Goals

Groupings of AEW seasons are compared to each other and to the overall AEW climatology to investigate interseasonal variability of AEW attributes and associated environmental conditions to determine

1. Causes of seasonal variability in AEW activity and TC activity
2. Trends of AEW characteristics in the context of large-scale natural climate phenomenon such as ENSO

Methodology

Data
- ECMWF ERA5 data spanning from 1979 to 2022
- AEW Tracking
  - AEWs are tracked using the Lawton et al. (2022) track database, which utilizes 700hPa curvature vorticity
  - This database has been validated against other wave trackers and is able to capture the majority of AEWs and accurately represent their climatology
- Developing AEWs: AEWs that develop into TCs
- Non-Developing AEWs: AEWs that do not develop into TCs

Year Groupings & Environmental Conditions
- Created xarray datasets of year groupings: active years, inactive years, El Niño years, and La Niña years
- Active & Inactive groupings based on TC activity in Main Development Region (MDR)
  - Active threshold: minimum nine TCs formed in MDR
  - Inactive threshold: maximum two TCs formed in MDR
- El Niño and La Niña groupings based on Climate Prediction Center’s Oceanic Niño Index historical records
- Analyzed environmental conditions of year groupings and differences between them

AEW Statistics
- All AEW statistics plots show a probability density function (PDF)
- AEW Strength: 700 hPa curvature vorticity averaged within 600km of the AEW center

Conclusions and Future Work

Summary
- The effects of ENSO stretch eastward in the Atlantic Basin to the location of the AEJ, which affects the development and non-development of AEWs.
- Expands our understanding of the relationship between ENSO and TCs
- Development of AEWs is associated with the location of the AEJ, perhaps more so than the number of AEWs in a season or the strength of AEWs.
- The lead time for tropical cyclogenesis prediction could increase
- Stronger, more northern AEJ during Niño years supports the idea that developing AEWs are weaker during El Niño years
- AEJ shifted south during El Niño years
- Stronger and more northern AEJ during La Niña years connected to stronger non-developing AEWs

Future Work
- Expand scope of conditions analyzed to include vorticity for insight into AEW vertical structure
- Conduct analysis for more year groupings to gather more data on tropical cyclogenesis trends related to AEWs and environmental conditions

References and Acknowledgments

This year’s Undergraduate Research Symposium poster is based on research supported by the National Science Foundation under Grant No. OCE-1930765 and the City of Miami, FL, for having a project on weather. The project was supported by NSF grant OCE-1755952 and through an NSF Graduate Research Fellowship (GRFP)


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ROSENSTIEL UNDERGRADUATE RESEARCH SYMPOSIUM | METEOROLOGY POSTER SESSION | 19 APRIL 2024 | CORAL GABLES, FL