Intertropical Convergence Zone Variability and your the relation with the hidroclimatology of Central America

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Abstract

The analysis of the statistics of the variations in position and intensity of the central axis of the Intertropical Convergence Zone (CM-ITCZ) in the different periods of the year, will provide a better understanding of their variability, their relationships oceanic and atmospheric phenomena and with Central America regional hydrology.

We will use several databases of oceanic and atmospheric data in order to determine through the variations of the center of mass and intensity of the ITCZ when and where the most intense influence (as precipitation surplus or defict) occurs during different times of the year.

The domain-average precipitation from two time series: one north of 11ºN and another south of 11ºN present contrasts on interannual to interdecadal time scales. In order to better understand the north–south precipitation contrasts, their interannual and decadal variations are studied in terms of how strong they depend on the intensity of the ITCZ and how the position of the ITCZ is dependent upon other climatic features such as tropical cyclones. When a tropical cyclone passes near Central America have noticed two situations: If the ITCZ is weak then the rains on the region are lower than when the ITCZ is well defined.

Furthermore we are also interested on how the location and intensity of the ITCZ are related to large-scale climatic patterns. Spatial moments (domain average, central latitude, and latitudinal spread) of zonally averaged precipitation anomalies along the Central America and the ocean around this region are analyzed, and each is correlated with global (MJO, SST and other) and local time series. The interannual band considered here corresponds to timescales that are particularly strong in tropical climate variations and thus is expected to contain much precipitation variability that is related to El Niño–Southern Oscillation; the decadal scale is defined so as to capture the whole range of long-term climatic variations affecting precipitation in the Central America region associated a the main component of rain in the zone: the ITCZ.

Study Scenario

Since -10 to 25º N and 100 to 55 ºW. Period 1979-2011.

Data

Analyze data of precipitation daily, monthly and annual series of:

Tropical Rainfall Measuring Mission (TRMM): 3-Hour 0.25 x 0.25 degree merged TRMM _3B42. Generate series used Mathlab of mass center and number of daily and monthly precipitation. 1998-2011.

Global Precipitation Climatology Project (GPCP): estimate monthly rainfall on a 2.5-degree global grid from 1979 to the present. The careful combination of satellite-based rainfall estimates.

Pedreros Precipitation Series : 2.5-degree- 1970-2004.

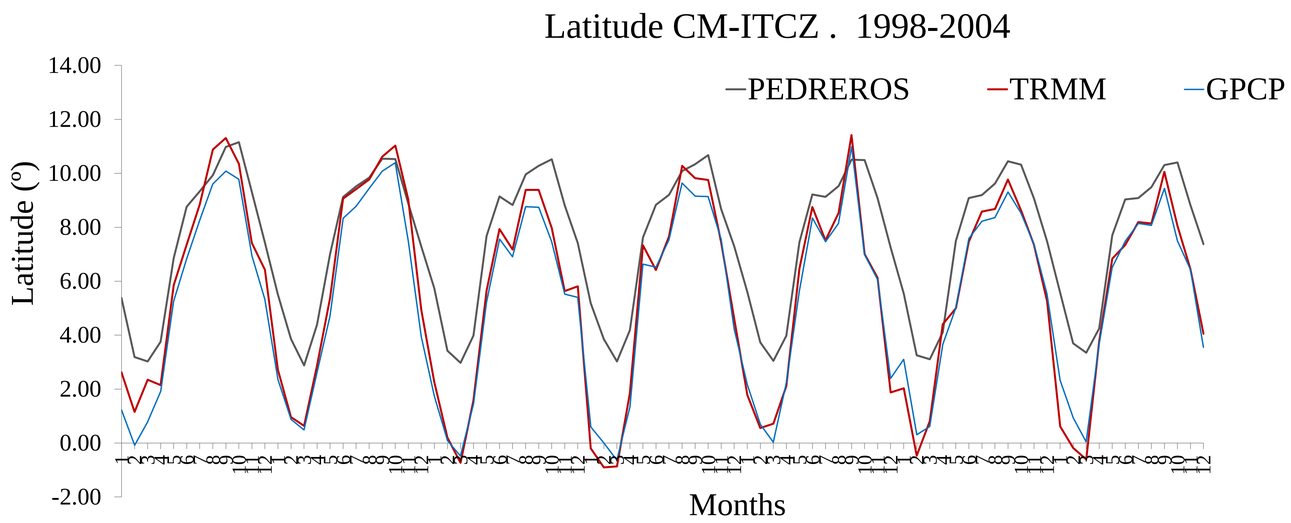
By comparison and correlations: **We will be use SST , AMO, MJO, Energy Cyclone Index, Ground data of meteorological stations in Central America (1970-2010). Hydrological data of Costa Rica basins.**

Background

North–South Precipitation Patterns in Western North America on Interannual-to-Decadal Timescales. M.D. Dettinger. D.R. Cayan, H.F. Diaz and D. M. Meko. 1998.

A shiftting band of rain. J.P. Sachs and C. L. Myhrvol. 2011

ITCZ rather than ENSO signature for abrupt climate changes across the tropical Pacific? G. Leduc , L.Vidal, K. Tachikawa, E. Bard.
The Central American Midsummer Drought: Regional Aspects and Large-Scale Forcing. R.J. Small and S. P. De Szoeke. S.P Xie. 2009.



