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Analysing the relation between changepoint year, elevation, and land cover over lower Columbia River basin in North America

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Three homogeneity tests were carried out on the lower Columbia River basin namely, Standard normal homogeneity test, Pettit test and Buishand test for daily gridded rainfall data having spatial resolution of 0.5° spanning a period of 43 years from 1980 to 2022. These tests were employed to estimate the breakpoint year for each grid and plotted on a map for spatial visualization. It was observed that a close relation follows between the elevation of a place, its changepoint year and the land use land cover of that area. The elevation of an area affects the direction of propagation of moisture laden winds that are developed over the Southwestern part of US from Pacific Ocean and gulf of California. And eventually governing where and how much precipitation they will bring. Additionally, the land cover of an area governs the amount of evapotranspiration and hence the pressure difference between the moisture laden winds and the atmosphere over that land cover. When the daily precipitation records of 4 decades were analysed for homogeneity and changepoint year observed spatially, it was noted that a particular elevation and land cover showed similar breakpoint and a trend is being followed. This study provides a novel way of understanding the behaviour of changing precipitation patterns taking into account the long-term variability of 4 decades.

Keywords: Homogeneity test, Change point analysis, Land use land cover, Lower Columbia River basin