Geophysical Research Abstracts
Vol. 14, EGU2012-13058-2, 2012
EGU General Assembly 2012

The role of biological soil crusts on soil moisture

S. Chamizo (1), Y. Cantón (1), R. Lázaro (2), E. Rodriguez-Caballero (1), and F. Domingo (2)

(1) Departamento de Edafología y Química Agrícola, Universidad de Almería, Almería, Spain (scd394@ual.es;ycanton@ual.es;rce959@ual.es), (2) Estación Experimental de Zonas Áridas (CSIC), Almería (lazaro@eeza.csic.es;poveda@eeza.csic.es)

In water-limited ecosystems, water becomes the most important driver for plant productivity. In these systems, spatial distribution of water resources is not random but organized into a mosaic of water-depletion areas linked to water-accumulation areas. In other words, water is transferred from interplant patches that act as source areas to vegetation patches that act as sinks of this resource. Thus, structure and functioning of interplant patches have a decisive role in water redistribution and distribution patterns of vegetation. Soil surface in the interplant spaces of most arid and semiarid ecosystems is covered by biological soil crusts (BSCs). These organisms regulate water fluxes into and through soils and play major roles in local hydrological processes. In the last years, the role of these organisms in infiltration and runoff has gained increased importance and a better knowledge about their effects on these processes has been acquired. However, the role of BSCs in other important components of the water balance such as evaporation or soil moisture has been scarcely studied, so that their effects on these processes remain unknown. The objective of this work is to examine the influence of BSCs on soil moisture regimes in the top profile of the soil in two semiarid ecosystems of SE Spain with contrasting soil texture and where BSCs are well-represented. Soil moisture content at 0.03 and 0.10 m was monitored under two representative types of BSCs, a dark cyanobacteria-dominated BSC and a light-coloured lichen-dominated BSC, and in soils where these BSCs were removed by scraping, at both study sites. Our results show that, under high water conditions, removal of BSCs leads to a decrease in soil moisture compared to soils covered by BSCs. Decrease in soil moisture due to BSC removal namely affects moisture in the upper layer of the soil (0.03 m), but has little impact in deeper soil (0.10 m). Evaporation is also generally faster in soils with no BSCs than in soils covered by them. The type of BSC influences soil moisture in a different way depending on soil water conditions. Under high water content conditions, soil water loss is faster and soil moisture content lower under cyanobacterial than under lichen BSCs, due to higher infiltration promoted by lichens. On the contrary, under low water content conditions, lichen-crusted soils dry out faster and exhibit less moisture than cyanobacteria-crusted ones, attributed to the larger porosity and subsequent greater evaporative losses in lichen- than in cyanobacteria-crusted soils. We found higher moisture in coarse-textured soils than in fine-textured ones, despite the higher water retention capacity of the latter soils. More favourable conditions in the coarser soils, which had greater organic matter content, aggregate stability and were subject to less water stress due to its proximity to the coast, seems to contribute to this increased soil moisture content. BSCs therefore play an important role on the maintenance of water availability in the interplant spaces, thereby strongly affecting soil physical and biological processes, and the potential for emergence establishment and survival of plants in semiarid ecosystems.