

Analysis of changes in the mean rainfall patterns in Sri Lanka

Peiris K.N.C.,¹ Pathirana G.,² Atapaththu K.S.S.,^{1*} Wang D.,³ Priyadarshana T.¹

¹ *Department of Limnology and Water Technology, Faculty of Fisheries and Marine Sciences & Technology, University of Ruhuna, Sri Lanka.* ² *Department of Oceanography and Marine Geology, Faculty of Fisheries and Marine Sciences & Technology, University of Ruhuna, Sri Lanka.* ³ *Sun-Yat Sen University, Zhuhai, China*

In parallel with climate changes, understanding tropical rainfall dynamics becomes crucial for effective decision-making in agriculture, water management, and disaster preparedness. Sri Lanka, situated in the tropical Indian Ocean (IO), is particularly vulnerable to climatic shifts, especially concerning rainfall patterns. Despite this vulnerability, changes in mean rainfall remain underexplored, highlighting a critical research gap. The present study addressed this gap by examining shifts in mean precipitation in a warming climate context. The observational and reanalysis data (1990-2023) were analyzed to identify a midpoint marking a significant change in rainfall mean state, using statistical tests and sea surface temperature (SST) trends. This midpoint was then applied to analyze rainfall and associated climate mechanisms across Sri Lanka. Our analysis reveals a notable increase in mean rainfall after 2009. The changes in arid, dry, wet, and intermediate zones were 0.31, 0.74, 0.58, and 0.18 mm day⁻¹ respectively. These increases are linked with large-scale ocean-atmosphere dynamics, including shifts in wind patterns, SST, moisture convergence, and vertical wind velocity. Specifically, the rise in SST in the IO and the resultant circulation patterns have enhanced moisture convergence, driving the observed rainfall increase from 2009 to 2023 compared to the preceding period. Our findings provide vital insights for shaping sustainable policies aligned with SDG 13 on climate action.

Keywords: Climatic zones, Indian Ocean region, Rainfall mean state

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**Corresponding author: keerthi@fish.ruh.ac.lk*