UNIVERSITY of HAWAI'I MĀNOA

Department of Atmospheric Sciences
Dual Seminar Announcement

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SCHOOL OF OCEAN AND EARTH SCIENCE AND TECHNOLOGY

Use of Stochastic Simulation to Gap-fill Daily Rainfall Time Series for Studying Long-term Daily Rainfall Variability in Hawaii

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You are invited to a Zoom meeting.
When: May 5, 2021 at 3:30PM HST

Register in advance for this meeting:
https://hawaii.zoom.us/meeting/register/tJYvfu2urD8jEtb2-aKc4ISPr4W9YuHre-tE

After registering, you will receive a confirmation email containing information about joining the meeting.

Abstract:

Long-term daily rainfall records in Hawaii exhibit a variety of gaps in observations. While there are numerous statistical measures used to fill the gaps, it is historically difficult to find a single methodology that captures rainfall's temporal dependence and spatial variability influence on a single station's record or amongst multiple stations. Stochastic simulation for occurrence using a first order, two-state Markov chain and rainfall amount generation process utilizing the mixed exponential distribution is tested as a gap-filling measure for daily rainfall, in an effort to incorporate more stations for better geospatial coverage in examining long-term daily rainfall variability across the state.

A single site and multi-site process are tested against a variety of gap types (random days, regularly missing days, and month(s)-long gaps) to determine the minimum coverage percentage needed for the model to accurately reproduce the spatial patterns in rainfall occurrence and amount. Initial results show the methodology performs well at 80% data coverage, consistent with other gap-filling methodologies. The occurrence process overestimates the number of dry days during the wet season, suggesting the need for other meteorological or climatological inputs to account for Hawaii rainfall patterns. The mixed exponential distribution fits non-zero rainfall well for windward and lee side stations regardless of data coverage percentage. However, an additional distribution is needed to account for the heavy rainfall periods which can be underestimated in the current model configuration.

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The Bayesian model averaging (BMA) for ensemble precipitation forecasts

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Abstract:

In this study, the Bayesian Model Average (BMA) was used to predict the precipitation probability distribution. BMA created the predictive PDF as a weighted average of PDFS centered on the individual bias-corrected report, where the weights are posterior probabilities of the models generating the report and reflecting the global report 'relative'. The contributions to predictive skill over a training period. In this study, BMA is extended to probabilistic quantitative development precipitation forecasting. The predictive PDF corresponding to one ensemble member is a mixture of a discrete component at zero and a gamma distribution. Unlike methods that predict the probability of exceeding a threshold, BMA gives a full probability distribution for future precipitation. The proposed method is applied to the daily precipitation forecast at Hilo airport in April 2020 based on 5 models of North American Multi-Model Ensemble (NMME), and the accurate prediction probability distribution is obtained. Using data even earlier, daily 48-h forecasts of 24-h accumulated precipitation in the North American Pacific Northwest in 2003–04 could be conducted by using the University of Washington mesoscale ensemble. It also gave probability of precipitation forecasts that were much better calibrated than those based on consensus voting of the ensemble members. It gave better estimates of the probability of high-precipitation events than logistic regression on the cube root of the ensemble mean.