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# Reduced tree growth in the semiarid United States due to asymmetric responses to intensifying precipitation extremes

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Earth's hydroclimatic variability is increasing, with changes in the frequency of extreme events that may negatively affect forest ecosystems. We examined possible consequences of changing precipitation variability using tree rings in the conterminous U.S. While many growth records showed either little evidence of precipitation limitation or linear relationships to precipitation, growth of some species (particularly those in semiarid regions) responded asymmetrically to precipitation, such that tree growth reductions during dry years were greater than, and not compensated by, increases during wet years. The U.S. Southwest in particular showed both a large increase in precipitation variability coupled with asymmetric responses of growth to precipitation. Simulations suggested roughly a two-fold increase in the probability of large negative growth anomalies across the Southwest resulting solely from 20$^{th}$ century increases in the variability of cool-season precipitation. Models project continued increases in precipitation variability, portending future growth reductions across semiarid forests of the western U.S.