and transmitted to the ARM Data Archive for storage and availability to the scientific community.

Using an ARM Mobile Facility

Both AMFs are available to collaborate with experiments (especially those involving aircraft) from other agencies. They can accommodate instruments in addition to, or in place of, the baseline collection. Scientific organizations interested in using an AMF are encouraged to submit proposals at the following website: www.arm.gov/campaigns/propose.

Sponsor

The AMFs were developed through funding from the DOE Office of Science, Office of Biological and Environmental Research. Numerous national laboratories are responsible for the science, engineering, and operation of the AMFs, which are managed by the ARM Climate Research Facility.

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DOE/SC-ARM-10-024



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