

THE INFLUENCE OF THE INTER TROPICAL CONVERGENCE ZONE ON SRI LANKA CLIMATE

¹N. Jeyadharushan and ²V. Nandakumar

¹Vavuniya Campus, University of Jaffna
²University of Peradeniya.

Keywords: *Inter Tropical Convergence Zone (ITCZ), Monsoon season, Thunderstorm, Tropical cyclones*

Introduction

The location of Sri Lanka, within the tropics between 5° 55' to 9° 51' North latitude and between 79° 42' to 81° 53' East longitude, the climate of Sri Lanka could be characterized as tropical and very much influenced by Inter Tropical Convergence Zone (ITCZ). Near the equator, from about 5° north and 5° south, the northeast trade winds and southeast trade winds converge in a low pressure zone known as the Inter Tropical Convergence Zone (Fig. 1). The ITCZ is also known as the Equatorial Convergence Zone or Inter tropical Front. The ITCZ was originally identified from the 1920s to the 1940s as the "Inter tropical Front" (ITF), but after the recognition in the 1940s and 1950s of the significance of wind field convergence in tropical weather production, the term "ITCZ" was then applied. When it lies near the equator, it is called the near-equatorial trough. Where the ITCZ is drawn into and merges with a monsoonal circulation. Due to Rainfall in Sri Lanka has multiple origins, Monsoonal, Convective and expressional rain accounts for a major share of the annual rainfall. The mean annual rainfall varies from under 900 mm in the driest parts (south eastern and north western) to over 5000mm in the wettest parts (western slopes of the central highlands).

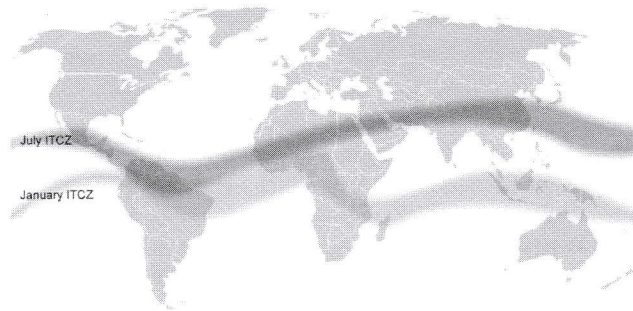


Figure 1: Inter Tropical Convergence Zone (ITCZ)

The Inter tropical Convergence Zone has been called the doldrums by sailors due to the lack of horizontal air movement but its erratic weather patterns with stagnant calms and violent thunderstorms (the air simply rise with convection). Solar heating in the region forces air to rise through convection which results in a plethora of precipitation. The ITCZ is a key component of the global circulation system.

The location of the ITCZ varies throughout the year and while it remains near the equator, the ITCZ over land ventures farther north or south than the ITCZ over the oceans due to the

variation in land temperatures. The location of the ITCZ can vary as much as 40° to 45° of latitude north or south of the equator based on the pattern of land and ocean.

The ITCZ follows the sun in that the position varies seasonally. It moves north in the northern summer and south in the northern winter. The Climate of Sri Lanka is dominated with sifting of the ITCZ, the Climate experienced during 12 months period in Sri Lanka can be characterized in to 4 climate seasons as follows.

Methodology

The Secondary Rainfall Data used for analysing and find out the variation among the seasons

1. First Inter monsoon season - March - April
2. Southwest monsoon season - May - September
3. Second Inter monsoon season - October - November
4. Northeast monsoon season - December - February

First Inter monsoon season (March - April): The motion of the Hadley cell, which is driven by intense solar heating, induces the formation of the ITCZ, which provides precipitation (Fig.2).

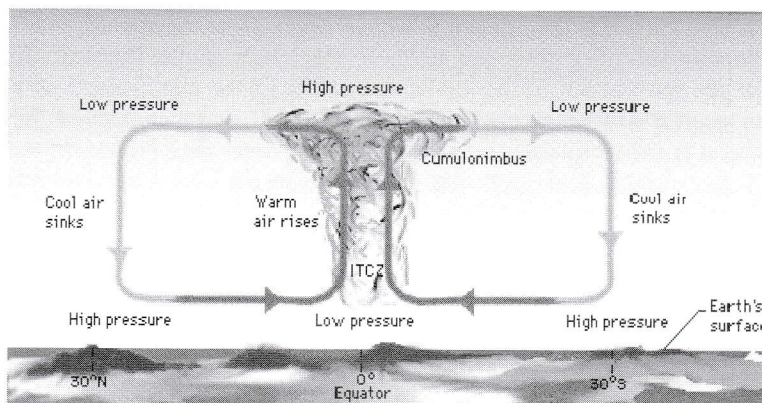


Figure 2: First Inter monsoon season

The Inter tropical Convergence Zone, known also as the doldrums or ITCZ, is the main focal point for showers and thunderstorms in the tropics. The reason for this is that northeasterly trade winds to the north of the ITCZ meet southeasterly trade winds from the south. The piling up of air near the surface due to the converging winds forces the warm, humid air over the tropical oceans to rise. As the air rises, it cools and water vapor condenses into clouds and rain. If conditions are favorable, some clusters of thunderstorms that form along the ITCZ can grow into hurricanes. The ITCZ's position fluctuates during the different seasons. The graphic above shows the typical position of the ITCZ during the northern hemisphere's summer. During the northern hemisphere's winter, the ITCZ migrates southward to just south of the equator in some areas (Semyon A. Grodsky and James A. (2003). There's a diurnal cycle to the precipitation in the ITCZ. Clouds form in the late morning and early afternoon hours and then by 3 to 4 p.m., the hottest time of the day, convective thunderstorms form and precipitation begins. These storms are generally short in duration.

