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Evaluation of soil water storage with time in mountain areas taking into account the influence of vegetation

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The objective of this paper is to quantify the influence of climate and vegetation on water dynamics in mountain watersheds. To do so, soil water content has been monitored for a period of 16 months within the watershed of the Messa torrent (Rubiana municipality-North Italy). The influence of vegetation, altitude and topographic conditions on flow phenomena as infiltration and evapotranspiration was analyzed. At 11 experimental sites TDR probes were installed at different depths (2, 7, 15, and 30 cm); information on slope, soil texture, the type of vegetation and forest vegetation cover measuring the LAI (Leaf Area Index) aws collected at each site. It was found that soil water storage was mainly controlled by the type of vegetation. Big differences in terms of water storage were noted between stations with grass and forest cover. In fact, for grass covered stations, the dynamics of soil water content profiles were predominantly conditioned by the meteorological events, whereas for forest covered stations the responses were much more limited due to foliar interception (during infiltration) and canopy shading (during evapotranspiration). Some tree species seemed to have more influence on soil water content behavior than others. The station with hazel nut trees (Corylus avellana L.) with high water uptake from soil, registered very low water content values though being close to a small river. On the other hand, the two stations with black pine (Pinus nigra L.) cover showed to be the only two stations where uniform water content profiles were observed over depth. Next, the second important impact factor was found to be the “altitude”. This was clearly observable for the stations with grass cover where water storage increased with altitude due to the decrease in evapotranspiration generated by the drop in temperature. The influence of altitude was less

noticeable for forest covered stations where the canopy cover reduced the possible effect of evapotransipration losses and the floor of organic matter reduced the possible effect of temperature drop. Finally, a third important impact factor was found to be the slope. For two joint stations with identical grass cover but with different slopes, i.e., 0 and 30% slope, the water storage of the flat area showed to be systematically higher (5%) than that observed for the sloping field. This difference was maintained over time. From these results, it may be concluded that the type of vegetation cover is the main factor influencing soil water storage dynamics. Altitude and slope are next important; this is especially noticeable for grass covered areas.