

Motivation

- The Great Plains Low-Level Jet (GPLLJ) acts as a moisture corridor from the Intra-Americas Seas into the central US. It has profound seasonal influence over the United States on tornadoes (by altering vertical wind shear and availability of moisture), agriculture and forestry (affecting rainfall and seed dispersion), and Human health (migration of birds and insects which in turn affects influx of certain pests and disease causing agents).
- The variability of the GPLLJ is affected by the adjacent Pacific and Atlantic Oceans. The fluctuations in its strength, location and timing of the GPLLJ has important implications over the central US.
- Thus, we access the ability of the FLOR climate model to simulate the GPLLJ and corresponding oceanic influences. This will aid in advancement of our ability in the prediction of the GPLLJ and its effects on the North America.

Observed GPLLJ – ENSO Relation

La Nina leads to stronger GPLLJ in Spring

El Niño leads to stronger GPLLJ in Summer

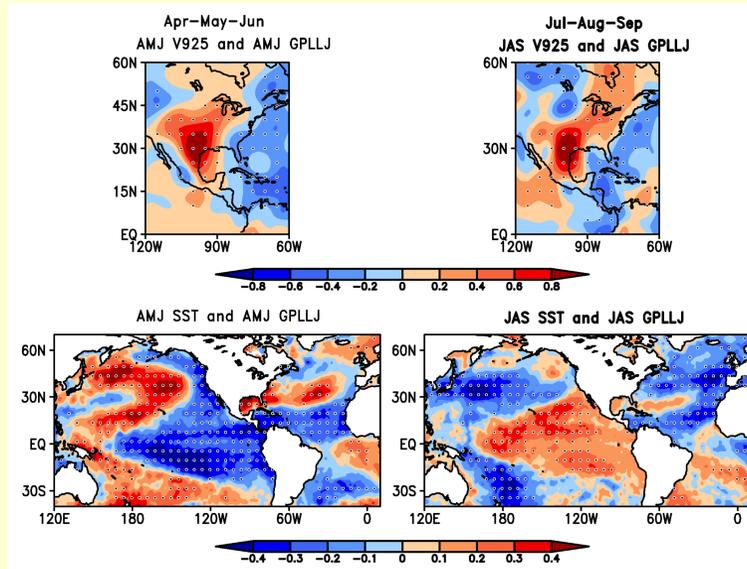
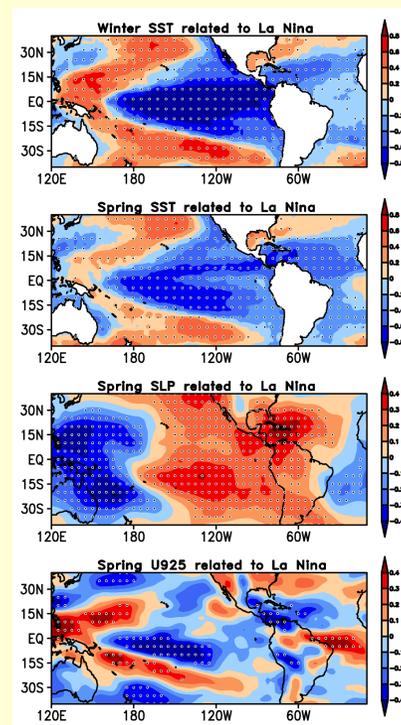


Fig1: Point correlation between seasonal anomaly of meridional winds at 925hPa and seasonal GPLLJ (top), and between seasonal anomaly of SST and seasonal GPLLJ (bottom). Dotted regions indicate 5% significance level.

- 1) What are the mechanisms which drive seasonal change in relation between the GPLLJ and ENSO?
- 2) Do coupled climate models simulate such a seasonal change in relation?

Mechanism for AMJ



*Czaja, A., P. van der Vaart, J. Marshall, 2002: A Diagnostic Study of the Role of Remote Forcing in Tropical Atlantic. DOI: [http://dx.doi.org/10.1175/1520-0442\(2002\)015<3280:ADSOTR>2.0.CO;2](http://dx.doi.org/10.1175/1520-0442(2002)015<3280:ADSOTR>2.0.CO;2)

- Pre-DJF ENSO is related to easterlies in the tropical Atlantic through the high SLP over the tropical Atlantic (*Czaja et al. 2002).

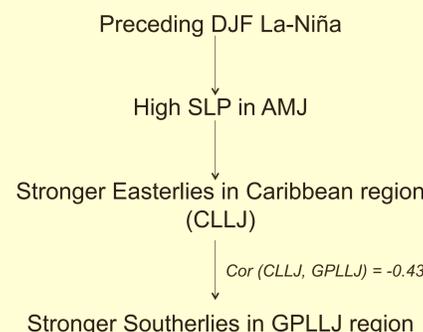


Fig2: Point correlation of seasonal anomaly of SST, SLP and zonal winds at 925hPa with preceding DJF Niño3.4 index. Dotted regions indicate 5% significance level.

