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Unperturbed root fungal communities in a temperate forest recovering from five years of reoccurring droughts

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Since industrialization, the global average temperature increases with far reaching consequences for the world climate. One phenomenon is the current occurrence of more heavy and long droughts in Middle Europe, which lead to extensive tree die-off and shows that we need a better understanding of the forest-soil ecosystem in times of climate change.

Within the interdisciplinary Kranzberg Roof Experiment, we study the drought resistance and drought recovery of mature Norway spruce (*Picea abies*) and European beech (*Fagus sylvatica*). The trees experienced a rainfall exclusion for five years during the vegetation period and were rewetted by drip irrigation in summer 2019. Our interest focuses in the functional role of ectomycorrhizal and overall fungal communities on tree drought resistance and recovery. Particularly, we hypothesized the rewetting event will lead to a shift in community structure because of steeply rising water and nutrient availabilities.

To get insights to the development of the fungal communities right after the rewetting period, we sequenced the fungal ITS2 region of fine root DNA extracts. The roots were taken from soil cores before and at several time-points after irrigation.

We found that the fungal communities stayed quite similar to each other during the time-frame of recovery we investigated (84 days), while the amount of new root tips strongly increased directly after the rewetting. Surprisingly, the organic material which had accumulated as it was not degraded during the years of drought, did not lead to a shift in community composition. In particular, there were no changes in the relative amounts of saprotroph fungi in the phase after the rewetting.

Therefore, root fungal communities – the interface between trees and soil – seemingly did not experience a strong pressure to adapt their composition to the new condition, which matches their resistant behavior during the long drought phase before (cf. abstract 2937).