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Analysis of the Impact of Climate Change on Extreme Hydrological Events in California

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Estimating magnitude and occurrence frequency of extreme hydrological events is required for taking preventive remedial actions against the impact of climate change on the management of water resources. Examples include: characterization of extreme rainfall events to predict urban runoff, determination of river flows, and the likely severity of drought events during the design life of a water project. In recent years California has experienced its most severe drought in recorded history, causing water stress, economic loss, and an increase in wildfires. In this paper we describe development of a Climate Change Toolkit (CCT) and demonstrate its use in the analysis of dry and wet periods in California for the years 2020-2050 and compare the results with the historic period 1975-2005. CCT provides four modules to: i) manage big databases such as those of Global Climate Models (GCMs), ii) make bias correction using observed local climate data , iii) interpolate gridded climate data to finer resolution, and iv) calculate continuous dry- and wet-day periods based on rainfall, temperature, and soil moisture for analysis of drought and flooding risks. We used bias-corrected meteorological data of five GCMs for extreme CO_2 emission scenario rcp8.5 for California to analyze the trend of extreme hydrological events. The findings indicate that frequency of dry period will increase in center and southern parts of California. The assessment of the number of wet days and the frequency of wet periods suggests an increased risk of flooding in north and north-western part of California, especially in the coastal strip.

Keywords: Climate Change Toolkit (CCT), Extreme Hydrological Events, California