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Intensification of future low-flow events in relation to projected changes in large-scale climate drivers due to climate change

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Large-scale climate processes such as the El Nino Southern Oscillation (ENSO), Indian Ocean Dipole (IOD) and Southern Annular Mode (SAM) influence the hydro-climatology of Southeast Australia (SEA). In the present study, we show that low-flow events in many catchments in SEA are significantly influenced by variability in these climate drivers. Extreme value distributions and Generalised Linear Models (GLMs) are used here to model low-flow characteristics such as intensity, duration and frequency with respect to these climate drivers. Further, we study how the future projections of ENSO, IOD and SAM are likely to evolve under climate change by examining the projected values of their representative indices and how they will impact low-flow events in the region. It is found that the future dry phases of these climate drivers are likely to be more dry than those in the historic period. This in turn is expected to lead to intensification of low-flow events in the future, resulting in lower availability of fresh water during occurrences of the dry phases of these climate drivers. Thus, climate change in the future is expected to significantly influence future low-flow events in the region thereby making it even more crucial for water managers to adequately manage and ensure water availability.

Keywords: low-flows, ENSO, IOD, SAM, Extreme Value Theory, Generalised Linear Models, Southeast Australia, CMIP5, RCP8.5.