



## **Anthropogenic aerosol emissions and rainfall decline in South-West Australia: coincidence or causality?**

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It is commonly understood that the observed decline in precipitation in South-West Australia during the 20th century is caused by anthropogenic factors. Candidates therefore are changes to large-scale atmospheric circulations due to global warming, extensive deforestation and anthropogenic aerosol emissions - all of which are effective on different spatial and temporal scales.

This presentation focusses on the role of rapidly rising aerosol emissions from anthropogenic sources in South-West Australia around 1970. An analysis of historical longterm rainfall data of the Bureau of Meteorology shows that South-West Australia as a whole experienced a gradual decline in precipitation over the 20th century. However, on smaller scales and for the particular example of the Perth catchment area, a sudden drop in precipitation around 1970 is apparent.

Modelling experiments at a convection-resolving resolution of 3.3km using the Weather and Research Forecasting (WRF) model version 3.6.1 with the aerosol-aware Thompson-Eidhammer microphysics scheme are conducted for the period 1970-1974. A comparison of four runs with different prescribed aerosol emissions and without aerosol effects demonstrates that tripling the pre-1960s atmospheric CCN and IN concentrations can suppress precipitation by 2-9%, depending on the area and the season. This suggests that a combination of all three processes is required to account for the gradual decline in rainfall seen for greater South-West Australia and for the sudden drop observed in areas along the West Coast in the 1970s: changing atmospheric circulations, deforestation and anthropogenic aerosol emissions.