We observed the decade-long (2000-2009) annual and seasonal diurnal cycles of rainfall over quarter degree pixels using quality (0.25° x 0.25°), with near round-the-clock sampling via ground-based radars and several networks of tipping bucket rain gauges. However, our approach is focused over smaller areas by satellites such as NASA's Tropical Rainfall Measuring Mission (TRMM). Several recent diurnal rainfall studies such as Sorooshian et al. (2002) have focused on the large scale diurnal cycle, as estimated during the spring months (March – May).

Our method is limited to quarter degree pixels that contain gauges. Pixels were grouped into three specific geographical regions: coastal, mid-range, and inland. The diurnal cycle of each region was determined by calculating the mean of all the pixels within that grid.

We analyzed each region’s mean daily rainfall rate, its corresponding rainfall intensity rmax and rmin, and other significant secondary modes.

### Introduction

Several recent diurnal rainfall studies such as Sorooshian et al. (2002) have focused on the large scale diurnal cycle, as estimated during the spring months (March – May). These studies have shown that diurnal rainfall can be a significant contributor to the annual cycle's late morning maximum. However, our approach is focused over smaller areas by satellites such as NASA's Tropical Rainfall Measuring Mission (TRMM). Several recent diurnal rainfall studies such as Sorooshian et al. (2002) have focused on the large scale diurnal cycle, as estimated during the spring months (March – May).

During the autumn months (September – November), tmax occurs in the afternoon for all regions and all data sets. Coastal pixels have the highest rmax values for gauge data whereas rmax for radar data is highest for mid-range pixels. Climatology and radar data suggest that the convergence zone establishes itself between mid-range and inland pixels. Two secondary modes occur during the overnight to morning hours. Rainfall rates are significantly lower with a minimum occurring during the early morning hours and a maximum occurring during the afternoon.

**Gauge Data**

- **Inland:** rmax = 0.3% (0.04%)
- **Mid-range:** rmax = 4.4% (0.44%)
- **Coastal:** rmax = 10.7% (1.07%)

**Radar Data**

- **Inland:** rmax = 0.1% (0.01%)
- **Mid-range:** rmax = 2.1% (0.21%
- **Coastal:** rmax = 11.0% (1.10%)

### Annual Diurnal Rainfall Cycle

- **Tmax for all regions and both data sets occurs in the afternoon.** Coastal pixels have the highest rmax values, suggesting the convergence zone is prevalent there.
- **Maritime convection develops after midnight due to gravity waves emitted by land heating (Mapes et al. 2002).** These showers move toward the coast and contribute to a small early morning mode.
- **The area of maximum rainfall is closest to the coast during the winter.** This pattern is consistent with a diurnal cycle where the sun is low on the horizon.
- **The area of maximum rainfall moves inland during the summer months has the greatest influence on the annual cycle.** This pattern is consistent with a diurnal cycle where the sun is high on the horizon.

### Summer Diurnal Rainfall Cycle

- **During the spring months (March – May),** the sun is low on the horizon and the area of maximum rainfall moves inland. The area of maximum rainfall is closest to the coast during the winter. The area of maximum rainfall moves inland during the summer months has the greatest influence on the annual cycle. This pattern is consistent with a diurnal cycle where the sun is high on the horizon.

### Autumn Diurnal Rainfall Cycle

- **During the autumn months (September – November),** the area of maximum rainfall is closest to the coast during the winter. The area of maximum rainfall moves inland during the summer months has the greatest influence on the annual cycle. This pattern is consistent with a diurnal cycle where the sun is high on the horizon.

### Winter Diurnal Rainfall Cycle

- **During the winter months (December – February),** the sun is high on the horizon and the area of maximum rainfall moves inland. This pattern is consistent with a diurnal cycle where the sun is high on the horizon.

### Spring Diurnal Rainfall Cycle

- **During the spring months (March – May),** the sun is low on the horizon and the area of maximum rainfall moves inland. This pattern is consistent with a diurnal cycle where the sun is low on the horizon.

### References


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