

ARM Madden-Julian Oscillation Investigation Experiment

From October 2011 through March 2012, the Atmospheric Radiation Measurement (ARM) Climate Research Facility will obtain data at two locations in the tropics for the ARM Madden-Julian Oscillation Investigation Experiment, or AMIE. The second ARM Mobile Facility (AMF2) will be located on Gan Island in the Maldives, measuring the Madden-Julian Oscillation (MJO) as it begins and propagates eastward. Instruments at ARM's permanent research site on Manus Island in Papua New Guinea will obtain additional measurements of the MJO as it begins to strengthen after passing through the Maritime Continent area of southeast Asia.

Tropical convection plays an important role in the MJO. In the tropics, atmospheric convection creates a pattern of warm air rising, often with clouds forming, and cool air sinking. It is one of the prime methods of transporting solar energy from the equator to the polar regions, and it causes the daily rainstorms common in regions located around the equator. The two AMIE campaigns, along with other related collaborative campaigns, will produce a data set that scientists can use to better understand the physical mechanisms behind the MJO and improve the climate models that simulate its effect on global climate.

Scientific Objective

The Madden-Julian Oscillation (MJO) is a 30–60 day wave that propagates eastward. In the western Pacific, an MJO cycle includes a convectively active phase with widespread maritime



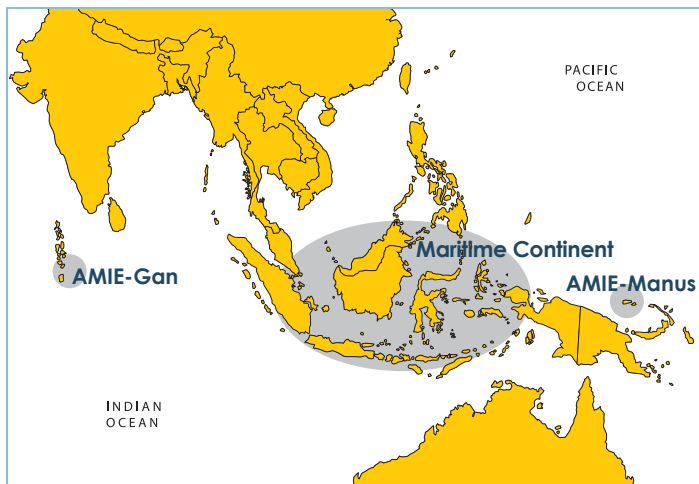
convection, increased precipitation, and very cloudy conditions, and a suppressed phase with reduced convective activity and less precipitation.

The MJO dominates tropical intraseasonal variability, but climate models have difficulty predicting its occurrence, as well as its effects and its interactions with regional monsoons and El Niño. ARM's unique instrumentation, including newly acquired and installed 3D cloud and precipitation radars, will allow studies of the initiation, propagation, and evolution of convective clouds within the framework of the MJO.

Collaborators

AMIE, sponsored by the U.S. Department of Energy, is taking place in conjunction with the Dynamics of the Madden-Julian Oscillation (DYNAMO) and Cooperative Indian Ocean experiment in intraseasonal variability in the Year 2011 (CINDY2011) campaigns. Key collaborators include:

- Maldivian Meteorological Service
- National Science Foundation/National Center for Atmospheric Research
- Office of Naval Research
- National Oceanic and Atmospheric Administration
- National Aeronautics and Space Administration
- Japan Agency for Marine-Earth Science and Technology
- Indian National Institute of Oceanography



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 web page: 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-11-020



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