MAGIC: Marine ARM GPCI Investigations of Clouds

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HORIZON LINES

ARM
CLIMATE RESEARCH FACILITY

Why, When, and Where?

Low marine boundary layer clouds over the ocean exert a large influence on Earth's climate through reflection of sunlight and mediating interactions between air and sea.

These clouds are a challenge to global climate models (computer codes that attempt to describe and predict the climate), which have difficulty in accurately representing them and the transitions among their different types (stratocumulus, cumulus, etc.).

MAGIC will study these clouds by deploying radars and other scientific instrumentation on the Horizon container ship *Spirit* making regular transects between Los Angeles and Hawaii from October, 2012 to September, 2013.

The primary objective is to improve the representation of the stratocumulus-to-cumulus transition, an ever-present phenomenon along this particular transect, in climate models.

ARM's Marine Mobile Facility

The Atmospheric Radiation Measurement (ARM) Program (http://www.arm.gov/) of the U. S. Department of Energy was created in 1989 "to study cloud formation processes and their influence on radiative transfer."
(*"Radiation" in the present context refers to infra-red, visible, and ultra-violet light, and not in any way to radioactivity.*)

ARM manages three fixed study sites, two mobile facilities, an aircraft facility, and a data archive, and it funds climate research and supports field programs around the world.

The second ARM Mobile Facility (AMF2), consisting of three 20-foot modified "SeaTainers" & other smaller modules containing radars & other instruments, was designed for marine use.
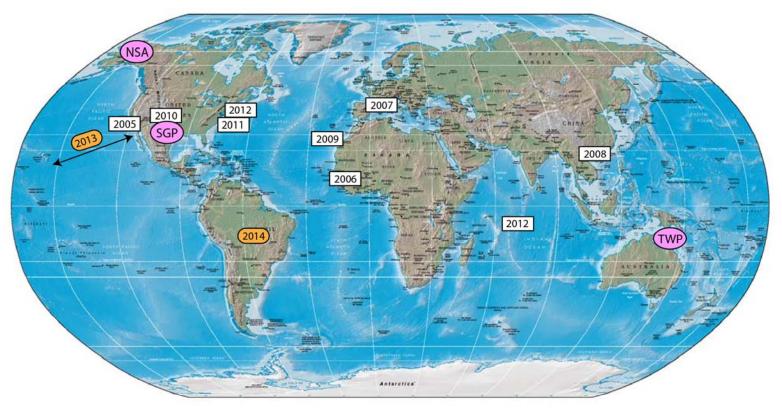

AMF2 radar SeaTainer

AMF2 aerosol SeaTainer

Module

Previous and Upcoming Mobile Facility Deployments

ARM Fixed Sites

SGP: Southern Great Plains (OK)
NSA: North Slope of Alaska
TWP: Tropical Western Pacific

ARM Mobile Facility (AMF) Deployments

2005 Point Reyes, CA
2006 Niamey, Niger
2007 Black Forest, Germany
2008 Shouxian, China
2009 Graciosa Island, Azores
2010 Steamboat Springs, CO
2011 Long Island, NY
2012 Gan Island, Maldives
2012 Cape Cod, MA

Upcoming

2013 Eastern North Pacific
2014 Amazon, Brazil

Deployment Will Be on the Horizon *Spirit*

The *Spirit* is 272 m long and 30 m wide, with a maximum speed of ~20 knots.

It makes the round trip from Los Angeles to Hawaii (4100 km) every two weeks.

Instruments would operate continuously and would be accompanied by two technicians.

Horizon Lines, the largest container shipping company operating under the Jones Act, accounts for 37% of total U.S. marine container shipments from the continental U.S. to Alaska, Puerto Rico, and Hawaii.

WE THANK HORIZON LINES AND THE CAPTAIN AND CREW OF THE HORIZON SPIRIT FOR THEIR ENCOURAGEMENT AND SUPPORT OF THIS ENDEAVOR!

Model Intercomparisons Are Interested in MAGIC

GPCI, the GCSS Pacific Cross-section Intercomparison (GCSS: GEWEX Cloud Systems Study; GEWEX: Global Energy and Water Cycle Experiment, a core project of the World Climate Research Programme) used a transect near the route taken by the *Spirit*.

Along this GPCI transect, cloud type and cover vary from low stratocumulus with high coverage near Los Angeles to puffy cumulus with low coverage near Hawaii.

EUCLIPSE, the European Union Cloud Intercomparison, Process Study & Evaluation Project (a collaborative effort of 12 institutes in Europe) also uses the GPCI transect.

CGILS: the CFMIP- GCSS Intercomparison of Large Eddy Models and Single Column Models compares results at locations S6, S11, and S12 along the GPCI transect.

Average low-level cloud cover