Attribution of observed multi-decadal changes in rainfall and future prospects over Victoria, Australia

Surendra Rauniyar*[1] and Scott Power[2]

[1]Australian Bureau of Meteorology – 700 Collins Street, Docklands VIC 3008, Australia
[2]University of Southern Queensland – Queensland, Australia

Abstract

Cool season (April to October) rainfall contributes to 2/3rd of the annual average over Victoria and is important for many crops and for replenishing reservoirs. However, since the start of the Millennium Drought in 1997, rainfall over Victoria has been unusually low (_˜12% below relative to 1900-1959 average) during its cool season. Here we used rainfall under preindustrial, historical, and 21st century (RCP2.6, RCP4.5 and RCP8.5) simulations from 24 CMIP5 climate models to quantify the magnitude of the observed multi-decadal drying that can be attributed to external forcing, and to quantify the combined impact of both external forcing and internal variability on Victorian rainfall over coming decades. We found that rainfall in the past two decades is below the preindustrial average in two-thirds or more of model simulations. However, the magnitude of the multi-model median externally-forced drying is equivalent to only 20% of the observed drying. This suggests that the drying is dominated by internally-generated rainfall variability. The externally-forced drying, according to models becomes dominant from 2010-2029, when 90% of the model simulates drying. While Victorian rainfall will continue to vary from year to year and decade to decade, we estimated that there is only a 12% probability that internal rainfall variability will completely offset the externally-forced drying averaged over 2018-2037 period, regardless of scenario. By the late 21st century the externally forced change under RCP8.5 is so large that internal variability appears too small to be able to offest it. However, models exhibit difficulty in simulating the magnitude of the observed decline in rainfall which reduce the confidence in our projections.

Keywords: Attribution, Climate Change, CMIP5, RCPs, Victorian Rainfall, Cool Season, Drought

*Speaker