

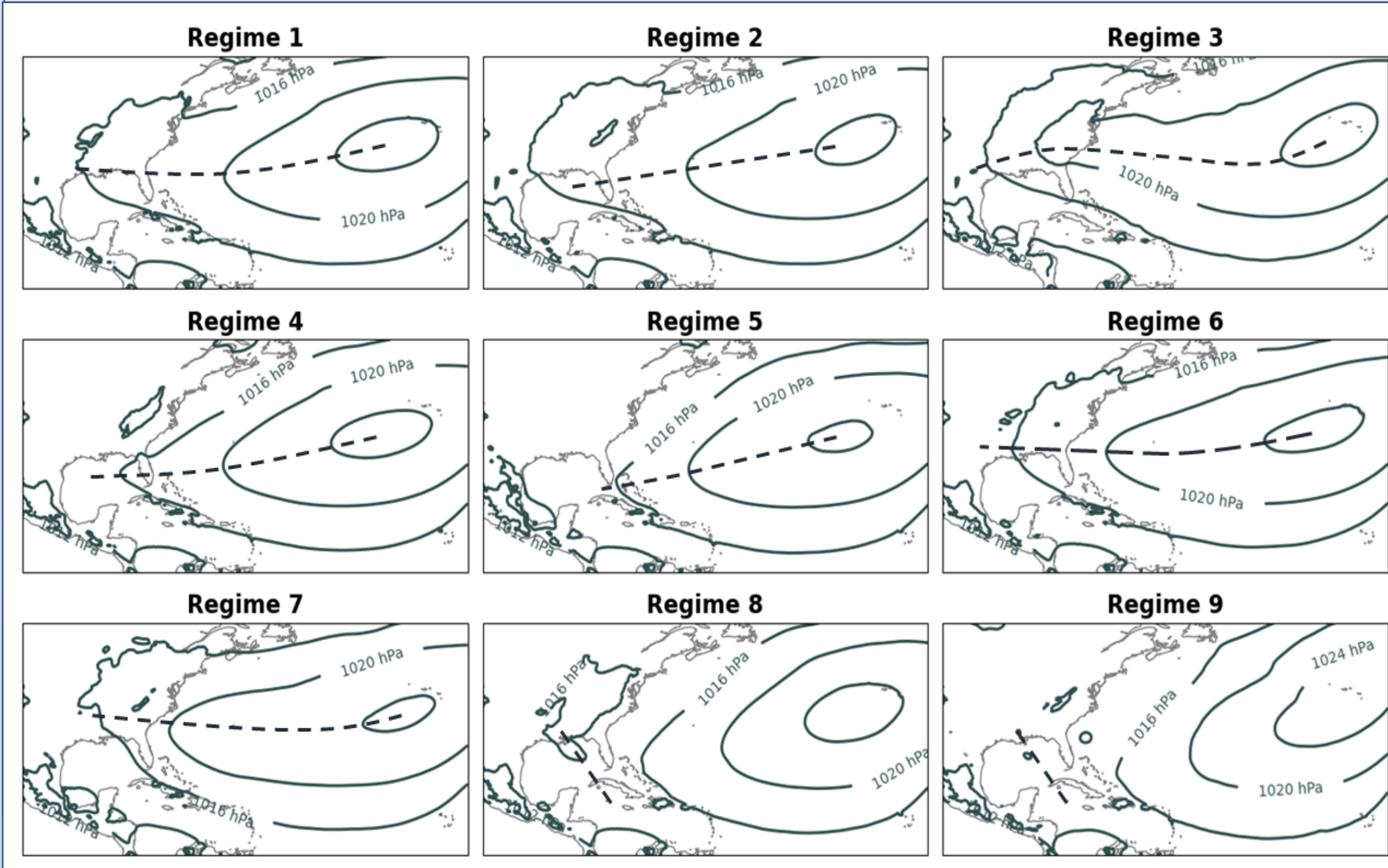
An Examination of Changes in the Florida Seabreeze Climatology

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Background

Florida precipitation patterns are generally governed by large scale flow, which can be defined and classified by nine different “Seabreeze regimes”. These regimes were originally defined by the Nation Weather Service Forecast Office in Tampa, FL. This flow is a product of many meteorological factors, namely the East-West positioning of the western ridge of the North Atlantic Subtropical High (NASH).

