MAGIC: Marine ARM GPCI Investigations of Clouds

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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.
Previous and Upcoming Mobile Facility Deployments

ARM Fixed Sites

- SGP: Southern Great Plains (OK)
- NSA: North Slope of Alaska
- IWP: 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.