Climatic drivers of wildfire occurrence and extent in semi-arid south-west Australia

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Background/question/methods: Changes in climatic patterns may drive shifts in the frequency, extent and intensity of wildfires and subsequent changes in the composition, structure, diversity and functioning of ecosystems in fire-prone regions. We investigated the climatic drivers of wildfire patterns in fire-prone semi-arid shrublands and woodlands of south-west Australia. We used superposed epoch analysis (SEA) to determine whether wildfire occurrence and extent were related to regional climate and/or broad-scale drivers of regional climate, including the El Niño southern oscillation (ENSO), the Indian Ocean dipole, atmospheric blocking in the Southern Ocean, and the southern annular mode.

Results/conclusions: Fires occurred during dry and hot conditions typically associated with the El Niño phase of ENSO, while fires tended not to during cool and wet conditions. However, years of major fire extent (i.e., 1,000 km^2 burnt) tended to occur during drought conditions that followed wet and cool conditions in spring and summer of the preceding year. These wet and cool periods were typically associated with the presence of blocking highs in the adjacent Southern Ocean. We hypothesise that high rainfall in spring and summer favours the growth of ephemeral plants while subsequent drought conditions promote fuel drying, resulting in continuous and highly flammable fuel beds capable of sustaining larger fires. As climatic extremes are expected to increase in intensity and frequency in the future, it is likely that the occurrence of extensive wildfires in semi-arid south-west Australia will also increase, potentially driving changes in the distribution and composition of fire-sensitive woodland communities.

Alison O'Donnell's research focuses on the role of climate, vegetation and topography on broad-scale spatial and temporal patterns of wildfires in semi-arid south-western Australia. Her research interests include landscape ecology, biogeography and dendrochronology.

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