M.S. Defense Announcement
Zaibeth Carlo-Frontera
October 6, 2023, at 10:00 a.m.

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Friday, October 6, 2023
10:00 a.m.

Defense
ATS Large Classroom (101 ATS) or Teams

Post Defense Meeting
Riehl Conference Room (211 ACRC)

Committee:
Elizabeth Barnes (Advisor)
Eric Maloney (Co-advisor)
Brooke Anderson (Environmental and Radiological Health Sciences)

Data-driven Models for Subseasonal Cyclogenesis Forecasts in the East Pacific and North Atlantic

Tropical cyclones (TCs) are hazardous and financially burdensome meteorological events. Previous studies have revealed that longer timescale phenomena, including the El Niño Southern Oscillation (ENSO), the Madden-Julian Oscillation (MJO), and African Easterly Waves, influence TC development by modifying large-scale environmental conditions such as vertical wind shear, mid-level moisture, and sea surface temperatures. Statistical models have been developed to forecast TCs in the Atlantic and Pacific basins by incorporating information about ENSO and the MJO. Expanding on this work, we employ logistic regression (LR) and neural network (NN) models with an expanded set of variables to predict cyclogenesis on subseasonal timescales for the east Pacific and Atlantic regions. These models utilize ENSO and MJO indices, along with other local environmental information, and demonstrate enhanced forecasting skill relative to models that only use TC climatology. Overall, the NN model shows superior performance compared to the LR model, retaining skill out to three weeks leadtime for the east Pacific, and out to four weeks for the Atlantic basin. The predictive capabilities of the model are demonstrated for the years 1983 and 2021. To gain insights into the decision-making process of the NN models, an AI explainability technique is employed to understand which features are considered important in making the predictions. For both basins, the addition of ENSO and MJO information prove to be essential for the superior forecast skill of the NN model.