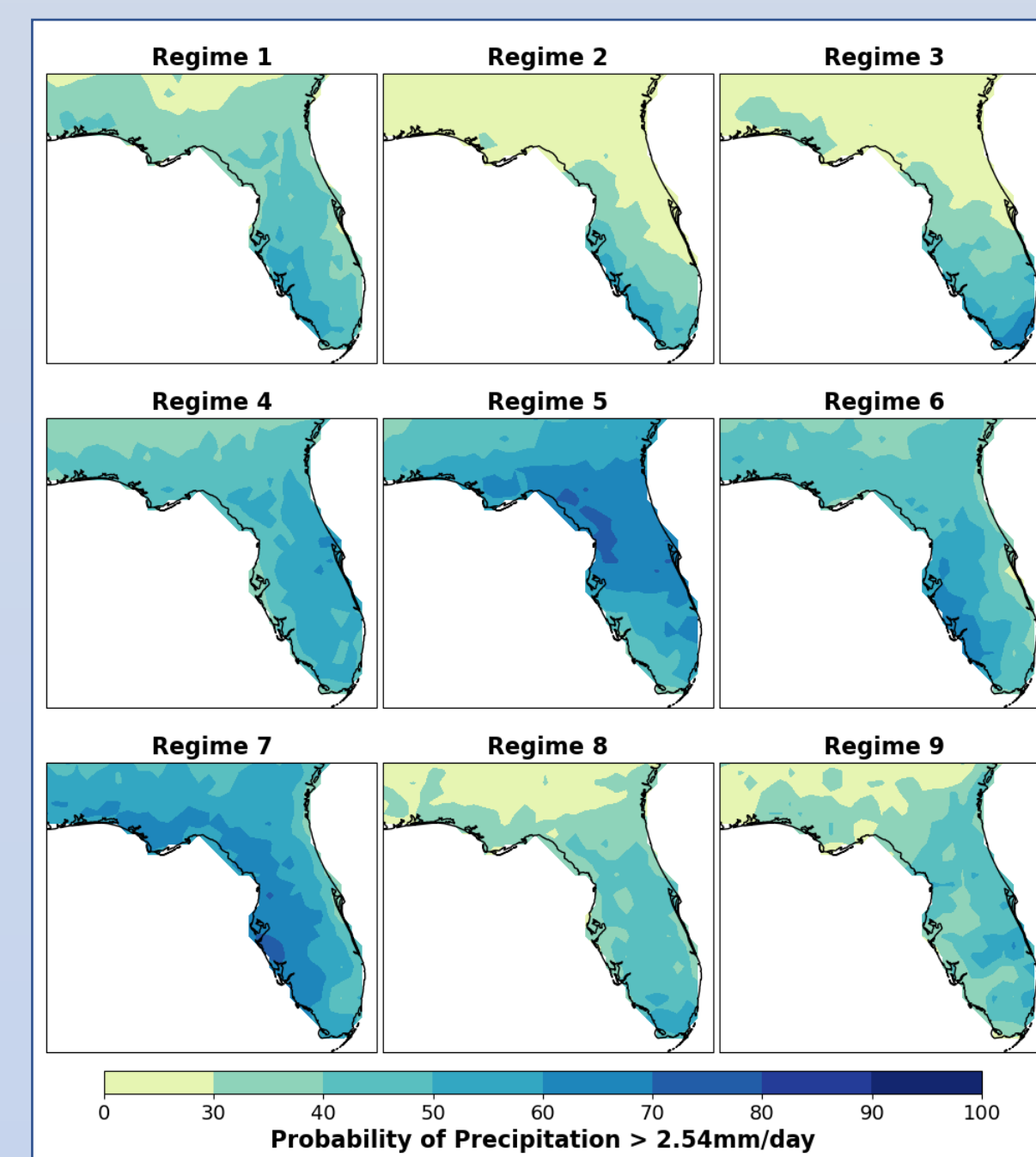


Results

Our findings show that Regime 4, which corresponds to moderate W/SW mean flow, is the most prevalent of all the regimes, while the least common is Regime 9, a strong N/NW mean flow. Comparing the data from the first 30 years to the second 30 years, we see an increase in southwesterly flow associated with Regimes 4 and 5, as well as a decrease in Regimes 2, 3, 6, and 7, all of which are characterized by an easterly component its mean flow. Lastly, we have observed an increase in days with “light and variable” flow, categorized as Regime 1. To summarize, a net increase in mean westerly flow with a net decrease in flow with easterly components.

