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Department of Atmospheric Sciences M.S. Defense Announcement

Department of Atmospheric Sciences, S.O.E.S.T., University of Hawai'i at Mānoa
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M.S. Defense Title:

A Quantitative Climate Study of Dynamically Downscaled Simulations of the 1997/98 El Niño Wet Season in Hawai'i

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Time: 9:30 AM

Location: Hawaii Institute of Geophysics Building, HIG 309

Abstract:

The 1997/98 El Niño, one of the largest planetary-scale climate phenomena on record, was chosen as a preliminary case study in which to test the feasibility of using WRF3.7 (Weather Research and Forecasting Model, Version 3.7) for climate studies. The 1997/98 El Niño wet season (November to April) was compared with the 2005/06 ENSO-neutral wet season by dynamically downscaling two different reanalysis products, NCEP R2 and ERA-Interim, via WRF3.7. The performance capabilities of the WRF model were assessed by employing different forcing fields, land-surface models, domain configurations, and horizontal resolutions, with and without reanalysis grid nudging, for the two largest Hawaiian Islands, Maui and the Big Island. Model performance was validated in a series of comparative rainfall tests to determine the accuracy of simulated rainfall by directly comparing model output with observed rain gauge measurements during the two specified time periods. Sensitivity studies were also performed to assess model response to changes in input (e.g., forcing fields, horizontal grid resolution, etc.). Once total resolvable precipitation compared favorably with observed NCDC rain gauge data in terms of accumulated 6-month simulated rainfall totals, the simulations were determined to be rainfall validated. Following these validation procedures, the dynamically downscaled simulations were then examined in terms of physical variables which seemed to best characterize the atmospheric changes in the Hawaiian climate system and most likely contributed to the reduced precipitation during the 1997/98 El Niño wet season. More generally, this thesis investigated the applicability of using WRF as a regional climate model for conducting long-term climate studies.