

**Title: Using reanalysis to investigate drivers of rainfall variability in Queensland, Australia**

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**Abstract:**

Queensland experiences considerable inter-annual and decadal variability in its rainfall, of which a drought in the early 2000s is only the most recent manifestation. Little is understood about the large-scale climate drivers of this variability, however, beyond a tenuous connection to the El Niño Southern Oscillation (ENSO). This study uses the 20th Century Reanalysis alongside other reanalyses to analyze the atmospheric circulation patterns associated with variability and trends in Queensland's rainfall. Seasonal patterns of rainfall variability in Queensland over 1900-2008 are constructed from empirical orthogonal teleconnection analysis of a high-quality, interpolated rain gauge dataset for Australia. While the leading pattern of variability in each season describes state-wide rainfall anomalies, subsequent patterns identify variations in individual regions of Queensland, such as the tropical Cape York Peninsula and the mid-latitude southeastern corner. Regressions of these rainfall patterns onto the 20th Century Reanalysis circulation fields reveal variability and trends in number and intensity of the synoptic systems that bring rainfall to each region of Queensland. The 20th Century Reanalysis is shown to be particularly valuable in identifying decadal and multi-decadal variability in these rain-bearing systems, as it is the only reanalysis dataset of sufficient length to properly resolve these signals.

This study is part of a collaboration between the Walker Institute at the University of Reading and the Queensland Climate Change Centre of Excellence.