# On the dynamics of the Caribbean Low Level Jet

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## Abstract

The Caribbean Low Level Jet (CLLJ) is a key element of the Mesoamerica Climate. Its intensification during July produces a westward displacement of the Inter-Tropical Convergence Zone (ITCZ) over the eastern Pacific that results in the Mid-Summer Drought (MSD), **Fig. 1**.

This acceleration is not produced by a strengthening of the North Atlantic Subtropical High (NASH). Over the Caribbean Sea the mass field adjusts to the wind field. The CLLJ is accelerated and decelerated through a dynamical interaction with high frequency transients. The meridional convergence of zonal momentum at 700 hPa around 15°N provides the required source of momentum for the zonal wind, **Fig. 2**.

The downward flux of zonal momentum to the 925 hPa occurs from May through July, due to subsidence over Caribbean. Such effect disappears from August through October resulting in deceleration of the CLLJ, **Fig. 3 and 4**.

The ageostrophic component of winds in the western Caribbean leads to enhanced precipitation around the Gulf of Panama, **Fig. 5**.

The meridional flux of relative vorticity in the CLLJ region forces an anticyclonic circulation to the north that results in an easterly wave guide deflecting northwestward towards central Mexico, contributing to an important percentage of summer precipitation over the region. South of the CLLJ, a cyclonic circulation is forced by transients, **Fig. 2 and 5**.

An intense CLLJ tends to reduce Perturbation Kinetic Energy (PKE) over the Caribbean and precipitation over most of the IAS. A moderate to weak CLLJ tends to enhance them, **Fig. 6**. The impact of transient mean flow interactions appears to be crucial for climate over Mesoamerica.

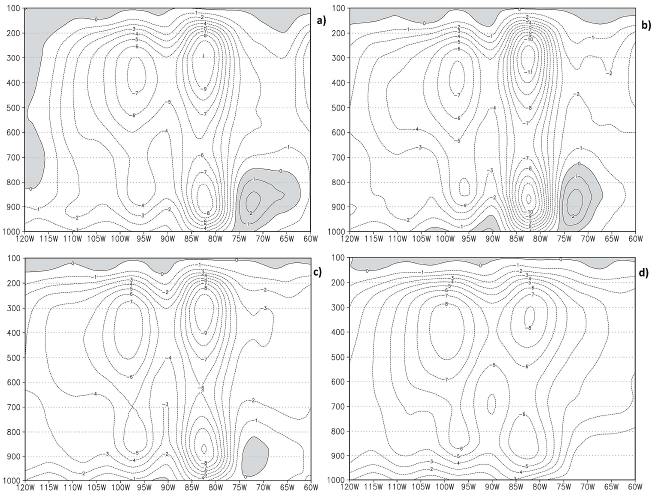

***Fig. 3*** *Vertical cross section of the omega field (hPa/s) x10$^{-2}$ along 12.5°N between 120W and 60°W during a) June, b) July, c) August, and d) September.*

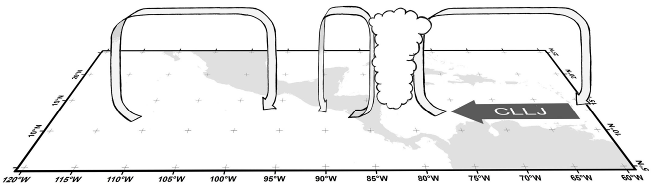


***Fig. 4*** *Diagram shows the state when MSD is in. CLLJ presents maxima of zonal wind. South of CLLJ exit region creates a deep convection doing a cell that has one point of return over de NE Pacific warm pool, with subsidence downward the convection is inhibited.*

