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MAGIC – ARM'S FIRST SHIPBOARD DEPLOYMENT

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ABSTRACT

The MAGIC project involves deployment of the Second ARM Mobile Facility AMF2 aboard a Horizon Lines cargo ship traversing a route between Los Angeles and Hawaii over a full year starting in October, 2012 to measure properties of clouds and precipitation, aerosols, and atmospheric radiation. MAGIC is the first true marine deployment of AMF2 and is a unique collaboration between ARM and Horizon Lines, LLC, the largest container shipping company operating under the Jones Act. The transect between Los Angeles and Hawaii is very near the line used by several modeling intercomparisons, specifically GPCI, EUCLIPSE, and CGILS. Along this transect cloud properties change from a low stratocumulus deck with high aerial coverage near the west coast of the U.S. to high puffy cumulus with low aerial coverage near Hawaii (Fig. 1), with important consequences for Earth's climate and energy budget. Climate models have a difficult time in accurately representing this transition. By collecting data over a full seasonal cycle, MAGIC will provide validation for these modeling efforts and aid in understanding and representing this transition. The principal objectives of MAGIC are to improve the transition 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 corresponding to the deployment period along these transects. To realize these objectives, MAGIC will measure properties of clouds and precipitation (specifically cloud type, fractional coverage, base height, physical thickness, liquid water path, optical depth, and drizzle and precipitation frequency, amount, and extent), atmospheric conditions (specifically temperature, relative humidity, wind speed and direction, and the vertical profiles of these quantities) and oceanic conditions (specifically sea state and sea surface temperature and salinity), properties of aerosols (specifically size distribution, light-scattering behavior, hygroscopic behavior, cloud condensation nuclei behavior, and composition), and spectral and broadband shortwave and longwave radiation and their interaction with clouds and aerosols (specifically broadband and narrow-channel direct and diffuse fluxes; downwelling and upwelling spectral radiances; and cloud and aerosol spectral optical thicknesses).