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MAGIC - MARINE ARM GPCI INVESTIGATION OF CLOUDS

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ABSTRACT

MAGIC, the Marine ARM (Atmospheric Radiation Measurement program) GPCI Investigation of Clouds, will deploy the Second ARM Mobile Facility (AMF2) aboard the Horizon Lines cargo container ship M/V Spirit traversing the route between Los Angeles, CA and Honolulu, HI from October, 2012 through September, 2013 (except from a few months in the middle of this time period when the ship will be in dry dock). During this time AMF2 will observe and characterize the properties of clouds and precipitation, aerosols, and atmospheric radiation; standard meteorological and oceanographic variables; and atmospheric structure. There will also be Intensive Observational Periods (IOPs), one in January, 2013 and one in July, 2013 during which more detailed measurements of the atmospheric structure will be made.

Clouds remain a major source of uncertainty in climate projections. In this context, subtropical marine boundary layer (MBL) clouds play a key role in cloud-climate feedbacks that are not well understood yet play a large role in biases both in seasonal coupled model forecasts and annual mean climate forecasts. In particular, current climate models do not accurately represent the transition from the stratocumulus (Sc) regime, with its high albedo and large impact on the global radiative balance of Earth, to shallow trade-wind cumulus (Cu), which play a fundamental role in global surface evaporation and also albedo. Climate models do not yet adequately parameterize the small-scale physical processes associated with turbulence, convection, and radiation in these clouds. Part of this inability results from lack of accurate data on these clouds and the conditions responsible for their properties, including aerosol properties, radiation, and atmospheric and oceanographic conditions.

The primary objectives of MAGIC are to improve the representation of the Sc-to-Cu transition in climate models by characterizing the essential properties of this transition, and to produce the observed statistics of these Sc-to-Cu characteristics for the deployment period along the transect. This first marine deployment of AMF2 will yield an unparalleled and extremely rich data set that will greatly enhance the ability to understand and parameterize clouds and precipitation, aerosols, and radiation and the interactions among them; the processes that determine their properties; and factors that control these processes. Deployment of AMF2 on a ship that routinely traverses this route will provide a long-term data set over a vast cloud region which is of intense interest to climate modelers. Specifically, the proposed transect lies closely along the cross section used for the GPCI, and the data collected will provide constraint, validation, and support for this modeling effort, and for associated modeling efforts such as the CGILS and EUCLIPSE.

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