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Can analyses of continental-scale variation in tree growth reveal effects of climate change on forest productivity?

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Australia is a superb natural laboratory to study continental-scale processes given the comparatively little disturbed state of natural vegetation that spans the temperate to tropical zones. Nonetheless, historical ecology studies are revealing dramatic changes in natural vegetation cover across Australia, apparently in response to altered fire regimes, climate change (decreasing precipitation in southern Australia and increasing precipitation in northern Australia) and more controversially CO2 enrichment. We have analyzed the pattern of the last 50 growth events of a conifer, Callitris columellaris, that has a continental distribution from arid to seasonally dry tropical climates to temperate maritime ones. We found a general trend to decreasing growth irrespective of climate zone. These trends appear explicable as a consequence of the combination of high temperatures and water stress that are increasingly limiting the growth season. We are currently analyzing a continental array of permanent forestry plots in high biomass Eucalyptus forests to determine if the trends in the native conifer are also apparent in broad-leaf species.