

**THE CLIMATE TRENDS OVER SOUTH ASIA
AND THEIR INFLUENCE
ON SRI LANKA.**

A THESIS SUBMITTED

BY

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**in fulfillment of the requirement
for the award of degree of**

MASTER OF PHILOSOPHY

**DEPARTMENT OF PHYSICS
FACULTY OF NATURAL SCIENCES
THE OPEN UNIVERSITY OF SRI LANKA
NAWALA, NUGEGODA**

(June, 2006)



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Abstract

Sea Surface Temperature (SST), Outgoing Longwave Radiation (OLR) data and Rainfall data were used to investigate the relationships between SST, OLR in the Indian Ocean with Sri Lankan rainfall during the periods of 1971 to 1990 (SST), 1974 to 1990 (OLR) and 1900 to 1996 (Rainfall). A statistically significant positive correlation was observed between South West Monsoon (SWM) / North East Monsoon (NEM) rainfall of Sri Lanka and SST in the Indian Ocean. A negative correlation was found between SST and rainfall during three months of lag of SST before SWM rain onset over the region. It is found that during an El-Nino year high SST ($>29^{\circ}\text{C}$) field covers a large area over the Indian Ocean centered the equator compared to a normal year. From June, the area north of the equator in Indian Ocean warms very rapidly and gradually moves northward. Different types of SST anomalies were found during El-Nino and La-Nina years in the Indian Ocean. During El-Nino / La-Nina years, Indian Ocean shows negative / positive SST anomalies. Positive / negative SST anomalies were observed in the western Indian Ocean towards the western Pacific Ocean prior to a El-Nino / La-Nina events. During the 20 years time period, decadal SST in the seventies was cold and the decadal SST in the eighties was warm. It was found that most of the regions show an increasing trend in SST during the time period of 1970 to 1990. The highest strong increase was observed in the region RY2 (0.02924°C per year). Roughly a 5-year fluctuation in SST in several regions was observed and an increase of SST was observed in the surrounding ocean of Sri Lanka after 1978. The OLR fluctuation in the study domain showed a changing pattern in the time period of 8-9 years. There is an increasing trend in convective activity in the study domain after 1982. During the months of January to March, North / South of the equator experienced to low / high convective activity during an El-Nino year. Convective activity decreases over the Indian sub continent and maritime continent from May to August during an El-Nino year as compared to a normal year. Influence of OLR field on the SWM / NEM rainfall was

evident. Strong correlations were found with a significant level $p < 0.05$ for the regions in Western / Eastern Indian Ocean with a one month lag. It was observed that there was a positive and negative OLR anomaly propagates towards the Pacific Ocean from eastern Indian Ocean prior to El-Nino / La-Nina events. It was found that SST in the Indian Ocean has a significant relationship with the rainfall in Sri Lanka during an El-Nino / La-Nina year. It was evident from the study, that there was a clear influence of El-Nino / La-Nina phenomenon over the Indian Ocean. Further, it was also observed that during an El-Nino year there was a reduction in rainfall over the northern part of the island during NEM season. The 1st inter-monsoon recorded less than normal rainfall and the 2nd inter-monsoon rainfall was above normal. El-Nino / La-Nina phenomenon energetically affects the North East Monsoon rainfall. During May central and northern part received more rain while in December only the Southwestern part received extensive rain.

It was observed that quasi-biennial oscillation was prominent in the country's rainfall. Five year and ten year periodicity of rainfall fluctuation was dominant in the Dry zone. It was found that there was a decreasing trend in rainfall in Sri Lanka. However, decrease in the Wet zone is stronger than in the Dry zone. When the Wet zone rainfall is considered, highest decreasing trends were found in Nuwara Eliya and Kandy. Further, it was found that only Colombo exhibits increasing trend in rainfall of 0.15 mm / Year. Decreasing trend of rainfall was observed in Dry Zone / Wet zone during the time periods of 1918-1952, 1963-1978 / 1928-1953, 1961-1985.