

Century Scale Climate Change in the Central Highlands of Sri Lanka

Jayanka De Silva and Upul J. Sonnadara
Department of Physics, University of Colombo, Sri Lanka

ABSTRACT

An analysis of century scale climate trends in the central highlands of Sri Lanka is presented. Monthly rainfall and temperature records of the period 1869 – 2006 from five climatological stations were analyzed. The trend is calculated by the least squares regression analysis and the significance of the observed trend is estimated using the Mann Kendall statistic. The results clearly show that there is a statistically significant decrease in annual rainfall in the western slopes of the central highlands. Throughout the last century, the annual reduction of rainfall in Nuwara Eliya which is at an altitude of 1,895 m was 5.2 mm/year. The decrease is largely due to the reduction in southwest monsoon rainfall which contributes to 75% of the total reduction. No significant change was observed on the eastern side of the central highlands which receives rainfall predominantly from the northeast monsoons. The mean annual temperature in the mountainous region shows a uniform increasing trend which is in line with the 100-year global temperature increase of 0.8 ± 0.2 °C. Kandy, which is at an altitude of 477 m and closely linked with the rainfall climatology of Nuwara Eliya, showed no significant change in the mean annual temperature. If the current trend continues, in another 100 years, western and eastern slopes of central highlands will receive the same amount of rainfall from the southwest monsoon and the northeast monsoon which will have far reaching consequences for Sri Lanka's economy and the ecology of the hill country.

Keywords: Climate change, Trend analysis, Mann Kendall statistic, Hill country, Monsoons

1. INTRODUCTION

In recent years, a number of research studies have reported the variability and trends that have taken place in the global as well as regional level climate systems (IPCC 2007). While temperature has been increasing globally, rainfall is seen to fluctuate across regions. Global land precipitation has increased by a small amount (a trend of 0.9 mm/decade) during the last century with considerable variability in decadal scales (New et. al. 2001). The dominant mode of inter-annual variability in land precipitation is linked to the El-Nino/Southern Oscillation (ENSO) episode. Positive trends are found for annual precipitation in most parts of the world with some exceptions such as North Africa. An increase in rain intensities has been reported for selected countries in the Northern and Southern hemisphere covering 40% of the land mass, while the total number of rainy days has remained relatively stable (Groisman et. al. 1999). In India, Sri Lanka's neighbour, evidence has emerged regarding the increase in the frequency of extreme rainfall events during the last century, with increasing and decreasing trends in different regions (Roy and Balling 2004). Especially, the southwest monsoon rainfall has shown significant decreasing trends over a number of states including Kerala (Krishnakumar et. al. 2009).

There are several studies available in literature that discusses the short-term as well as long-term trends in annual and seasonal rainfall over Sri Lanka. A recent analysis carried out with long term (>100 years) rainfall time series revealed a fluctuation in seasonal rainfall in Sri Lanka (Malmgren et. al. 2003). Statistically significant trends (both increasing and decreasing) related to the Southwest monsoon season (May-September) were found to exist for some stations while no changes were seen for the northeast monsoon season (October-