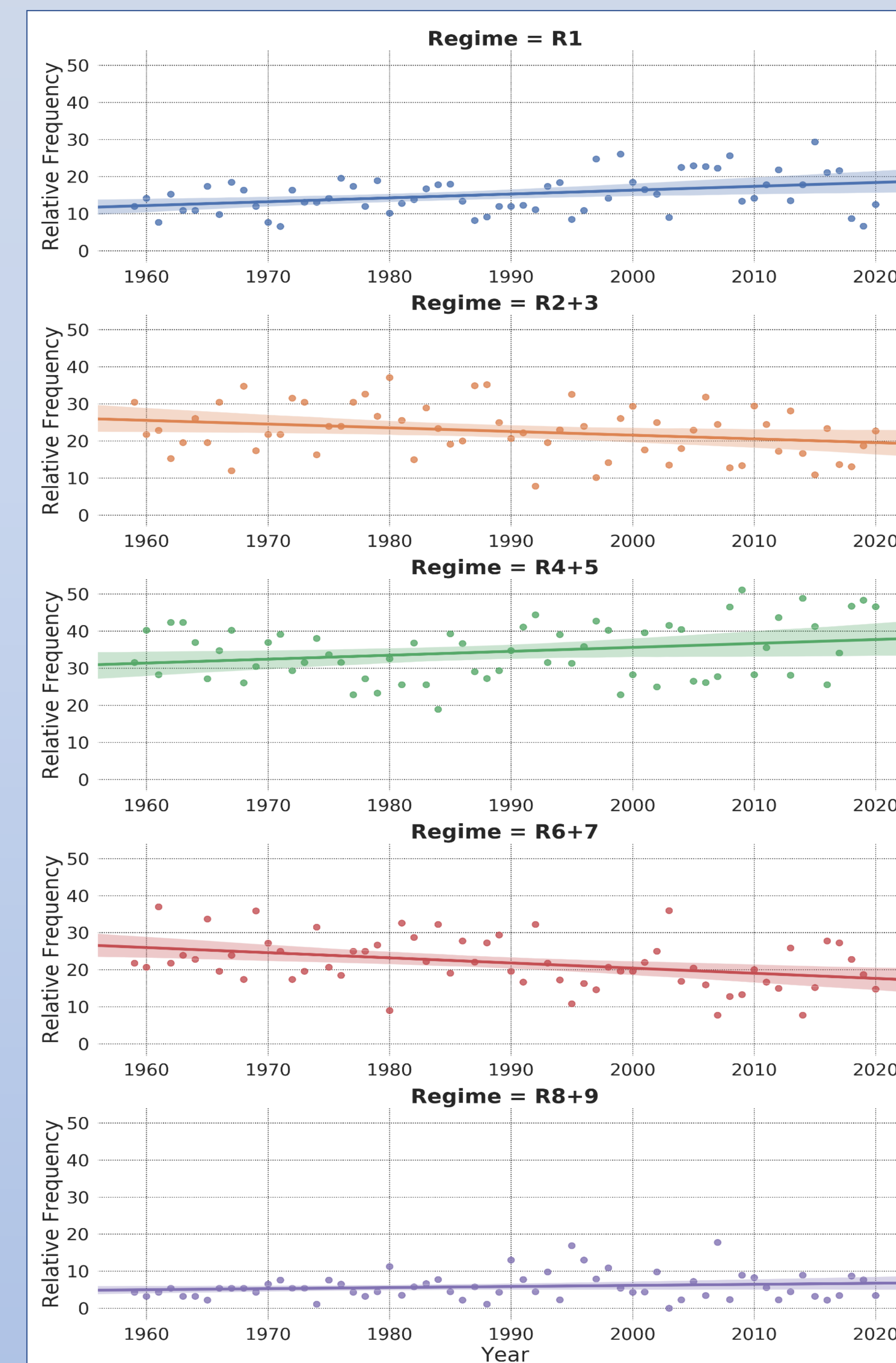
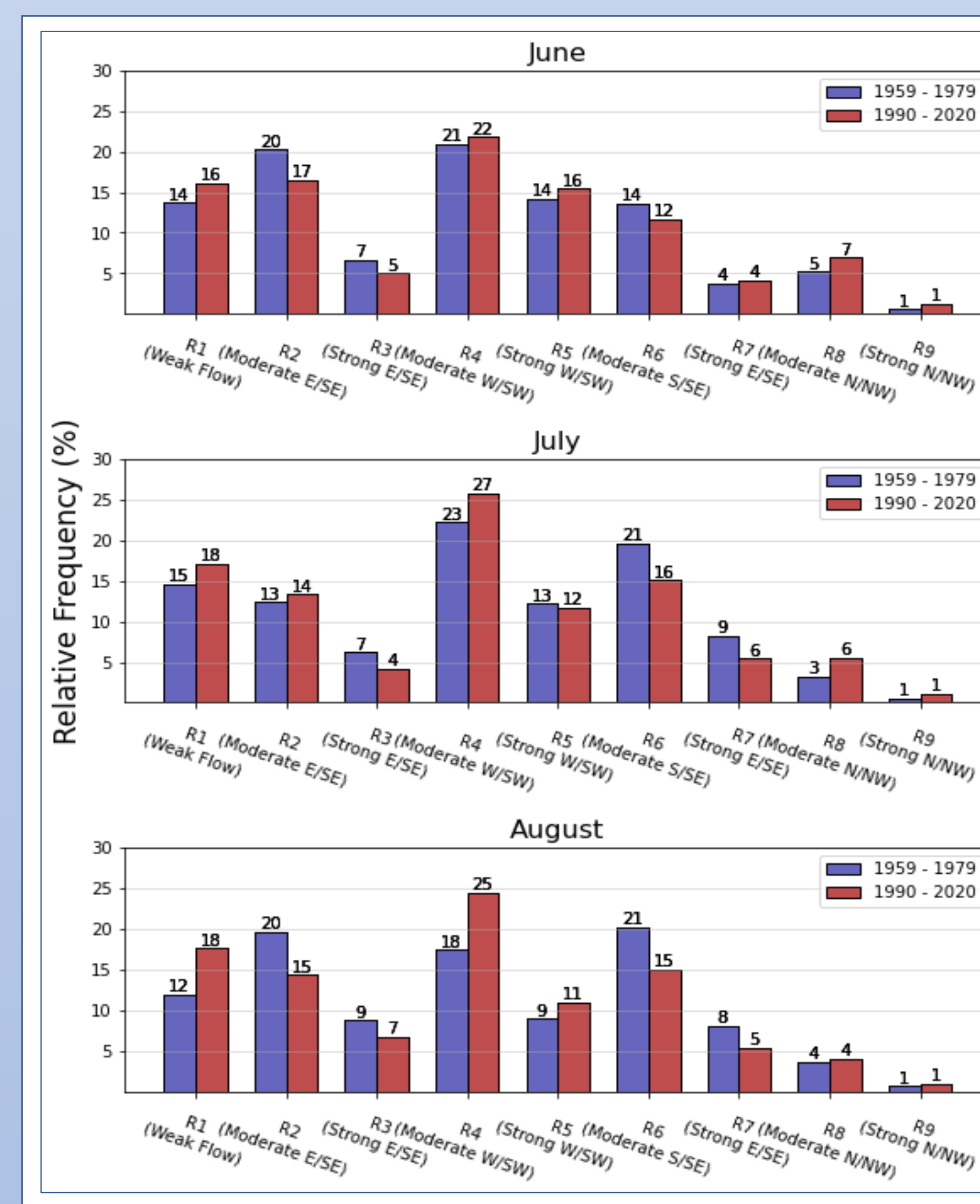
Motivation

Our goal is to determine whether the sea breeze climatology has changed significantly over the past 60 years. Such changes may result from variability and/or trends in the strength/position of the NASH. We compare the sea breeze regime climatology from the 1959-1989 period to the 1990--2020 period. Changes in the sea breeze climatology are important because of the potential impact on precipitation patterns over Florida.



Methods

These climatologies were generated using 700, 850, 925 and 1000 hPa vector wind fields, using the U and V wind components, from the fifth generation European Centre for Medium-Range Weather Forecasts Reanalysis (ERA5), as well as precipitation data from the Climate Prediction Center Unified Gauge-Based Precipitation.



Future Work

For the future, we plan to examine composite atmospheric conditions for each regime to understand the causes in changes in regime frequency. We also seek to analyze the difference in regime frequency for rainy vs dry summers. We further aim to disentangle the influence of internal variability and climate change on the changing sea breeze regime climatology. Finally, we would like to explore different methods for defining the sea breeze regimes that incorporate additional atmospheric variables with the hope that these new regimes will be more predictive of precipitation probabilities.