UNIVERSITY of HAWAI'I MĀNOA

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

SCHOOL OF OCEAN AND EARTH SCIENCE AND TECHNOLOGY

M.S. Defense Title:

A Study of Summer leeside rainfall Maxima over the Islands of Hawai'i and Oahu

Ms. Yu-Fen Huang
Meteorology M.S. Candidate
Department of Atmospheric Sciences
School of Ocean and Earth Science and Technology
University of Hawai'i at Mānoa

Date: **Friday, March 18, 2016**
Time: **10:00 AM**
Location: **Hawaii Institute of Geophysics Building, HIG 310**

Abstract:

The Kona side of the island of Hawai'i is the only leeside of the Hawaiian Islands that exhibits pronounced summer rainfall maxima. In contrast, there is no marked rainfall maximum on the west coast of Oahu. In order to diagnose the physical processes for the rainfall in the Kona area and western Oahu, the historical daily real-time experimental forecasts for both the annual and diurnal cycles were analyzed using the fifth-generation Pennsylvania State University-NCAR Mesoscale Model (MM5) coupled with the advanced land surface model (LSM) from June 2004 to February 2010.

During the summer months, trades (6-8 m s^{-1}) are persistent with significant orographic blocking over the Island of Hawai'i. A relatively strong and moist westerly reversed flow appears adjacent to the Kona coast. The flow over Hawai'i is under a low (~0.3) Froude-number (Fr)-flow regime for the massive mountains, which are well above the trade wind inversion (TWI). Furthermore, the diurnal heating cycle on Hawai'i is strongest in summer. Enhanced orographic lifting due to both westerly reversed flow and the upslope flow, combined with higher moisture content, one of summer rainfall maxima occurs in the afternoon hours on the lower Kona slopes. In addition, a nocturnal rainfall maximum occurs just west of the Kona coast due to convergence between offshore flow and the westerly reversed flow. During the summer, the westerly reversed flow is stronger with higher moisture content than during the winter. Therefore, the nocturnal rainfall offshore of Kona also has a summer maximum.

In contrast, the Ko'olau and the Waianae mountains of Oahu are below the TWI with Fr ~ 1. Thus, the airflow aloft can cross the mountains and descend on the leeside of both mountain ranges. For the west leeside of Oahu, the air is warmer and drier than on the windward side due to the rain shadow effect, daytime heating and vertical mixing. Therefore, afternoon showers are infrequent on the west leeside of Oahu during the summer months. During the night, the descending airflow on the west leeside is followed by a hydraulic jump without a westerly reversed flow, and there is no nocturnal rainfall maximum adjacent to the western coast of Oahu.