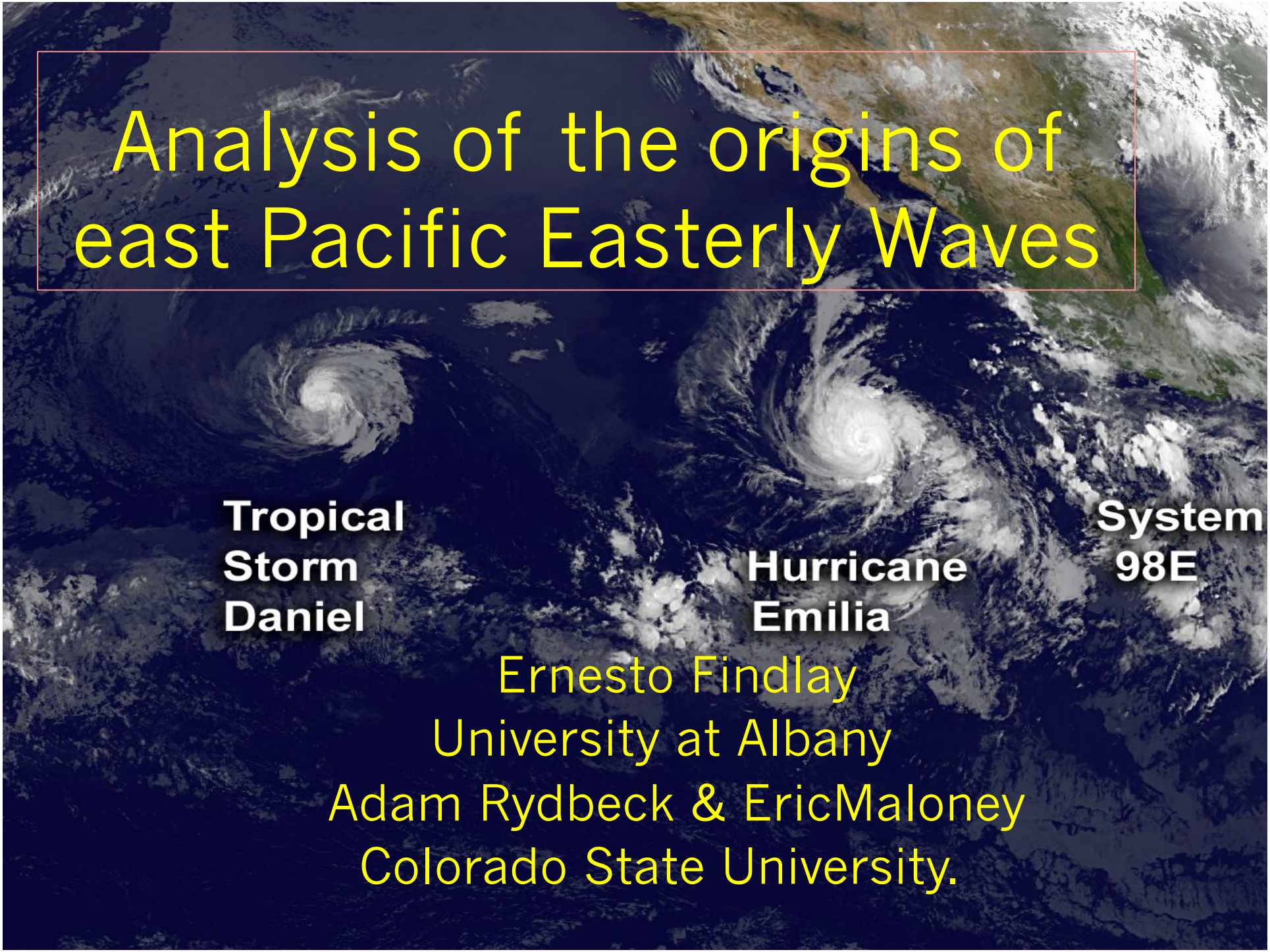

Analysis of the origins of east Pacific Easterly Waves

