

Impacts of climate change on temperature in New South Wales, Australia

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ABSTRACT

Climate change affects many aspects of the environment. One of these effects is a rising temperature. It is evident that both the intensity and duration of heat waves are increasing in Australia. However, there is a lack of research on its spatial and temporal variability. In this doctoral research, temperature data from New South Wales (NSW) are analysed to understand how the heat waves are changing in NSW due to climate change. Also, temperature intensity-frequency-duration (TDF) curves are developed for NSW, which will have possible applications in bush fire management and heat wave mitigation. This study addresses the following research questions:

1. Does the historical NSW temperature data present any statistically significant trend in the temperature indices and heat wave indices?
2. How the trends in temperature and heat waves are related with various climate change indices (SOI, ENSO, AMO, SAM)?

3. How to evaluate the spatial and temporal variation of trends in the selected temperature indices in NSW due to climate change?
4. How TDFs in NSW are linked with climate indices?

For this study, 36 weather stations are selected from NSW states of Australia covering the period 1989–2018. Preliminarily trends in temperature extremes are investigated by means of Mann–Kendall (MK), Sen's slope estimator and linear regression methods. Three indices, focusing on daily maximum temperature (TX90pct), daily minimum temperature (TN90pct), and average daily temperature (EHF), are investigated for heatwaves with different durations (1, 5 and 10 days) in relation to intensity, frequency, duration and first occurrence parameters. Finally, the influences of three global climate drivers, El Niño/Southern Oscillation (ENSO), the Indian Ocean Dipole (IOD), and the Southern Annular Mode (SAM), are investigated. The findings of this study will be useful in formulating strategies for managing the impacts of extreme temperature events in NSW.