**The role of living organisms as modulators of the response of arid ecosystems to climate change and N deposition**

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Global environmental change (GEC) will have major impacts on the functioning of biotic communities, and will foster important changes in their current composition and diversity. Given that crucial ecosystem functions and services, such as productivity, nutrient cycling and carbon storage, depend on biodiversity, biodiversity losses associated to GEC, are predicted to be accompanied by yet further extreme ecological events and potential catastrophic shifts in natural ecosystems. However, large uncertainty exists about how GEC-induced alterations in the composition and diversity of biotic communities will impact ecosystem functioning and the ability of ecosystems to provide goods and services. This is particularly true for terrestrial microbial communities, as we are only starting to understand the role that environmental factors play in determining their abundance, distribution and diversity.

Our group aims to understand how multiple biotic communities (vascular plants, biocrusts and microbial communities) modulate the impacts of two major GEC drivers (climate change and N deposition) on ecosystem functioning in drylands at multiple spatial scales (from local to global). Drylands, highly sensitive to GEC, extent globally and in Spain cover two thirds of the territory, and the dependence of an important part of the human population on them for goods and services, makes crucial to understand how drylands may be affected by GEC and, more specifically, to know how their biotic communities will modulate ecosystem responses to GEC: i) To evaluate the composition and diversity of soil microbial communities in global drylands,

ii) To determine the relative importance of microbial and plant communities and abiotic factors as drivers of ecosystem multifunctionality in drylands at regional and global scales,

iii) To test how climate change- and N deposition-induced changes in biocrust and microbial communities affect key ecosystem processes related with nutrient and with the exchange of trace gases between the soil and the atmosphere, and

iv) To assess how soil biotic legacy effects of climate change affect vascular plants and ecosystem processes, as well as the resistance and resilience of soil microbial communities to climate change.

For doing this we propose the use of different experimental approaches, multiple biotic communities and spatial scales to test the same core ideas, to allow wider generalizations of the results obtained.