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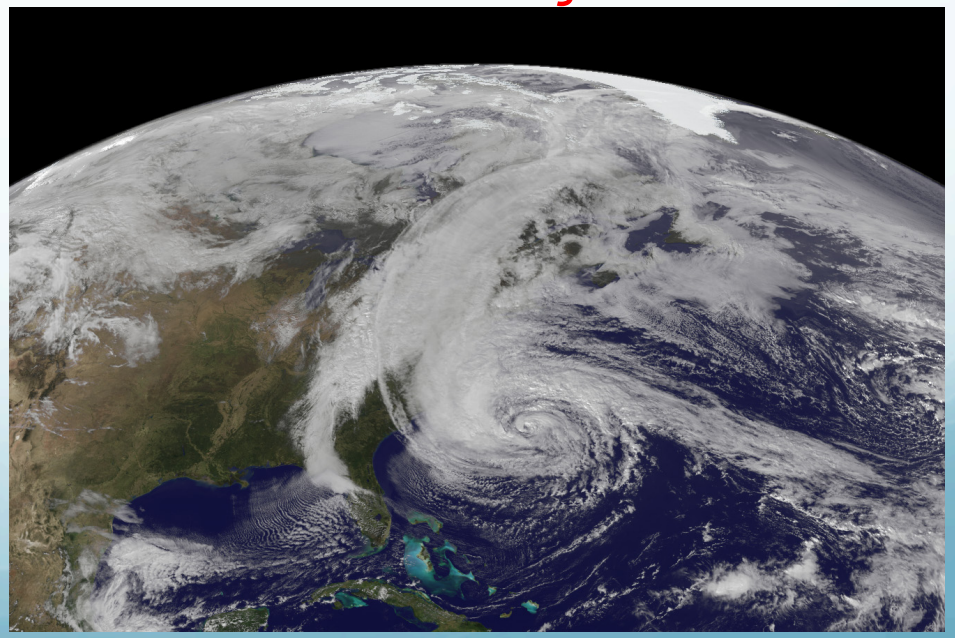
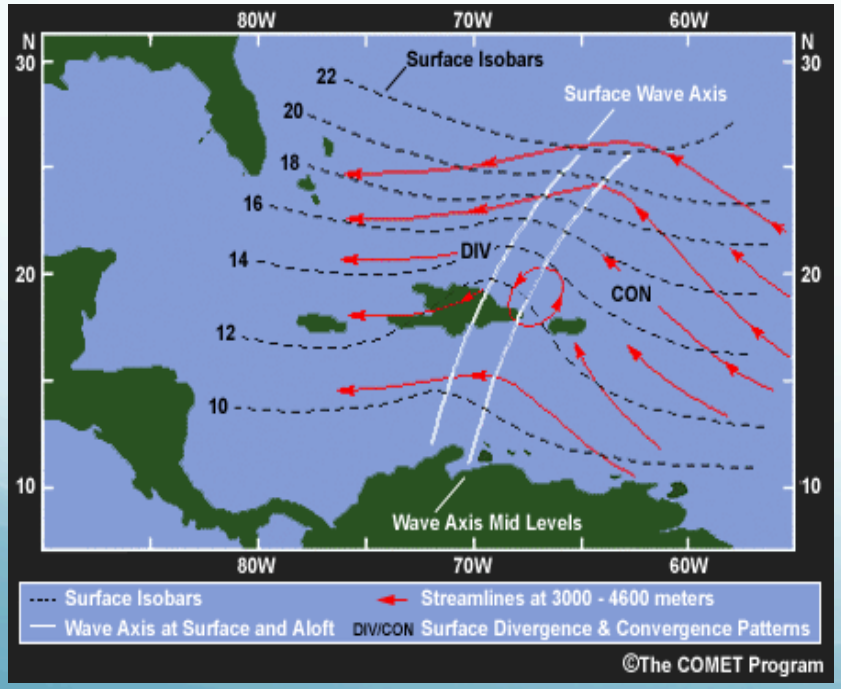
Motivation

