UNIVERSITY of HAWAI'I MĀNOA

**Department of Atmospheric Sciences Seminar 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

# WINTERTIME SOUTHEASTERLY AIRFLOW IN THE COASTAL WATERS OF HAWAI'I

**Mr. David Hitzl**
Atmospheric Sciences Ph.D. Candidate
Department of Atmospheric Sciences
University of Hawai'i at Mānoa

**Date:** **Wednesday, December 7, 2016**
**Refreshments:** **3:00pm at MSB courtyard**
**Free Cookies, Coffee & Tea Provided**
**(Please Bring Your Own Cup)**
**Seminar Time:** **3:30pm**
**Location:** **Marine Sciences Building, MSB 100**

## Abstract:

Orographically modulated airflow in the Hawaiian coastal waters varies with seasonal synoptic changes in the prevailing winds. Satellite, buoy and global model simulations indicate a significant proportion of E to SE flow in vicinity of the Hawaiian Islands during winter, altering the location and magnitude of channel and tip-jet accelerations as compared with the more common east-northeasterly trade-wind conditions. The primary trigger for the E – SE airflow events is the approach of mid-latitude fronts, which, depending on their proximity to the island chain, determine the degree of the southerly wind component.

Using the Weather Research and Forecasting Advanced Research (WRF-ARW) model, simulated airflows in the vicinity of the islands under an easterly flow regime are shown to accurately capture the ʻAlenuihāhā Channel airflow acceleration *and* deflection as well as sea-level pressure changes related to blocking and the channel constriction when compared with sounding and ship-level data. Boundary layer winds, $\theta$ and $\theta_e$ profiles and inversion heights are also verified in the channel. Calculated values of the differential of refractivity and Froude number both suggest an inversion drop with subsequent hydraulic jump in the channel exit.

In a 10-day composite of simulated southeasterly airflow, tip-jet winds from Laupāhoehoe on the Big Island approach the ʻAlenuihāhā Channel, where they turn, perpendicularly, through the channel. Wind acceleration in the channel occurs primarily along the southern coast of Maui, although its ultimate speed is modulated by the Laupāhoehoe tip-jet.

Further model experiments show that flow deflection and acceleration in the channel are dependent upon whether the prevailing flow impinges upon the SE coast of Haleakalā. A local, ageostrophic, along-gap pressure gradient is induced by increased blocking pressure along the coast of Haleakalā when SE Maui remains outside of the wake of the Big Island with respect to the prevailing wind. Removal of Maui County from the model domain restructures the local pressure gradient translating to a wind speed difference of ~ 6 m $s^{-1}$ in the channel exit during a 'flow through' case. Removal of the Big Island further reveals the role the speed and direction of the Laupāhoehoe tip-jet plays in determining the ultimate speed of winds in the channel.