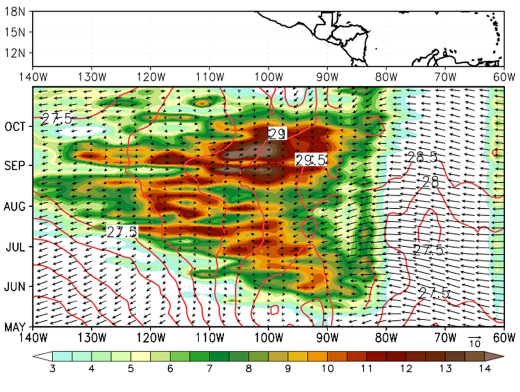

***Fig. 1*** *Hovmöller diagram of the climatology of pentad precipitation (mm/day), weekly sea surface temperature (°C) red lines, and 925hPa weekly winds averaged between 12.5°N and 15°N from 140°W to 60°W.*

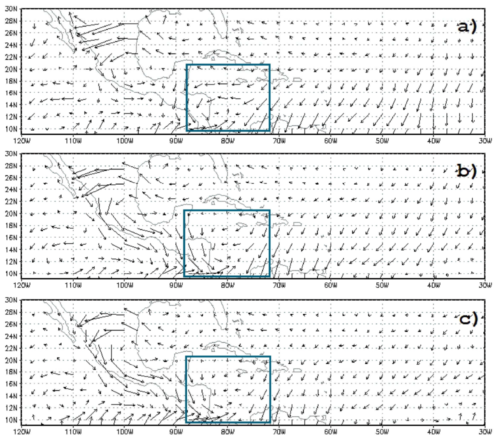

***Fig. 5*** *Ageostrophic wind (ms$^{-1}$) at 925 hPa: a) June, b) July and c) August (1979-2008 Climatology)*

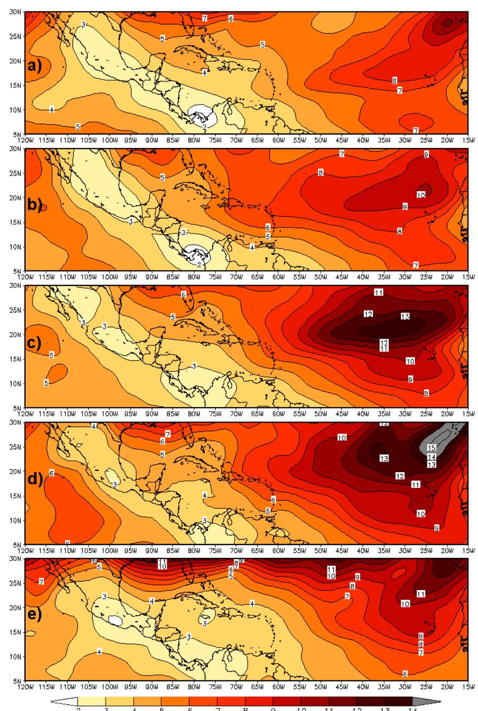

***Fig. 6*** *Perturbation Kinetic Energy (PKE m$^2$s$^{-2}$) of high frequency transients (3-9 days)$^{-1}$ at 700 hPa: a) June, b)July, c) August, d) September and e) October(Climatology)*

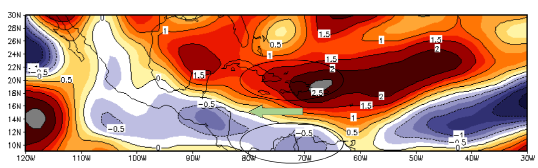

***Fig. 2*** *Meridional flux of zonal momentum (m$^2$s$^{-2}$) of high frequency transients (3-9 days)$^{-1}$ at 700hPa, in July (Climatology).*

**References**

1) Salinas-Prieto JA. 2006: Dinámica de ondas del este y su interacción con el flujo medio en el Caribe. *Ph. D. dissertation*, Universidad Nacional Autónoma de México, Centro de Ciencias de la Atmósfera, 109 pp, México.

2) Herrera, E., Magaña, V. and Caetano, E. (2013), The role of transients in the Mid Summer Drought over the Tropical Americas. AGU Meeting of the Americas.

http://moa.agu.org/2013/eposters/eposter/a21b-04/

3) Herrera, E., Magaña, V. and Caetano, E. (2014), Air–sea interactions and dynamical processes associated with the midsummer drought. *Int. J. Climatol.* **35**: 1569-1578. doi: 10.1002/joc.4077