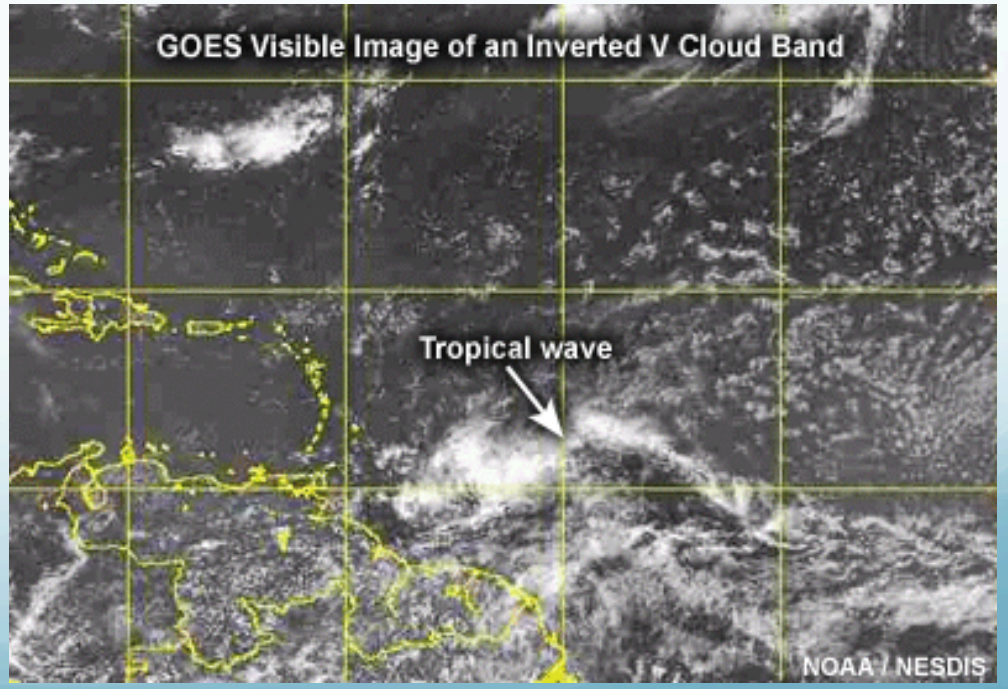
- To better understand the origins and tracks of easterly waves in the east Pacific.
- From the last 15 years, according to National Hurricane Center, 70% of tropical cyclones in the east Pacific developed from African easterly waves.



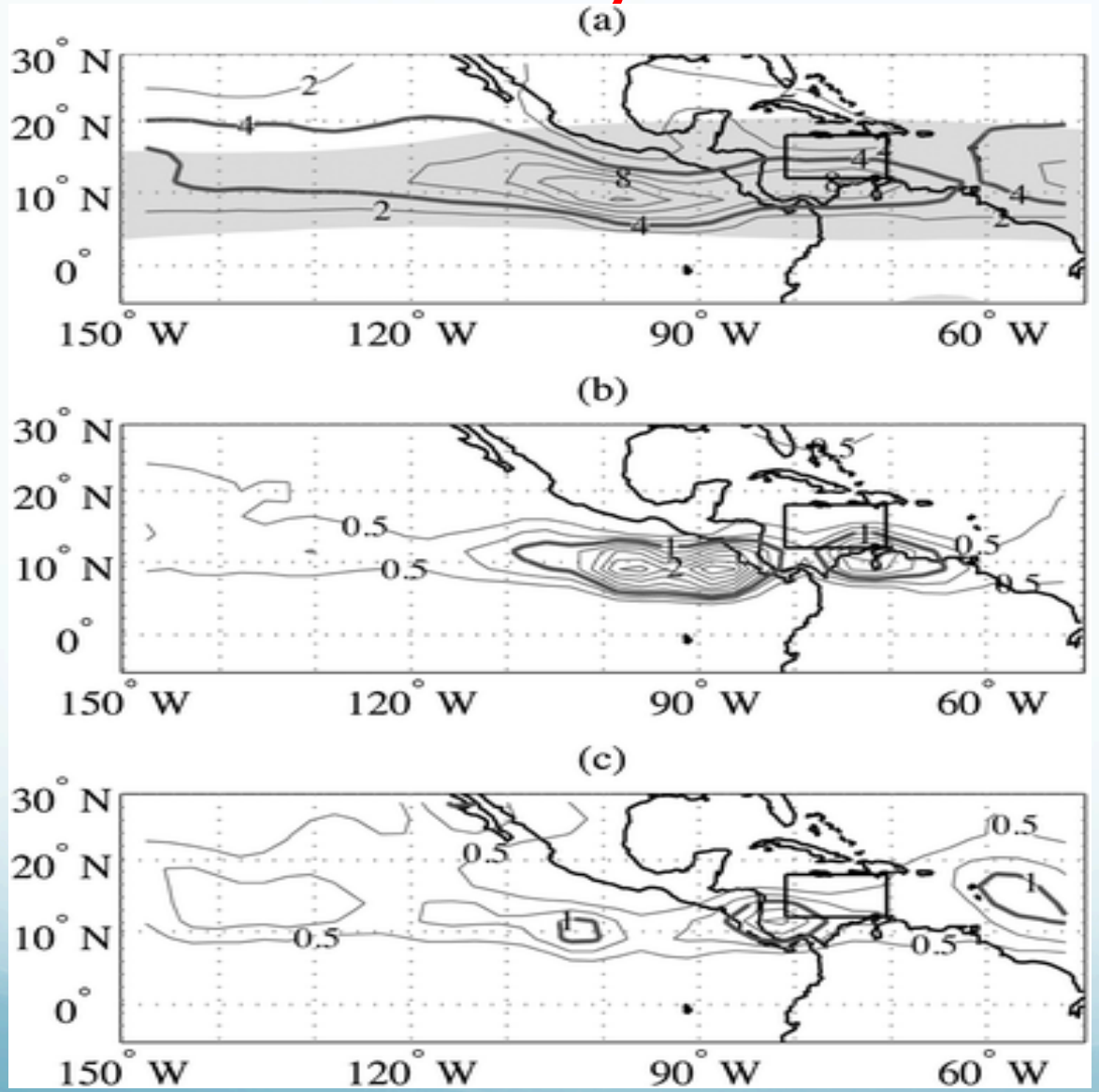
What is an easterly wave?

