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Effects of rainfall partitioning by Mediterranean vegetation on soil water content dynamics. Results from field studies along a climatic gradient in Spain.

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The role played by rainfall partitioning by vegetation is of paramount importance for the water balance both at local and catchment scales. Rainfall partitioning fluxes (throughfall and stemflow) have a large degree of temporal and spatial variability and may consequently lead to significant changes in the volume and composition of water that reach the understory vegetation and the soil. Throughfall affects the surface soils horizons and stemflow, channelled by branches and stems, can reach deeper soil layers and remain available for the roots.

This work investigates the effect of rainfall partitioning on soil water content in three Mediterranean study areas covering a strong climatic gradient and different vegetation species. From Northern to Southern Spain the study areas are: The Vallcebre research catchments (42º 12'N, 1º 49'E) with forest patches of Pinus sylvestris and of Quercus pubescens, The Parapuños research catchment (39º 35'N, 6º 5'W), a wooded rangeland with Quercus rotundifolia and annual grasses in open areas, and the Tabernas experimental area (37º 0'N, 2º 26'W) with disperse shrubs and a mixture of annual plants and biological soil crusts in open areas. Mean annual rainfall ranges between 862 and 235 mm (in Vallcebre and Tabernas respectively).

For the studied tree species throughfall was the dominant flux and have a similar rate, being stemflow only a small part of the bulk rainfall. For the studied shrubs, measured throughfall as well as stemflow were highly variable between species. Superficial soil water content was on average lower under forest (Vallcebre) or individual trees (Parapuños) that in the open areas. Contrarily, in Tabernas soil was wetter under shrubs than in open areas, although with higher variability.

Driest soils below continous forest covers, as in Vallcebre, or even in sparse covered areas as in the Parapuños catchment, may be explained by the dominant role of rainfall interception and transpiration. In Tabernas, soil moisture usually remained higher under shrubs than below open areas except for some small rainfall events. This is likely related to the fact that, shrubs architecture funnels precipitation towards the soil through stemflow. Individual shrubs may also act as sinks for overland flow generated in open areas, promoting infiltration.