Mechanism for JAS

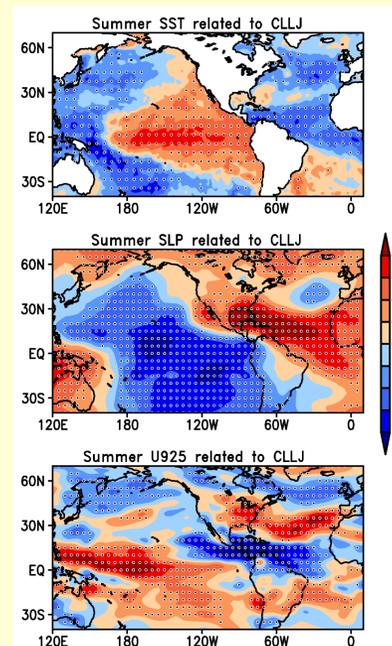
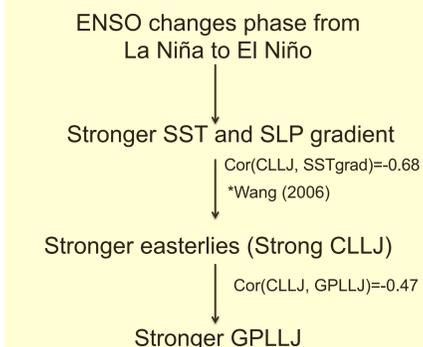


Fig3: Point correlation of JAS seasonal anomaly of SST, SLP and zonal winds at 925hPa with JAS CLLJ index. Dotted regions indicate 5% significance level.



- In both spring and summer, the link between the GPLLJ and ENSO is through the CLLJ.

*Wang, 2006: An overlooked feature of tropical climate: Inter-Pacific-Atlantic variability. DOI: 10.1029/2006GL026324.

FLOR Simulation of GPLLJ-ENSO Relation

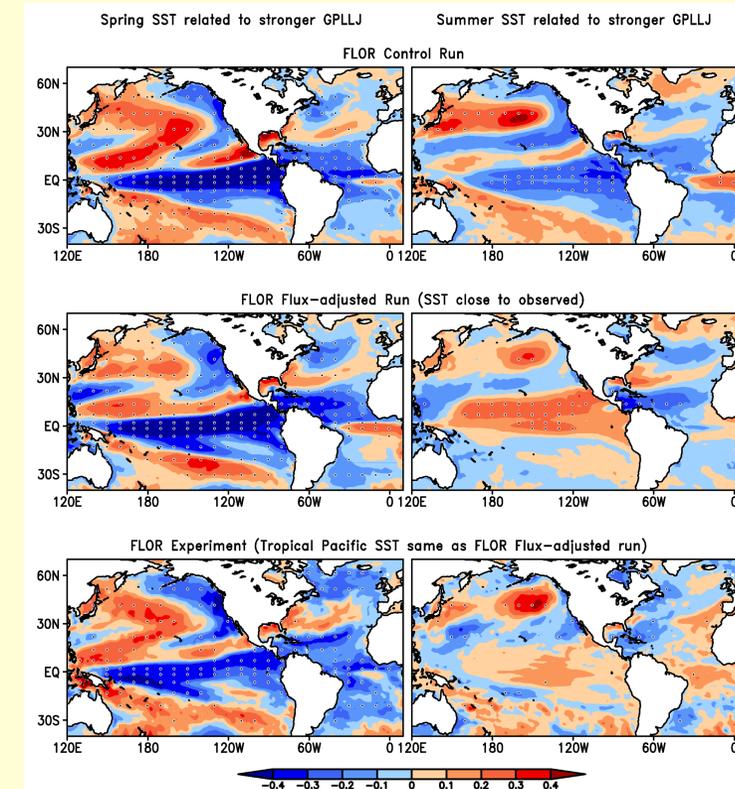


Fig4: Point correlation between seasonal anomaly of SST and seasonal GPLLJ for FLOR control run (top), FLOR flux-adjusted run (middle) and FLOR experimental run (bottom). Dotted regions indicate 5% significance level.

- FLOR fails to simulate seasonal change in relation - may be related to inaccurate phase-locking of ENSO.
- FLOR flux-adjusted run (FLOR-FA) has better phase locking of ENSO and thus simulates the seasonal change in relation.
- FLOR-EXP (experiment wherein FLOR-FA SSTs are prescribed in the tropical Pacific Ocean) supports the hypothesis.
- However, the GPLLJ-ENSO relation is weak - may be related to the inaccurate relation of the North Pacific SSTs with GPLLJ (work in progress).

Conclusions

- Observations suggest that a stronger GPLLJ is related to La-Niña during late spring and to El Niño during late summer.
- FLOR model fails to capture the seasonal change in relation between the GPLLJ and ENSO.
- We demonstrate the important role of ENSO phase-locking in capturing seasonal change in relation.
- In addition to the tropical Pacific SSTs, the North Pacific SSTs also play a crucial role in determining the variability of the GPLLJ.