- Variability at 3-10 day timescales. The disturbances move east to west, with a spatial scale of thousands of kilometers
- Inverted trough of low pressure.
- Inverted v-shaped wind flow.





Easterly waves cont...



a) Track

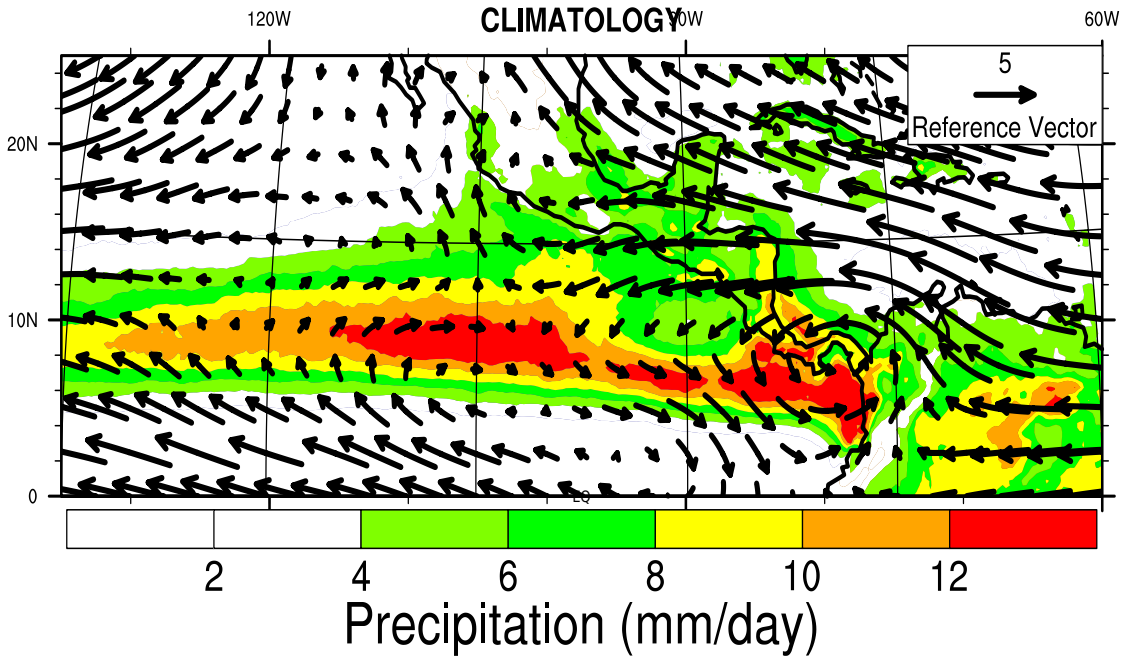
b) Genesis

c) Lysis

Serra et al. 2010

Climatology

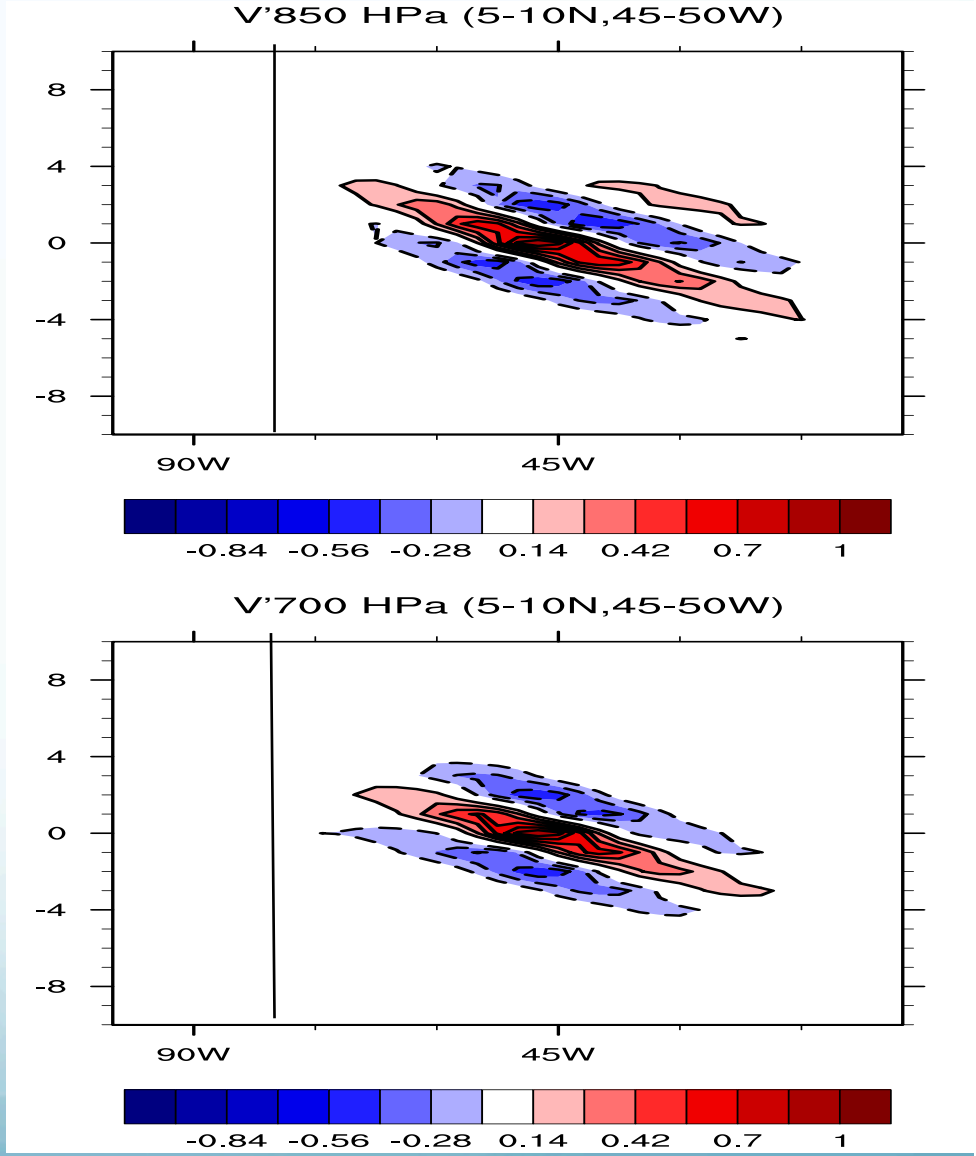
- Background cyclonic vorticity in the east Pacific.
