Case Study Analysis of Easterly Wave Formation in the East Pacific

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Introduction

Easterly waves are off equatorial low-pressure convective regions that migrate westward at 5-11 m/s in the tropical easterlies. Most originate from Africa, however some can be initialized locally in the East Pacific.

What are the objectives of this research?

- To observe what influences easterly waves to form and where they originate by analyzing two cases of easterly waves that formed to become tropical cyclones.

Why is this research important?

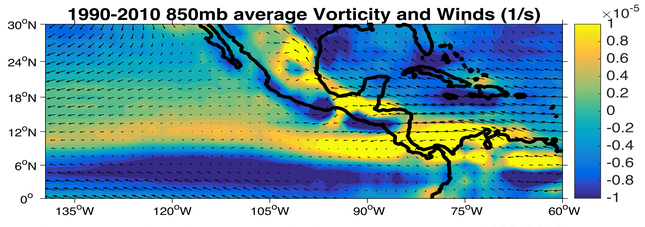
- Easterly Waves form a majority of the tropical cyclones in the East Pacific and Atlantic.
- Better understanding of how/where they form and develop can help us to better forecast hurricanes.

Methodology

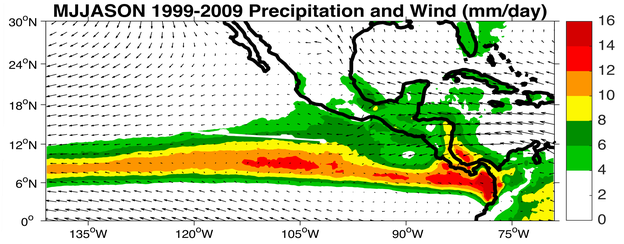
Analyzed TRMM and ECMWF datasets in MATLAB. Created vorticity wind and precipitation plots to observe what impacted them to grow and where they came from.

- Entire study domain is defined as (0N-30N, 60W-135W).

Overview



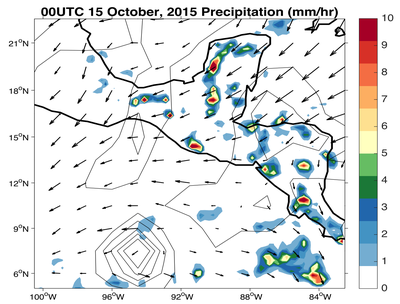
Climatology Map of average vorticity and wind between 1990-2010 during June-October.

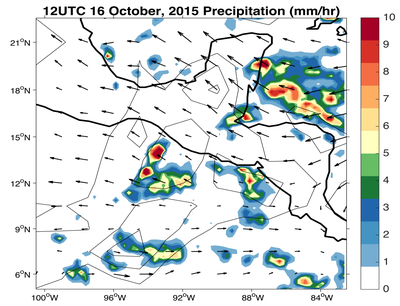


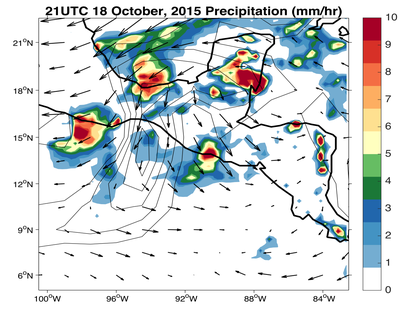
Climatology Map of precipitation and wind between 1999-2009 during June-November

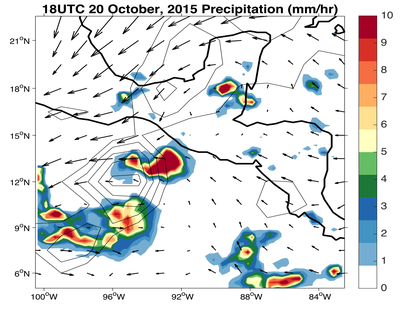
Storm Development

Hurricane Patricia:

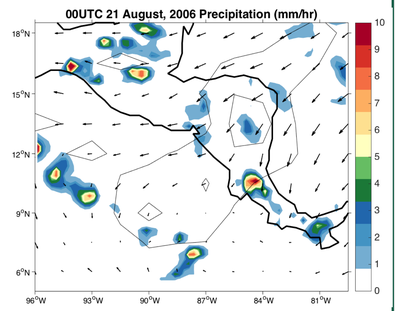


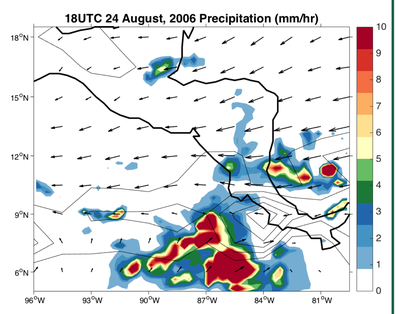


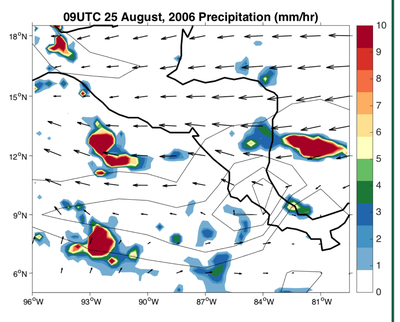


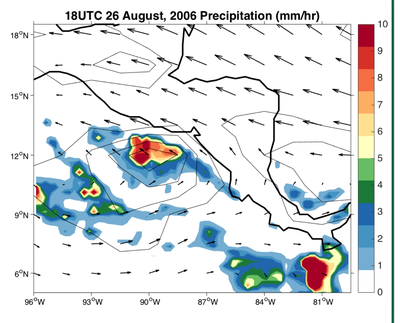


Hurricane John:





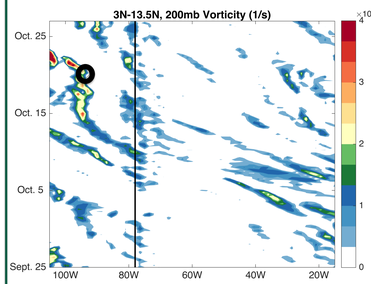


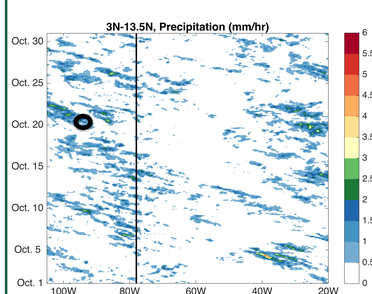


The figures above show the gap wind event's influence on the vorticity and precipitation in these easterly waves that formed to become hurricanes. The left column shows Hurricane Patricia and the right shows Hurricane John.

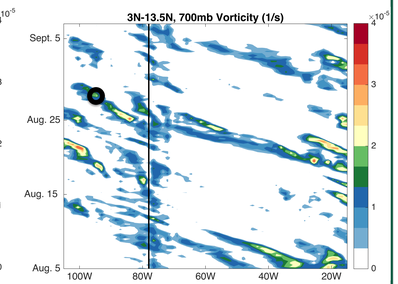
Hovmöller Plots

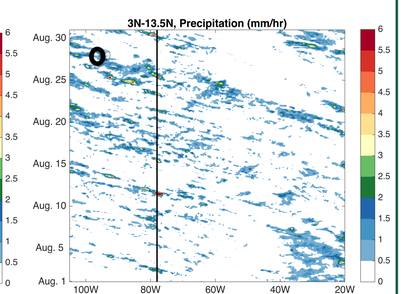
Hurricane Patricia:





Hurricane John:





Hovmoller diagrams for Patricia (left) and John (right). Top panels are 700mb vorticity and bottom panels are precipitation.

Conclusions

The easterly wave that formed into John originated from Africa but intensified through interactions with local processes.

Hurricane Patricia's origin is local.

The gap wind events influenced the organization of vorticity and precipitation in the initial disturbances from which these tropical cyclones formed.

Both local and remote processes appear to be important for easterly wave formation in the east Pacific.

References

1.Rydbeck, A. V., and E. D. Maloney, 2015: On the Convective Coupling and Moisture Organization of East Pacific Easterly Waves. *J. Atmos. Sci.*, 72, 3850-3870.

Acknowledgements

This work has been supported by the National Science Foundation Research Experiences for Undergraduates Site in Climate Science at Colorado State University under the cooperative agreement No. AGS-1461270.

Special thanks to Justin Whitaker, Emily Riley Dellaripa, and Eric Maloney for their continuous patience and support. As well as the entire ESEMI organization for giving me this amazing opportunity.