# Intraseasonal variability of rainfall in the South Region of Guatemala during the years 1980 - 2015 influenced by the Madden Julian Oscillation

Paris Rivera, M.Sc.; Wuerner Ochoa, M.Sc.; Walter Bardales, M.Sc. & Marvin Salguero, Dr. [paris.rivera@gmail.com ], [wenerochoa@gmail.com ], [bardaleswa@gmail.com] & [marvinsal@gmail.com ]

Universidad de San Carlos de Guatemala

## ABSTRACT

In Guatemala, as in many parts of the world, climate analysis is based mainly on El Niño monitoring, Southern Oscillation (ENSO), climatic forecasts are generated that at the seasonal scale show good results but when it is necessary to analyze and predict the climate within of the seasons, that is to say month to month, these forecasts are not usually correct. There fore is very important to begin studying the variability of intra-seasonal climate because it would be possible to get closer to the most precisely prediction of when rain starts, when ends and how will be the temporary distribution. In the case of the regional seasonal forecasts, this result in represent the averages and accumulated of 3 or 4 months, which leaves without knowing the internal processes of that temporality that can be caused by some inter-seasonal fluctuation. This study will try to find the relationship between the MJO and rainfall in the territory, and then it will be possible to identify how it influences the distribution, quantity or temporality of it in the Southern Region of Guatemala, where the weather conditions, which are a direct factor in all activities, sometimes because of their scarcity and in others because of their surpluses, cause damage to various agricultural activities.

## SOUTHERN REGION OF GUATEMALA

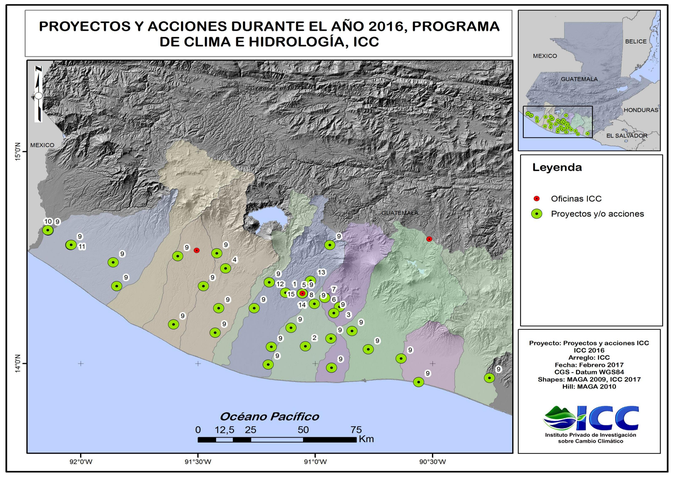


Figure 1. Study área. South Coast of Guatemala

## MADDEN–JULIAN OSCILLATION

The MJO was first discovered in the early 1970s by Dr. Roland Madden and Dr. Paul Julian when they were studying tropical wind and pressure patterns. They often noticed regular oscillations in winds (as defined from departures from average) between Singapore and Canton Island in the west central equatorial Pacific (Madden and Julian, 1971; 1972; Zhang, 2005).The MJO consists of two parts, or **phases**: one is the enhanced rainfall (or **convective**) phase and the other is the suppressed rainfall phase. Strong MJO activity often dissects the planet into halves: one half within the enhanced convective phase and the other half in the suppressed convective phase. These two phases produce opposite changes in clouds and rainfall and this entire **dipole** (i.e., having two main opposing centers of action) propagates eastward.

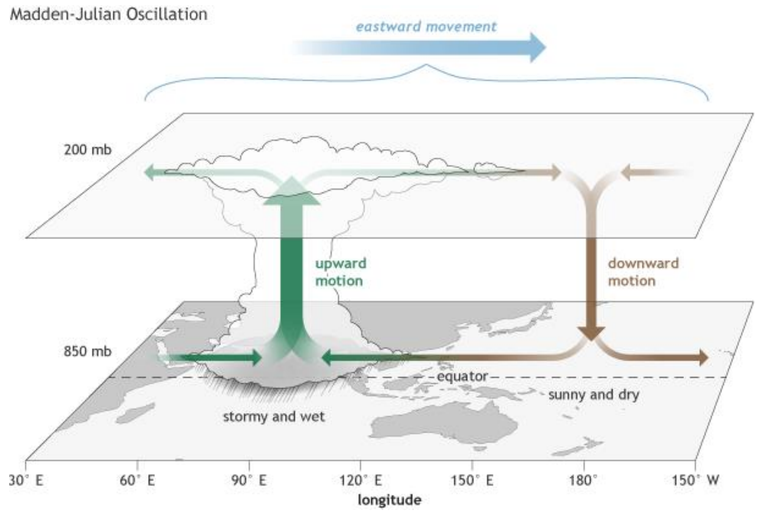


Figure 2. The surface and upper-atmosphere structure of the MJO for a period when the enhanced convective phase (thunderstorm cloud) is centered across the Indian Ocean and the suppressed convective phase is centered over the west-central Pacific Ocean. Horizontal arrows pointing left represent wind departures from average that are easterly, and arrows pointing right represent wind departures from average that are westerly. The entire system shifts eastward over time, eventually circling the globe and returning to its point of origin. Climate.gov drawing by Fiona Martin.

