Soil biotic legacy effects on the response of plant growth to drought

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Interactions between above-ground and belowground biota have the potential to modify ecosystem responses to climate change. While there is growing evidence of the effects of drought on plant growth and soil microbial communities, little is known about the effect of drought on the direction and strength of plant-soil feedbacks and the consequences for carbon cycling processes. Recent studies suggest that dominant plant species and drought could influence future drought responses of plants, in terms of growth and nutrient uptake, as a result of legacy effects on soil food webs.
A glasshouse experiment was established to test the hypothesis that plant growth is less affected in soil conditioned by conspecific species (i.e. by the same species) and when soil has previously experienced drought conditions. Moreover, we predicted that these changes would be related to shifts in the soil microbial community.
Two plant species (*Dactylis glomerata* and *Leontodon hispidus*) were grown in soils with four different histories (conspecific or not, undergone previous drought or not), which were then exposed to a drought. Plant community responses were examined by measuring growth, phenotypic plant traits and biomass resource allocation trait. Moreover, soil microbial community responses were characterised, and CO_2 fluxes (soil respiration and photosynthesis) and leaching losses of carbon and nitrogen, were quantified.
Preliminary results show that plant growth and above-ground biomass production following drought depended on soil history and whether plants were grown in monoculture or competition. Bacterial and fungal communities were also affected by soil history, with the largest change in the composition observed when the soil had previously experienced drought. These preliminary results suggest that drought conditions can have long lasting effects on below-ground communities with associated consequences on the strength of feedback on above-ground communities. Complete data analyses will establish whether any associated effects on soil carbon cycling have occurred.