Geophysical Research Abstracts
Vol. 20, EGU2018-8783, 2018
EGU General Assembly 2018

The contribution of throughfall to the spatial and temporal patterns of soil water content in two forest stands located in a Mediterranean mountainous area.

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Near-surface soil water content variability in forest ecosystems is affected by complex interactions among climate, topography, forest structure and soil properties. However, studies taking into account the indicated driven factors at the detailed scale are scarce. This work has the main objective of studying the control that throughfall exercises on the local spatial variation of the near-surface soil water content. Two stands, representative of the Mediterranean mountainous areas in the southern margin of the Pyrenees were studied; one dominated by Quercus pubescens and the other by Pinus sylvestris, both located in the Vallcebre Research Catchments (NE Spain).
Throughfall and the related shallow soil water content were monitored in each plot in 20 locations selected according to forest canopy distribution. Throughfall was monitored with automatic tipping-bucket rain recorders and soil water content with automatic TDR probes (0-20 cm depth). The main characteristics of the nearest tree (DBH, height, crown volume, mean branch angle) and soil parameters (such as depth of the organic horizon, texture, soil porosity and organic matter content) were also measured.
Soil water content increments in the locations showed a strong linear relationship with adjacent throughfall depths in both forest plots. The number of monitoring locations presenting soil water content increments during rainfall events increased similarly with throughfall depth in both forest plots, resulting that for throughfall depths greater than 10 mm all the locations showed some soil moisture increment. The results from the application of linear mixed models, including throughfall, nearest tree structure parameters and soil characteristics, indicated that the best model explained only a 44% of the soil water content variance for the oak plot (throughfall depth with positive significant effect) and 58 % for the pine plot (with throughfall depth and depth of the organic horizon as positive and negative significant effects respectively). Apart from the obvious effect of throughfall, we consider that other factors as soil hydrophobicity or the role of stemflow in sampling locations near trees must be investigated as possible controls of the soil water content spatial variability observed within the forest plots.