Geophysical Research Abstracts
Vol. 19, EGU2017-14404, 2017
EGU General Assembly 2017

Contrasting responses between vegetation and soil microbial biomass and nutrient pools may exacerbate the detrimental impacts of climate change in a semiarid shrubland ecosystem

José Ignacio Querejeta (1), Lupe León-Sánchez (1), Emilio Nicolás (1), Iván Prieto (1), Sara Ondoño (1), Fernando Maestre (2), and Carlos García-Izquierdo (1)

(1) CEBAS-CSIC, Murcia, Spain (querejeta@cebas.csic.es), (2) Universidad Rey Juan Carlos, Móstoles, Spain

We conducted a 4-year manipulative experiment in a semiarid shrubland in Southeastern Spain in which we simulated the warmer and drier climate conditions forecasted for the Mediterranean Region. We evaluated the effects of warming (W), rainfall reduction (RR) and their combination (W+RR) on the performance of a native plant community, with a focus on six coexisting shrub species. Warming (W and W+RR treatments) consistently decreased net photosynthesis rates and water use efficiency across species throughout the study. Shoot dry biomass production was strongly decreased by the three climate manipulation treatments in all the target species. Leaf nutrient (N, P, K, Fe, Zn, Cu) concentrations and pool sizes in foliage were consistently decreased by warming across species, indicating reduced plant nutrient uptake and status. Plant survival rate at the end of the 4 yr. study period was also drastically decreased by experimental warming. In contrast to the strong detrimental effects of warming on plant performance, microbial biomass in rhizosphere soil increased in response to warming. However, despite increased soil microbial biomass, the activity and/or production efficiency of key microbial extracellular enzymes for soil nutrient cycling (phosphatase, urease, glycine-aminopeptidase) were significantly decreased by warming, suggesting slowed N and P mobilization and cycling rates and increased microbial immobilization, especially in the W+RR treatment. Overall, the data indicate that a warmer and drier climate could shift the competitive balance between plants and soil microbes, thereby exacerbating nutrient limitation of photosynthesis and water use efficiency, with detrimental feedback effects on vegetation productivity and cover in this dryland ecosystem.