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# Global spatial dependence of vegetation recovery from meteorological drought impacts

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In the 21st century droughts have become more frequent, have shown an increased duration, a greater spatial extent and are increasingly exacerbated by human water demands. Understanding the impacts of droughts on vegetation dynamics, the legacy effects and especially the recovery are essential aspects to understand the prolonged effects that meteorological droughts can have on ecosystems.

This research looks at the spatial dependence of vegetation recovery after a meteorological drought, i.e. the extent to which events co-occur at multiple locations simultaneously, explaining underlying mechanisms and patterns which could potentially support recovery forecasting in the future. To understand the spatial dependence of vegetation recovery we characterized spatiotemporal dynamics of vegetation recovery with the use event synchronization and complex networks and identified hydroclimatic and geophysical predictors of this behaviour using remote sensing and ERA5 reanalysis data.

We found that there are strong global patterns in vegetation drought synchronization, which was specicially high in Australia and southern Africa, and low in large parts of Africa and east Asia. Overall, the biggest drivers of differences in spatial dependence are temperature, aridity and precipitation variability. On a global scale high dependence is mainly occurring in regions experiencing large-scale spatially connected droughts, mostly related to strong climate signals like ENSO. Areas with a low spatial dependence are characterized by a high natural water availability, resulting in more local and vegetation type-specific resilience to drought.

Our work indicates a diverse set of features driving ecological drought occurrence, synchronization and recovery. These findings could be a useful tool to use in forecasting ecological drought response to ongoing meteorological droughts.