- Ample background precipitation favorable for easterly wave growth. Precipitation maximum in



Seasonal average from June-November (1998-2012) of 850 hPa mean wind and mean precipitation per day.

Results

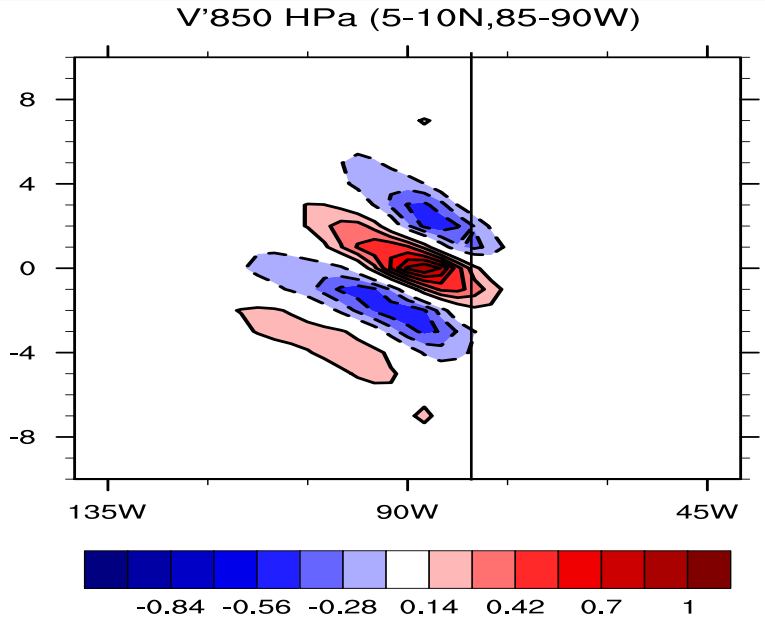
- The lag correlation of 2-10 day meridional wind anomalies suggest that waves in the Atlantic do not cross over into the Pacific.