Problem: Knowing the behaviour of the center of mass and the intensity of the ITCZ throughout the year and their interaction with different systems and atmospheric and oceanic phenomena.

In Central America there are distinct dry and wet extreme precipitation patterns resulting in significant economic and human lives losses. Knowing about the mechanisms of one of the main producers of rain in our country will allow us to better plan for activities affected by the scarcity or abundance of rain, allowing us to minimize losses. It is clear that in this context the variation of the interannual and decadal precipitation plays a large role in the economic and social roles of Central America.

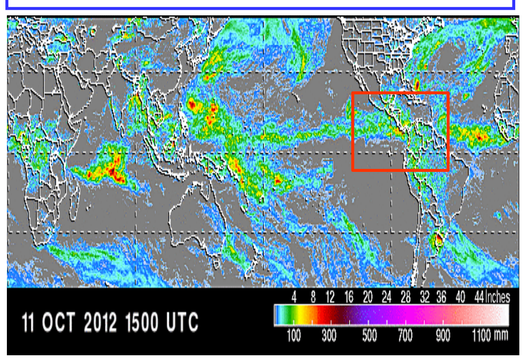
Advances

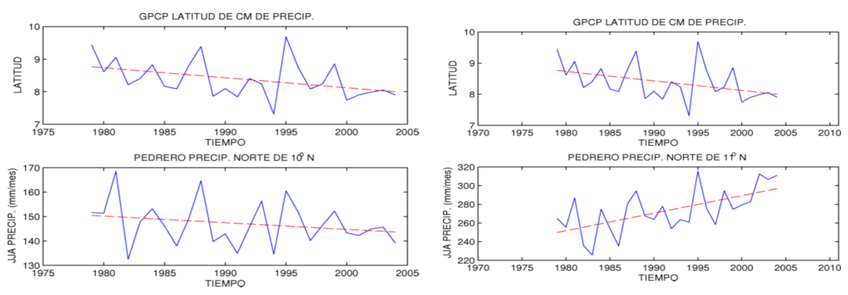
The movement of the ITCZ is responsible for the dry season and the rainy season for much of Central America and especially in Costa Rica, but also the intensity of this band of cloudiness is a vital factor in the influence and effect on weather systems as tropical cyclones..
So study the position of Centroid of the ITCZ will reveal the variability of this with events like El Niño or La Niña, with tropical systems and MJO.

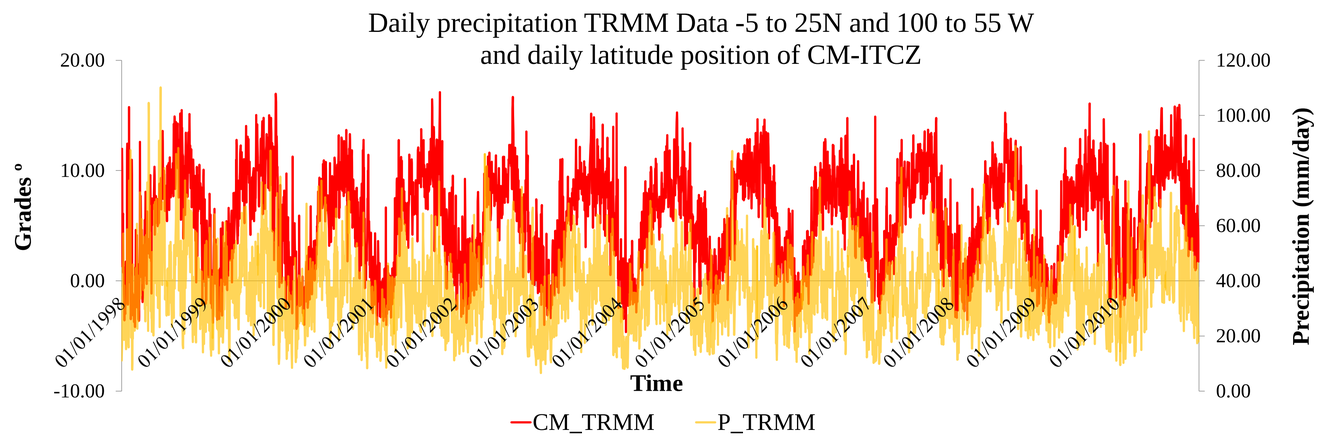
In the paleoclimatic analysis and modeling of global climate change there is a discrepancy between the expected position of the ITCZ during warm climates.

PRELIMINARY RESULTS

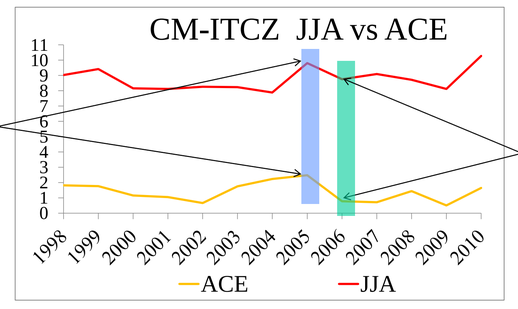
The position of central latitude of the ITCZ show more high correlation with the JJA precipitation of north of 11ºN than correlation of lower of 10-7ºN. A working hypothesis is that it is the intensity instead of the position what is more relevant to the variability of the 10-7ºN, precipitation.







2005
High number of cyclones
Wet Conditions



2006
Niño
Dry Conditions

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