

DRIZZLE VARIABILITY IN MARINE STRATOCUMULUS IN THE AZORES

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ABSTRACT

The U.S. Department of Energy Atmospheric Radiation Measurement (ARM) Mobile Facility (AMF) has been operating at Graciosa Island in the Azores since May 2009 as part of a 21 month field campaign to study marine stratus clouds. The AMF instrumentation suite and location provide a unique opportunity to observe the properties of marine stratocumulus clouds, utilizing a variety of active and passive remote sensors, including a 95 GHz cloud radar, ceilometer, and microwave radiometer. Drawing from twenty different case days from four seasons, we apply a novel technique that decomposes cloud radar Doppler spectra into separate cloud and drizzle constituents. Using the decomposed radar observations, the temporal and spatial variability, both horizontal and vertical, of intra-cloud drizzle particle size distributions (PSD -- total number concentration, characteristic size and spread) are described. The variability of the drizzle PSD parameters is classified according to a number of controlling factors including cloud thickness, liquid water content, turbulence, time of day, and the mesoscale environment. Evidence suggests that drizzle is omnipresent in marine stratus clouds. Furthermore, our observations demonstrate that conventional radar-based approaches to detecting and characterizing drizzle are challenged.