

Remote drivers of rainfall variability in Australia

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This work identifies and documents a suite of large-scale drivers of rainfall variability in the Australian region. The key driver in terms of broad influence and impact on rainfall is the El Niño Southern Oscillation (ENSO). ENSO is related to rainfall over much of the continent at different times, particularly in the north and east with the regions of influence shifting with the seasons. The Indian Ocean Dipole (IOD) is particularly important in the June to October period, which spans much of the wet season in the south-west and south-east where the IOD has an influence. ENSO interacts with the IOD in this period so that their separate regions of influence cover the entire continent.

Atmospheric blocking also becomes most important during this period and has an influence on rainfall across the southern half of the continent. The Madden Julian Oscillation can influence rainfall in different parts of the continent in different seasons, but its impact is strongest on the monsoonal rains in the north. The influence of the Southern Annular Mode (SAM) is mostly confined to the south-west and south-east of the continent. The patterns of rainfall relationship to each of the drivers exhibit substantial decadal variability, though the characteristic regions described above don't change markedly.

The relationships between large scale drivers and rainfall are robust to the selection of typical indices used to represent the drivers. In most regions the individual drivers account for less than 20 per cent of monthly rainfall variability though the drivers relate to a predictable component of this variability. The amount of rainfall variance explained by individual drivers is highest in eastern Australia and in spring, where it approaches 50 per cent in association with ENSO and blocking.