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"Approaches to understanding decadal and long-term shifts in observed precipitation distributions in Victoria, Australia"

Abstract:

"Over the past century, rainfall totals in Australia's south-eastern state of Victoria have shown multi-decadal variability without clear trends. This has impacted agriculture, water security, ecosystem services, and flood hazards. Hydrological and meteorological evidence suggests that Victorian rainfall regimes have changed since the beginning of the Millennium Drought in 1997. Until now, Victorian precipitation intensity distributions have not been assessed in detail. We assess the time-varying aspect of precipitation intensity distributions not through trends, but by identifying temporal shifts in Victorian rainfall and using those different epochs to assess multi-decadal changes in rainfall characteristics. We analysed sub-daily to multi-day rainfall distributions from 1900 to 2020 for three regions and four seasons. Distributions are significantly different for the three epochs defined as 1900 to 1945, 1946 to 1996, and 1997 to 2020. We summarised precipitation distributions by categorising precipitation intensities, calculating histograms, and fitting gamma distributions.

"This study provides evidence that Victorian precipitation distributions have shifted over decades, and distributions depend on regional and seasonal differences. Recent rainfall declines are mostly due to decreasing light and moderate rainfall, despite increasing heavy rainfall. Heavy rainfall has shown a tendency to increase in frequency since 1997. Increases were greatest for six-hour springtime and summertime precipitation in northern Victoria and wintertime precipitation in southern and eastern Victoria. Observed precipitation distributions show changes that are consistent with climate projections. To better understand processes driving observed and projected changes to precipitation distributions across the world, interdecadal shifts, seasonal variations, and regional climates need to be considered."