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Meteorological drought termination: processes and trends

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Abstract: In the midst of a drought, how do we know when it will end? Having improved predictability of the weather and climate conditions that cause droughts to terminate would inform the management of existing water supplies for drinking, the environment, industry and power generation and help to balance water supply with flood control. Understanding longer-term changes in drought termination can also inform changes to future drought duration, and associated impacts on future water resource availability.

In addition to understanding when a drought is likely to end, understanding the likely rate at which the drought will terminate is also pertinent; faster meteorological drought termination rates, for example through extremely intense precipitation or serially clustered heavy precipitation events, can lead to different runoff responses compared to slower meteorological drought termination rates.

For Australia, recent findings have shown that meteorological droughts terminate with heavy precipitation, and that an absence of only a handful of these events can mean the difference between a drought continuing and terminating. In southeast Australia in particular, droughts develop when weather systems that transport moisture from the ocean and cause heavy precipitation disappear; when these weather systems return, the droughts terminate.

In this study, we systematically identify meteorological drought termination events using an ensemble of observationally-constrained precipitation products. We quantify the role of heavy precipitation in driving drought termination in different regions and identify and quantify the weather systems responsible.

We further investigate long-term changes in the rate at which droughts terminate and find a shift in termination rates in some regions, accompanied by shifts in the responsible weather systems and in the contribution of heavy precipitation to drought termination.

This new understanding of drought termination mechanisms and their historical changes can next be used to constrain uncertainty in future precipitation variability, focusing water resource adaptation efforts to the most likely of water futures.

Keywords: *Drought, precipitation, weather systems*

