UNIVERSITY of HAWAI'I MĀNOA

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M.S. Defense Announcement

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SCHOOL OF OCEAN AND EARTH SCIENCE AND TECHNOLOGY

M.S. Defense Title:

CHARACTERIZATION OF MARINE STRATOCUMULUS CLOUDS AND AEROSOL-CLOUD INTERACTIONS DURING ORACLES

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Date: **Monday, July 23, 2018**
Time: **9:00am**
Location: **Hawaii Institute of Geophysics Building, HIG 309**

Abstract:

ORACLES (ObseRvations of Aerosols above CLouds and their intEractionS) is a 3-year field campaign taking place during the months of August, September, and October in the years 2017, 2016, and 2018, respectively, off the coasts of Namibia and São Tomé in the southeastern Atlantic (SEA). The purpose of this campaign is to study the effects of biomass burning aerosols (BBA) on climatologically important stratocumulus clouds. In this region, BBA are the most dominant aerosol type that have the ability to modify cloud properties by serving as cloud condensation nuclei (CCN), which in differing amounts may alter the cloud properties. These aerosol-cloud interactions continue to be poorly understood and demand more in-depth research. For this project, we focus on data collected during the 2016 field deployment and specifically focus on in-cloud data collected with the Flight Probe Dual Range - Phase Doppler Interferometer (FPDR-PDI) aboard the NASA P-3 aircraft. The FPDR-PDI has the ability to measure microphysical cloud properties such as instantaneous cloud drop size, cloud drop concentration, drop size distributions and liquid water content. In addition, we used organic aerosol measurements from the HR-ToF-AMS and CCN data from the CCNc to characterize aerosol and cloud properties during the flight.

By using data from the above named instruments we determine when the plane descended into or out of cloud top, and detect if there were aerosol present immediately above and focus on such cases where these aerosol were present. Each of the 32 level cloud legs were then classified into cases of low and high CCN to characterize cloud properties such as cloud drop size distributions, distribution width, effective radius, and median diameter to see how the properties of clouds differ when exposed to low or high concentrations of aerosol.

We found that for the high CCN level leg segments, cloud properties exhibited characteristics of the 1st Indirect Effect. The median diameter for all of the level legs combined was 14.6 μm. The median diameter was found to be 12.82 μm for the high CCN cases, and 17.14 μm for the low CCN cases, which indicates a shift of the size distribution to the left to smaller droplet sizes with more "polluted" clouds and to the right to larger droplet sizes for the "clean" clouds. The median effective radius for the high CCN cloud legs was 10.44 μm and 13.29 μm for the low CCN cloud legs. Overall, TNC increased with CCN, with the mean shifting downwards toward lower TNC with the low CCN cases, and upwards towards higher TNC with the high CCN cases.