Department of Atmospheric Sciences
M.S. Defense Announcement

Department of Atmospheric Sciences, S.O.E.S.T., University of Hawai'i at Mānoa
2525 Correa Road, HIG 350; Honolulu, HI 96822 ☎956-8775

M.S. Defense Title:

TURBULENCE AND DROPLET CLUSTERING IN SHALLOW CUMULUS: THE EFFECTS OF AEROSOLS AND CLOUD HEIGHT

Mr. Dillon Dodson
Atmospheric Sciences M.S. Candidate
Department of Atmospheric Sciences
School of Ocean and Earth Science and Technology
University of Hawai'i at Mānoa

Date: Monday, March 20, 2017
Time: 9:00 AM
Location: IPRC Conference Room, POST 414

Abstract:

Little research has been conducted outside the lab on droplet clustering within clouds and its relationships with turbulence. This research aims to gain a better understanding on how turbulence can be used to map droplet clustering within a cumulus cloud and how aerosol number concentration effects droplet clustering by using aerosol-cloud relationships that are derived from warm continental cumuli subjected to various levels of anthropogenic influence sampled during the 2006 Gulf of Mexico Atmospheric Composition and Climate Study (GoMACCS) by the Center for interdisciplinary Remotely-Piloted Aircraft Studies (CIRPAS) Twin Otter aircraft. Drop size distributions, cloud liquid water content (LWC), and a time stamp (allowing for droplet calculations down to 10 -4 m scale) for when each cloud droplet was encountered were measured using the Artium Flight phase-Doppler interferometer (PDI). The pair-correlation function (PCF) is used to identify the scale of preferential concentration, with more clustering signifying a more turbulent environment and vice versa. Results using four complete days of data with 81 non-precipitating cloud penetrations (minimum 300 m in length) organized into two flights of low (L1, L2) and high (H1, H2) pollution data show a more turbulent environment near cloud edge as compared to the cloud center for all four cases, with low polluted clouds showing more droplet clustering for both cloud edge and center. Further analysis shows that the higher clustering experienced in low polluted clouds is due to L2, which has a significantly higher amount of clustering than the other three flights. It is believed that most of the clouds within the L2 flight are decaying, making cloud lifetime more significant to clustering than the aerosol number concentration, although more research must be done.