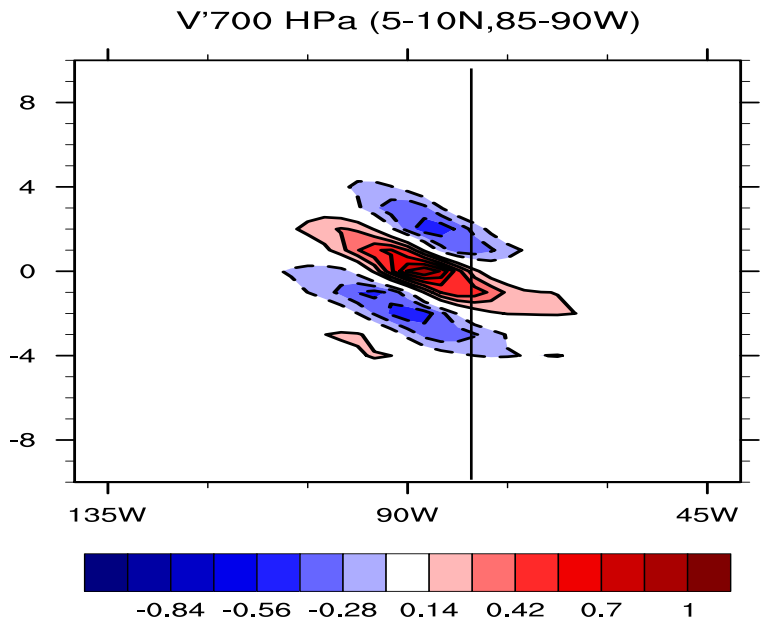


10 day lag correlation of 2-10 day bandpass filtered V wind anomaly in the Atlantic(5-10N,45-50W) correlated with those in the 3-13N tropical belt. Shaded values are statistically significant at the 95% confidence level, values above 0.14 are shaded.

Results cont...

- Furthermore, east Pacific waves look to develop around the bight of Panama.



