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Isopluvial Maps of Kerala using IMD Gridded Rainfall Data

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ABSTRACT

Rainfall characteristics are an essential input for the design of water management infrastructures such as dams, reservoirs, culverts, drains, etc. Engineers often make use of isopluvial maps to estimate design floods for the planning and design of such hydraulic structures. However, intensification of the hydrologic cycle in changing climate has perturbed the frequency and intensity of rainfall events, and are expected to increase in the future. The recent occurrence of frequent extreme rainfall events (EREs) in changing climate have hampered the stability of hydraulic structures, warranting a timely review of the rainfall characteristics considered in hydraulic designs. An overestimated/ underestimated design flood will lead to uneconomical or unsafe designs. The Indian Meteorological Department (IMD) provides the isopluvial maps of Kerala using station rainfall data, but the latest report was released in 2009. Although the probability for the occurrence of EREs over Kerala is very low, the recent years (2018, 2019, and 2020) witnessed the occurrence of multiple EREs across Kerala. In this context, the present study aims to prepare isopluvial maps of Kerala, and evaluate its evolution under the influence of the recent EREs. Isopluvial maps of return periods of 2, 5, 10, 25, 50, and 100 years are developed using 122 years of IMD gridded rainfall data (1901 – 2022) at a spatial resolution of 0.25°. The results show an increase in rainfall for all the return periods except 2 years. This is a typical characteristic of the impact of climate change, whereby an increase in rainfall intensity is observed with a decrease in rainy days. In other words, rainfall events of larger return periods are more intense.

Keywords: climate change; isopluvial map; extreme rainfall events