Southern Great Plains Newsletter

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ARM Mobile Facility Will Explore New Locales

For some time, scientists have wanted to expand the reach of the ARM Program to additional locales around the world. Now, researchers are developing the ARM Mobile Facility (AMF), an array of instruments in a pair of movable shelters. The portable AMF will complement the more permanent ARM Climate Research Facility (ACRF) sites at the Southern Great Plains (SGP), the Tropical Western Pacific (TWP), and the North Slope of Alaska (NSA), making similar measurements in important but rarely studied climates and locales. Researchers will use the more complete data sets generated to accelerate the improvement of global climate models.

To improve cloud-sunlight interactions simulated by global climate models, researchers need data from all types of climates and subclimates. Data from all around the globe will increase the accuracy of model results and make the models more realistic. Researchers need to test and improve cloud parameterizations used in global climate models to make more useful climate predictions.

Design and engineering for the AMF began in the summer of 2002 with input and collaboration from ARM engineers and scientists. The AMF design process, led by ARM Chief Engineer Kevin Widener, began in December 2000. A design review was held in December 2002, and Widener presented AMF plans at the 2003 ARM Science Team Meeting. Development work began in earnest in October 2003, when funding became available though the newly designated ACRF.

The AMF will house the following baseline set of instruments: (1) a balloon-borne sounding system (weather balloons) for vertical measurements of atmospheric state variables such as temperature, humidity, pressure, and winds; (2) a microwave radiometer profiler to measure temperature, water vapor, and liquid water content; (3) a W-band cloud radar, a microwave radiometer, a micropulse lidar, a Vaisala ceilometer, and a total-sky imager for cloud measurements; (4) an array of photometric instrumentation, such as broadband and spectral radiometers, to measure solar radiation; (5) surface meteorology stations for standard weather measurements on the ground; and (6) an eddy

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correlation flux system to measure surface energy fluxes. These instruments will mirror the sets at the fixed ACRF sites.

In addition to being portable, the AMF will provide flexibility in instrument selection. The facility can be custom equipped to meet the needs of various experiments, the location being investigated, or the research direction.

The AMF communications system will transfer data files from the AMF's integrated data collection systems to the ARM data

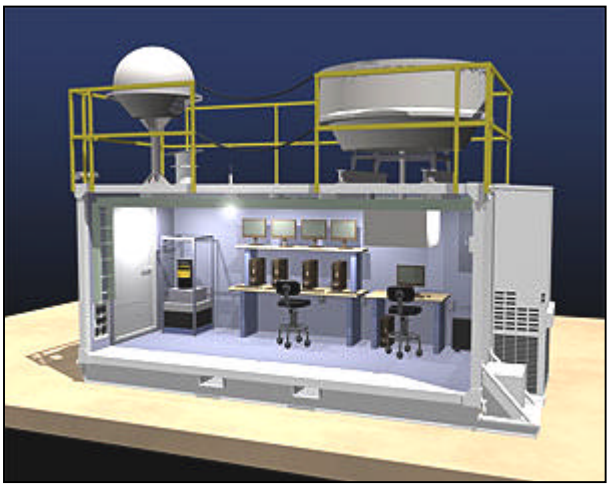

Figure 1. An artist's rendering of the new ARM Mobile Facility (ARM graphic).

processing center. Researchers will have the same online access to AMF data as to data from the fixed sites.

The shelters housing the AMF instrument controls have been designed to withstand a variety of environments, from arctic cold to tropical heat. The AMF will be used in a variety of climates in which little, if any, information has been collected previously for global science studies. Phenomena that might be explored include anthropogenic pollution, complex topography, deserts, extensive snow and ice sheets, marine stratus and stratocumulus clouds, monsoon climates, and tropical forests. Such phenomena influence climate in unique ways, but most have not been the subject of extensive data collection of the type that ARM requires to improve climate modeling. Potential deployment sites include the Amazon, the Arctic/Antarctic, Asia, Australia, continental North America, Europe, islands, and transoceanic ships.

The first phase of AMF development began in January 2004 and is scheduled for completion in November 2004. Instruments are being integrated with the data management and communications systems and configured in the portable shelters. The second phase will see integration of more complex instrumentation that requires additional time and effort.

Field testing of the AMF will take place at Pacific Northwest National Laboratory in Richland, Washington, in December 2004–February 2005. Once testing is complete and any problems have been corrected, the AMF will be launched in its first field deployment in Monterey, California in March–December 2005. The initial deployment will focus on collecting data on the microphysical characteristics of marine stratus clouds, particularly marine stratus drizzle processes. Very few actual measurements of these microphysical processes exist, despite an extensive body of computer modeling studies. The lack of global-scale quantitative data for comparison with model predictions has limited research progress in this area during the past decade.

The AMF's flexibility in moving instruments, especially to remote locations, is a great advantage.

Installation of more permanent sites takes more time, effort, and financial support. By saving costs and enabling faster deployment and more rapid data availability, the AMF will give researchers in the global climate community a measurement capability free from many limitations of past installations. Combined with the vast quantity of long-term data from the fixed ACRF sites in the SGP, the TWP, and the NSA, the focused AMF data sets from selected crucial locations will spur progress toward the ARM goal of developing reliable models for simulating climate change.

Climate Capsule

"Climate Capsule" is a new monthly feature introducing climate and weather definitions.

Greenhouse Gas

: a gas in the atmosphere that is more transparent to short-wavelength radiation (mostly visible light) from the sun than to long-wavelength radiation (infrared radiation) leaving Earth. Such gases reemit trapped energy, partly toward Earth's surface. Examples are carbon dioxide, methane, chlorofluorocarbons, and nitrous oxides.