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Sandia researcher Mark Ivey spends a week in Africa on site survey for climate monitoring equipment

After a six-month stint taking cloud and aerosol measurements at Point Reyes National Seashore on the California coast, a mobile suite of climate monitoring equipment was moved to Niamey, Niger, in October for a year's deployment there.

Going along to help survey the site and prepare for the deployment of the climate monitoring equipment was Sandia National Laboratories engineer Mark Ivey, who spent a week in the West African country. Sandia is a National Nuclear Security Administration lab.

ARM - for Atmospheric Radiation Measurement - is the largest global climate change research program supported by the U.S. Department of Energy (DOE). It was created in 1989 as part of the Global Change Research Program to help resolve scientific uncertainties related to global change, focusing on the role of clouds. ARM has three permanent research sites around the globe, plus the ARM Mobile Facility (AMF) that recently was deployed to Niger.

"This is the mobile unit's second deployment," Ivey says. "For the next year, the ARM Mobile Facility will be measuring cloud properties, solar and thermal radiation, and meteorological conditions at the surface."

He adds that a multi-national experiment is investigating how mineral dust from the Sahara and biomass burning play a role in the West African monsoon and the climate in general. The belief is that these aerosols, as well as deep tropical convection in the sub-Saharan wet season, have a big impact on climate in that region, and possibly well beyond Africa.

"This experiment will help us better understand how solar and thermal radiation are transferred in the atmosphere when deep convection and aerosols are present," Ivey says.

While the mobile unit will be taking climate measurements on the ground, a European satellite positioned over the Sahara will be taking them from the sky. The combined measurements will provide the first well-sampled, direct estimates of changes of solar and thermal radiation across the atmosphere. The mobile unit will also be used to study the impact of clouds, aerosol, and water vapor on the surface.

Niger is one of the hottest countries in the world, with heat so intense that it often causes rain to evaporate before it hits the ground. Ivey calls the Sahara "the biggest dust aerosol generator on the planet."

Teams from the participating organizations will be spending time at the research site on a rotating basis. A program technician will be there for more than a year to take care of the equipment and work with local meteorological observers.

Ivey, a member of the first rotation team, arrived in Niamey, Niger's capital, on Oct. 11, three days after a chartered 747 jumbo jet carrying the equipment landed at the airport. The AMF equipment includes seven containers, each 8 feet tall, 8 feet wide, between 12 and 20 feet long, and 5,000-10,000 pounds. One extra container with equipment will arrive in January. A separate container for batteries and other types of potentially hazardous materials was shipped from California to Niger, taking 12 weeks to get there by sea.

The mobile unit has its own power generation, communication system, and state-of-the-art climate measurement instrumentation.

Ivey worked closely with colleagues at Los Alamos National Laboratory in planning the Niger deployment. His involvement in the ARM Program dates back to the late 1990s when he led a team at Sandia that designed, built, and integrated ARCS - Atmospheric Radiation and Cloud Stations. The ARCS systems are still used at the Tropical Western Pacific ARM sites, and two ARCS vans were included in the AMF deployment in Niger.

Among Ivey's responsibilities as part of the first working team at the Niger sites was the on-site electrical engineering expertise required to install and operate the Mobile Facility. The U.S. Embassy in Niamey assisted with obtaining the formal procurement contracts required for local communications, utility, and meteorological support services.

ARM players

The Atmospheric Radiation Measurement (ARM) Mobile Unit is part of the African Monsoon Multidisciplinary Analysis (AMMA) research program that is scheduled to be in Niger for seven years. However, the ARM unit will be there only one year to support a Department of Energy-funded experiment called RADAGAST, short for Radiative Atmospheric Divergence using the ARM Mobile Facility, GERB Data, and AMMA Stations.

The principal investigator for RADAGAST is Anthony Slingo from the University of Reading in the UK. The ARM team includes science colleagues from DOE national laboratories Sandia, Los Alamos, Pacific Northwest (PNNL), Argonne, and Brookhaven; the Australian Bureau of Meteorology; and several other countries. PNNL initially designed and built the mobile unit, then turned the completed unit over to LANL for deployment. Sandia is handling engineering issues related to operations. The ARM program is funded through DOE's Office of Science.

ARM facilities

The DOE Atmospheric Radiation Measurement (ARM) Program established permanent instrumented research sites at three locales around the world for studying cloud formation and their influence on climate. Recently designated as "user facilities" by DOE, the ARM Climate Research Facility is now available to visiting scientists for experimentation.

The three regional sites include the Southern Great Plains site near the Oklahoma/Kansas border; the Tropical Western Pacific locale consisting of sites at Darwin, Australia, Manus Island, Papua New Guinea, and Nauru Island; and the North Slope of Alaska sites at Barrow and Atkasuk.

There is no fee for scientists using the facilities or data. However, to qualify for ARM funding for any incremental costs associated with an experiment, they must submit proposals to the ACRF Science Board, which reviews the proposals based on scientific merit and the feasibility and costs associated with using the facility. The board then provides recommendations to DOE for a final decision.

Chris Burroughs | Source: EurekAlert!

Further information: www.sandia.gov

www.sandia.gov/news-center/news-releases/2005/environ-waste-mgmt/arm.html