



Disentangling the independent roles of plant cover and bare-soil connectivity in dryland functioning

Susana Bautista (1), Ángeles G Mayor (2), and Francisco Rodríguez (3)

(1) Universidad de Alicante, IMEM, Dpt. Ecology, Alicante, Spain (s.bautista@ua.es), (2) ISEM, Université de Montpellier, CNRS, IRD, EPHE, Montpellier, France, (3) Universidad de Alicante, Department of Applied Mathematics, Alicante, Spain

Both plant cover and the connectivity of the bare-soil interpatch areas control resource conservation and ecosystem functioning in drylands. Since both attributes are closely interlinked, their relative importance and the respective role played as control factors are difficult to disentangle. To address this challenge, we followed a combination of modelling and manipulative experimental approaches. On the modelling side, we characterized the dependence of bare-soil connectivity on plant cover and thus provided a null model that differentiates the independent effects of plant pattern and cover on the hydrological and overall functioning of drylands. Using a bare-soil connectivity index, Flowlength, we developed explicit theoretical expressions for its expected value under a null model of random vegetation cover distribution. Bare-soil connectivity exhibits a non-linear inverse dependence on vegetation cover. The expressions for the mean values and standard errors for the random model allow the construction of confidence intervals and testing for deviations from the null random model in experimental data, and thus disentangling vegetation cover and pattern functional roles. On the experimental side, we created a variety of plant communities ad hoc, established on a set of 24 closed erosion plots, for which we independently manipulated vegetation cover and bare-soil connectivity and assessed plant performance, runoff and sediment yields. We found a negative effect of bare soil-connectivity on plant performance, which increased with plant cover, reflecting not only the independent role of both attributes but also the potential interactions between them.