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Title: An Ecohydrological Perspective of Drought-Triggered Vegetation Die-off and Land-Surface Changes

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Abstract:
Ecohydrological linkages between vegetation and the water budget can be particularly pronounced in semiarid systems and in response to extreme drought events, which are projected to become more frequent and intense with progressing climate change. We provide an overview of how under extreme drought conditions, a prolonged period with low values of soil water can trigger basic land surface changes through tree mortality and of the potential land surface feedbacks related to such mortality. Drought-induced tree mortality might first be triggered at ecotones between vegetation types, at the drier end of the distribution of the less drought-sensitive species, but under more extreme conditions can span elevational gradients and regions. Warmer temperatures might amplify such trends. Previous observations and new experiments are providing insights into the drought threshold that triggers tree mortality. Changes in tree cover resulting from mortality can result in large changes in near-ground solar radiation because the relationship between near-ground solar radiation and amount of tree cover includes non-linear relationships; these relationships are dependent, of course, on topography and aspect. Loss of tree cover via drought-induced mortality can be compensated for by post-drought increases in herbaceous cover. Research from more mesic ecosystems highlights that tree mortality in response to drought depends not only on the magnitude and duration of the drought, but also on the sequence of conditions prior to the drought, including baseline and flooding conditions. Vegetation die-off is likely to be a major type of response to climate change that impacts land-surface conditions and a broad range of ecological and hydrological characteristics.

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