

Why Victoria's autumn rainfall declined



A rainy morning in the Victorian Goldfields. Dave Townsend, iStockphoto

Fluctuations in sea-surface temperatures to the north of Australia and changes in atmospheric circulation patterns over the subtropical Indian Ocean have been identified as key factors leading to a significant decline in rainfalls in south-eastern Australia since 1950.

According to a report from a CSIRO Wealth from Oceans Flagship study – published in May in the science journal *Geophysical Research Letters* – since 1950 Victoria has suffered a 40 per cent decline in autumn rainfall (March to May) compared to the average recorded between 1961 and 1990.

The report's authors, CSIRO's Dr Wenju Cai and Tim Cowan, say the decline has been most prominent in May, which accounts for about half of the total seasonal reduction.

The identified causes show imprints of climate change influences, in part through a reduction in the number of La Niña events, and in part through changing weather systems originating from the subtropical Indian Ocean that are conducive to late autumn rainfall across Victoria.

The researchers found that since 1950 the spatially alternating high and low pressure systems (called pressure wave-trains) conducive to rainfall over southern Victoria in May have been weakening, leading to rising sea level atmospheric pressure over south-east Australia.

'This weakening is reinforced by a warming of the Indian Ocean, which is at

least in part due to global warming,'

Dr Cai says. 'This suggests that a component of climate change is active in southern Victoria receiving less rainfall.'

Influences from the Indian Ocean sector occur in conjunction with those from the Indonesian Throughflow region, to the north of Australia. Dr Cai says higher sea-surface temperatures in the Throughflow region are conducive to rainfall in central and northern south-east Australia, through the familiar tropical north-west cloud bands, which deliver rainfall to the region.

'Through April and May, large increases in sea-surface temperatures in the region are usually associated with a transition from an El Niño to a La Niña event, as part of the cycle of the El Niño–Southern Oscillation,' he says.

Mr Cowan says that in recent decades, there have been more El Niño events than La Niñas. As the system spends more time in an El Niño phase, and less time transitioning to a La Niña, south-east Australia receives less rainfall.

'This El Niño-like behaviour pattern of the Pacific system is also consistent with what is expected from climate change, as recent studies have shown,' he says.

Victoria is not alone among states experiencing rainfall declines. During the past 50 years there has been a decreasing trend in rainfall over much of Australia. In south-west Western Australia the trend is strongest in winter; and in southern Queensland strongest in summer.

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