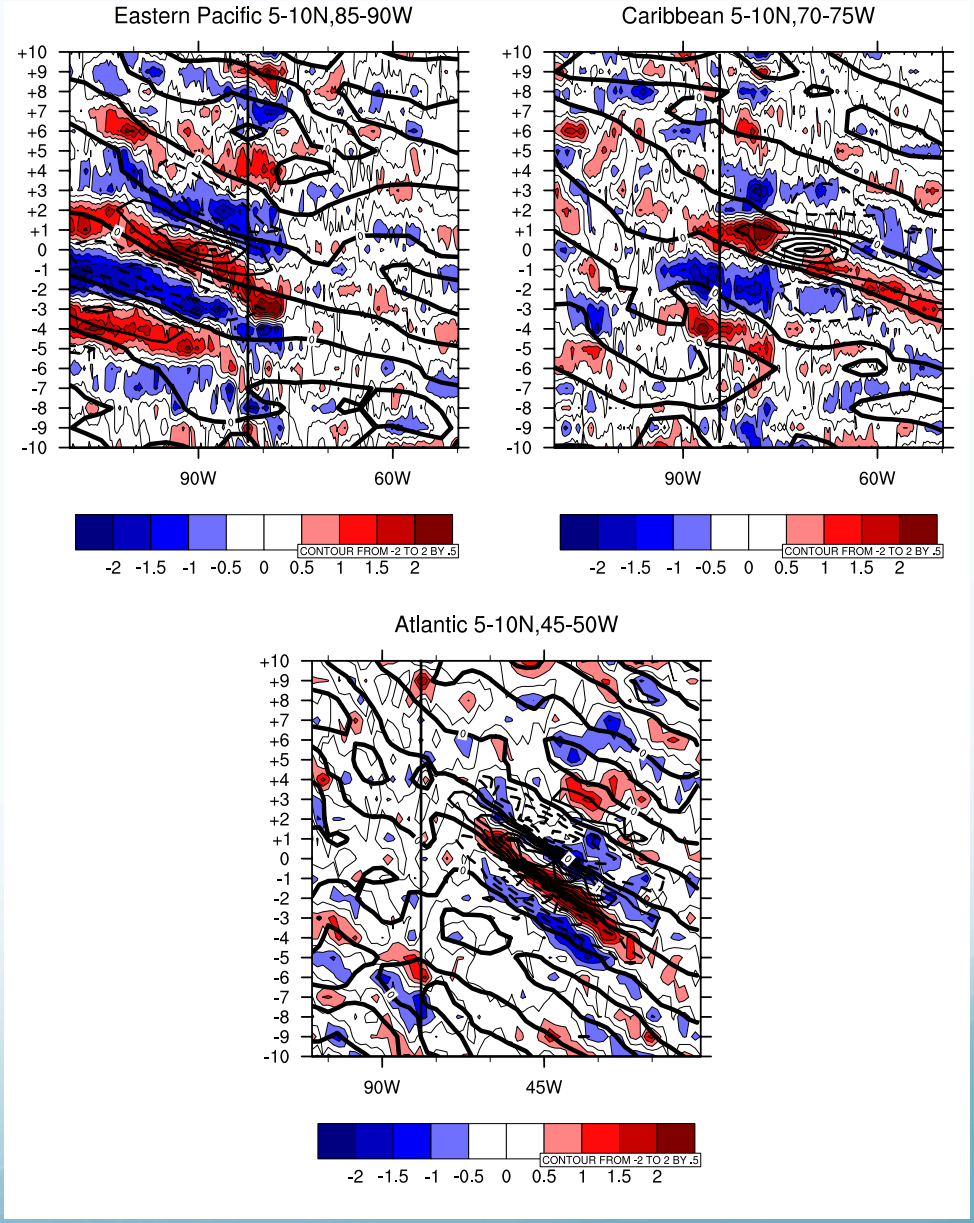


10 day lag correlation of 2-10 day bandpass filtered V wind anomaly in the Pacific (5-10N,85-90W) correlated with those in the 3-13N tropical belt. Shaded values are statistically significant at the 95% confidence level, values above 0.14 are shaded.

Composites

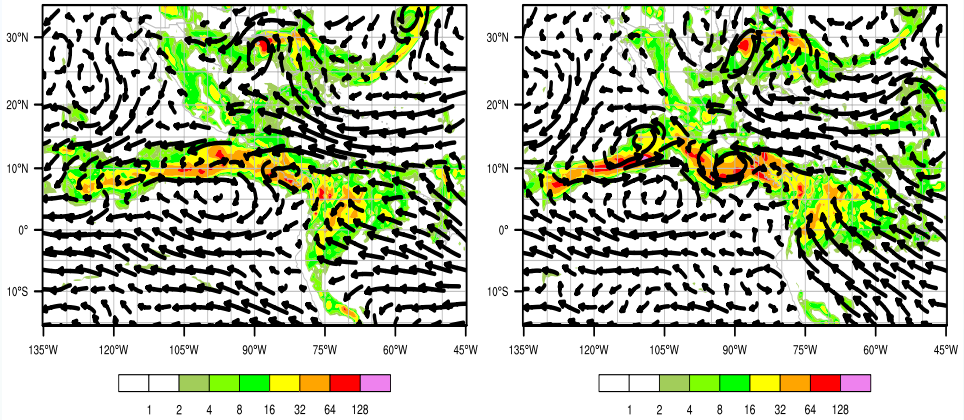
- As in previous figures, a composite of easterly waves suggest that waves in the Atlantic do not cross over into the Pacific and that they originate near the bight of Panama.

10 day lag of 2-10 day bandpass filtered V wind anomaly and 2-10 day bandpass filtered precipitation anomaly. Averaged over 3-13N. Fill values are precipitation anomaly. Contour values are V wind anomalies, negative values are dashed. Black line represent the location of the bight of Panama.

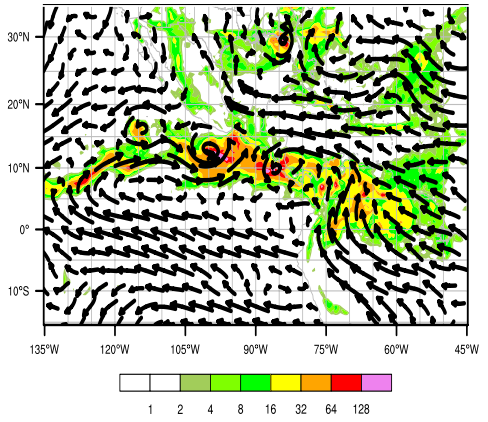


WRF simulation

- In (a) an easterly wave is first identified near Panama on August 6th. Two days later (fig.b) the wave has moved to near El Salvador, while it has gained strength. Finally, by August 10th the wave has intensified and moved near the Mexican coast.