## OBJECTIVES

Define the influence of variability for the Madden Julian oscillation in the season of Rain of the Southern Region of Guatemala. A.) To analyze a chronological series of Rain and find its relationship with Julia Madden Oscillation. B.) Determine the changes of quantity of rain influenced for the Maddem Julian Oscillation.

## METHODS AND SOME RESULTS

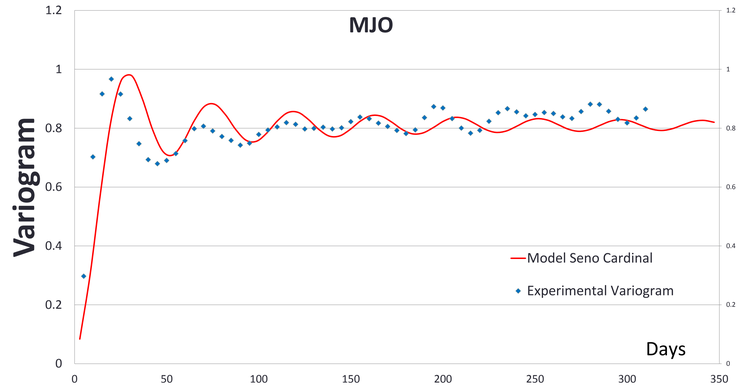


Figure 3. Variogram of the MJO. The stabilization is about 90 days. And the experimental variogram is some like the Seno Cardinal Model.

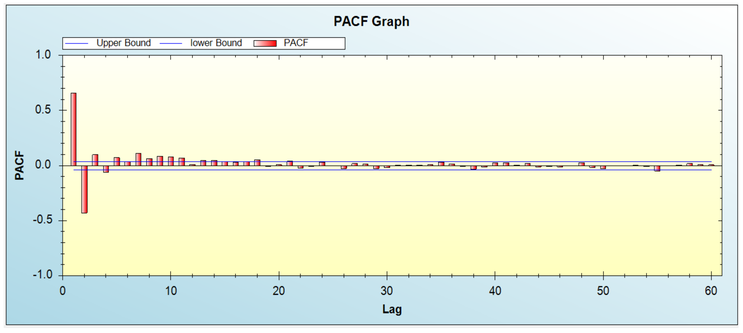


Figure 4. Correlaciogram of the MJO. Exist two principal signals, one positive and one negative in the Correlation Partial model, that's means that the variable can be seasonal.

## TIME SERIES OF ANOMALIES MJO INDEX, PP INDEX AND PP AVERAGE (SMOOTHED 60 DAYS.)

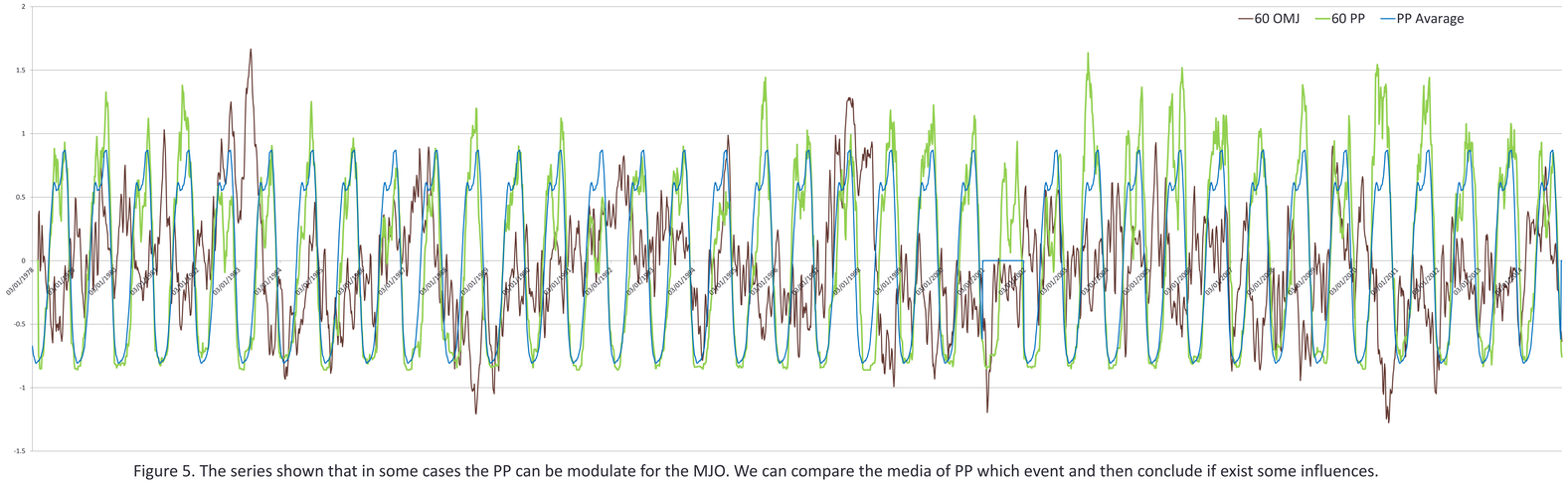


Figure 5. The series shown that in some cases the PP can be modulate for the MJO. We can compare the media of PP which event and then conclude if exist some influences.