Warm and uncomfortable conditions, with thunderstorm-type rain, particularly during the afternoon or evening, are the typical weather conditions during this season. The distribution

of rainfall during this period shows that the entire South-western sector at the hill country receiving 250 mm of rainfall, with localized area on the South-western slopes experiencing rainfall in excess of 700 mm (Keragala 771 mm). Over most parts of the island, the amount of rainfall varies between 100 and 250 mm, the exception being the Northern Jaffna Peninsula (Jaffna- 78 mm, Elephant pass- 83 mm). (*Suppiah. R and Yoshino M. M., 1984*)

Southwest monsoon season (May - September): The Sri Lanka rainfall pattern is influenced by the monsoon winds of the Indian Ocean and Bay of Bengal and is marked by four seasons. The ITCZ moves further away from the equator during the Northern summer than the Southern one due to the North-heavy arrangement of the continents. From mid-May to September, winds originate in the southwest bringing moisture from the Indian Ocean. When these winds encounter the slopes of the Central Highlands, they unload heavy rains on the mountain slopes and the southwestern sector of the island, Sri Lanka. Some of the windward slopes receive up to 2,500 mm (98.4 in) of rain per month, but the leeward slopes in the east and northeast receive little rain.

Windy weather during this monsoon eases off the warmth that prevailed during the 1st Inter monsoon season. Southwest monsoon rains are experienced at any times of the day and night, sometimes intermittently mainly in the South western part of the country. Amount of rainfall during this season varies from about 100 mm to over 3000 mm. The highest rainfall received in the mid-elevations of the western slopes (Ginigathhena- 3267 mm, Watawala- 3252 mm, Norton- 3121 mm). Rainfall decreases rapidly from these maximum regions towards the higher elevation, and in Nuwara-eliya drops to 853 mm. The variation towards the Southwestern coastal area is less rapid, with the Southwestern coastal belt experiencing between 1000 mm to 1600 mm of rain during this 5 month long period. Lowest figures are recorded from Northern and Southeastern regions.

Second Inter-monsoon season (October-November): In October and November, inter monsoonal months. During this season, periodic squalls occur and sometimes tropical cyclones bring overcast skies and rains to the southwest, northeast, and eastern parts of the island.

The thunderstorm-type of rain, particularly during the afternoon or evening, is the typical climate during this season. But unlike in the first inter monsoon season, the influence of weather system like depression and cyclones in the Bay of Bengal is common during the second inter monsoon season. Under such conditions, the whole country experiences strong winds with wide spread rain, sometimes leading to floods and landslides.

The second Inter monsoon period of October – November is the period with the most evenly balanced distribution of rainfall over Sri Lanka. Almost the entire island receives in excess of 400 mm of rain during this season, with the Southwestern slopes receiving higher rainfall in the range 750mm to 1200 mm (Weweltalawa Estate in Yatiyantota recording 1219 mm).

North east monsoon season (December - February): During December to Feb. monsoon winds come from the northeast, bringing moisture from the Bay of Bengal. The northeastern slopes of the mountains may be inundated with up to 1,250 mm (49.2 in) of rain during these months. Another inter monsoonal period occurs from March until mid-May, with light, variable winds and evening thundershowers.

The dry and cold wind blowing from the Indian land-mass will establish a comparatively cool, but dry weather over many parts making the surrounding pleasant and comfortable

weather except for some rather cold morning hours. Cloud-free skies provide days full of sunshine and pleasant and cool night. During this period, the highest rainfall figures are recorded in the North, Eastern slopes of the hill country and the Eastern slopes of the Knuckles/Rangala range. The maximum rainfall is experience at Kobonella estate (1281 mm), and the minimum is in the Western coastal area around Puttalam (Chilaw- 177 mm) during this period.

Discussion and Conclusion

The rainfall pattern is influenced by the ITCZ and monsoon winds of the Indian Ocean and Bay of Bengal and is marked by four seasons. The first inter monsoonal period occurs from March until mid-April, with light, variable winds and evening thundershowers. Second season is from mid-May to September, when winds originate in the southwest, bringing moisture from the Indian Ocean. When these winds encounter the slopes of the Central Highlands, they unload heavy rains on the mountain slopes and the south western sector of the island. Some of the windward slopes receive up to 2500 mm of rain per month, but the leeward slopes in the east and northeast receive little rain. The third season occurs in October and November, inter monsoonal months. During this season, periodic squalls occur and sometimes tropical cyclones bring overcast skies and rains to the southwest, northeast, and eastern parts of the island. During the fourth season, December to February, monsoon winds come from the northeast, bringing moisture from the Bay of Bengal. The north eastern slopes of the mountains may be inundated with up to 1250 mm of rain during these months.

References

- Barry, Roger Graham; Chorley, Richard J. (1992). *Atmosphere, weather and climate*. London: Routledge. ISBN 9780415077606. OCLC 249331900.
- Semyon A. Grodsky and James A. (2003), *The Inter tropical Convergence Zone in the South Atlantic and the Equatorial Cold Tongue*, University of Maryland, College Park.
- Suppiah. R and Yoshino M. M., (1984), *Rainfall Variations of Sri Lanka Part 1: Spatial and temporal patterns*, Meteorology and Atmospheric Physics , Volume 34, Numbers 4, Pages 329-340
- Suppiah. R and Yoshino M. M., (1984), *Rainfall Variations of Sri Lanka, Part 2*, Meteorology and Atmospheric Physics , Volume 35, Numbers 1-2, Pages 81-92