a) August 6th,2005 b) August 8th,2005

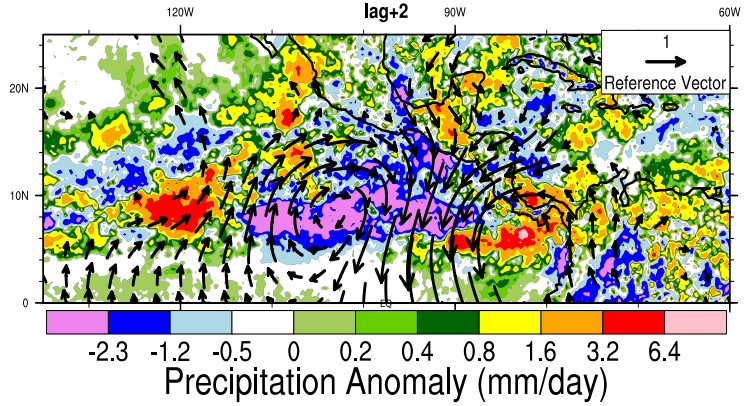


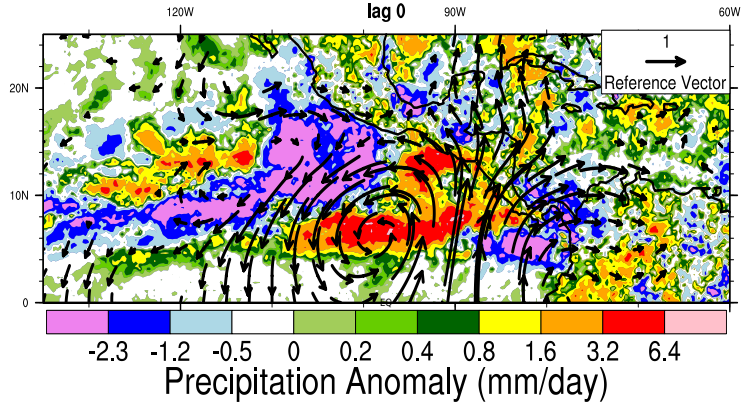
c)August 10th,2005

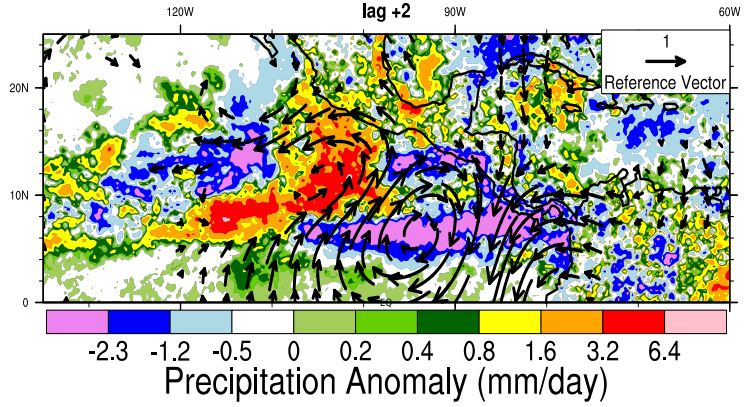
Observations

- Observations support similar origins, trajectory and intensity of the wave modeled in the previous figure.

Lagged composite of precipitation anomalies , and 850 hPa wind anomalies. Averaged over 5-10N , 85-90W. Only wind anomalies greater than 0.15 are plotted







Conclusions

- The bight of Panama is a climatologically favorable environment for the development of easterly waves due to the low-level cyclonic flow and precipitation maximum.
- Composites of easterly waves support the idea that most easterly waves are formed in east Pacific rather than initiating in Africa.
- Composites and lag correlation plots, support the idea that waves do not cross over from the Atlantic to the Pacific.
- The WRF model simulates the location, track, and intensity of easterly waves when compared to observations in a limited case study.

Future work

- Use the WRF model to determine whether easterly waves can be simulated in the east Pacific without intrusion of easterly waves from the Atlantic.
- Use WRF to determine importance of Panama Bight convection for seeding easterly waves
- Correlate the east Pacific developing waves with tropical cyclone frequency.
- Opportunity to evaluate model ability to trace easterly waves.

Thank you
Questions?