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Ecosystem functioning in drylands – patterns, processes and vegetation changes

Final report

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Motivation of the project

I spent three months in the Universidad Rey Juan Carlos university in Móstoles, Spain, with the research group of Prof. Fernando Maestre. His group BIODESERT is funded by an ERC Consolidator Grant. They investigate the effects of climatic and disturbance factors on the composition, species and functional diversity and ecosystem multifuncionality in global drylands. The aim of BIODESERT is to understand how global drylands respond to changes in climate and land use. The project aims to develop a better understanding of the functioning and resilience of drylands to desertification drivers. BIODESERT will provide a mechanistic understanding on the processes driving ecosystem multifunctionality under different global change scenarios, as well as key insights to forecast future scenarios for the provisioning of ecosystem services in drylands and to test and develop early warning indicators of desertification. The research group is among the top research groups in the field of dryland ecology and they regularly publish their results in the leading scientific journals like *Science* and *Nature*. The motivation of my visit was to get international experience, develop future cooperation and get insights and advice for my future ERC proposal.

Research activities during the project

- During my mobility project I got familiar with the global dryland sampling protocol. The protocol consists of a complex sampling of representative dryland sites, in particular: 1, vegetation sampling in quadrats, 2, sampling the patch-interpatch structure, 3, assessing vegetation structure and composition with the line-point-intercept method, 4, plant trait sampling, 5, soil sampling for measuring bulk density, 6, soil sampling for determining soil chemical parameters and microbial activity, 7, litter decomposition sampling with teabags and 8, measuring soil nutrients with ion exchange membranes.
  In the summer of 2018 me and my colleagues have already started the sampling of Hungarian study sites according to the BIODESERT protocol and we will be able to join this global network of already 31 countries.
- I presented my past and current research topics to the BIODESERT group and discussed the potential ways of cooperation by studying Hungarian drylands.
- During my stay I also participated in a novel litter decomposition experiment of Pablo García-Palacios. They study plant litter of six biomes, each biome is represented by 15 species. With random species combinations of litter mixtures, they will be able to test the effects of biomes as well as species and functional diversity on litter decomposition dynamics. I took part in the creation of litter mixtures, the composition

of soil-litter microcosms and the regular measurement of soil respiration and controlling of the moisture of the microcosms.

- I had the possibility to visit the field stations of Prof. Maestre in Aranjuez and Ciempozuelos, where they have field stations for the long-term monitoring of the effects of climate change (temperature increase, decreased precipitation, their combination and control) on the soil properties, biocrusts, plant species composition and ecosystem multifunctionality of drylands.
- I also started working on my future ERC proposal, I got a lot of support from Prof. Maestre and his colleagues. We discussed the most important core ideas and the structure of the proposal.
- During my stay, our submitted paper in Landscape Ecology got a major revision. I worked on the revision with my colleagues and the paper has been accepted in May 2018.

Most important results

- Spending three months in the BIODESERT group gave me invaluable experiences about the everyday work, organisation and scientific achievements of an internationally leading research group.
- I got familiar with new methodologies for field and lab measurements, which will be very useful for my future studies.
- I could start to develop my ERC proposal and I got invaluable insights and advice from internationally leading scientists.
- I got the possibility to join the BIODESERT network. Me and my colleagues have already started the sampling of the Hungarian sites, which will represent the most humid (i.e. arid-subhumid) types of the global drylands included in the BIODESERT network. After finalising all the sampling and measurements, the first manuscripts based on this grandiose global dataset will be written in 2019.
- We developed a living scientific cooperation between the Spanish and Hungarian institutes, which can hopefully lead to further cooperation in the future.