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Spatial patterns and stability of soil water content in forested slope and terraced area on the Loess Plateau, China

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Soil water content (SWC) plays a vital role in hydrological and vegetation restoration processes. It is the principal limiting factor for vegetation restoration on the Loess Plateau of China. This study aimed to analyze the spatial patterns and stability of SWC in a terraced area containing jujube trees (Ziziphus jujuba Mill.) and a forested slope with Chinese pine (Pinus tabulaeformis Carr.) following rainfall. The SWCs in nine soil layers at intervals of 0.2 m down to a depth of 1.8 m were measured at 21 locations both in the terraces and in the forested slope from July 19 to September 3 in 2014. The results showed that the SWCs at different soil depths were normally distributed. The SWC in terraces and forestland at each soil depth all had strong temporal stability. The temporal stability of SWC was lower in the 0–0.4 m soil layer than at the deeper soil depths. The representative locations for SWC were depth-dependent and the number of representative locations was not constant. The mean SWC was largest in the lower terrace slopes. The lowest mean SWC in the forested slope was at the mid-slope point due to the highest root distribution. The 0.4–0.6 m soil depth was generally the wettest in both terraces and forestland. The driest soil depth in terraces was 1.0–1.2 m while the driest soil depth in forestland was 0.8–1.0 m. The SWC had a significant positive correlation with clay and silt content. Moerover, the SWC had a significant positive correlation with SOC and did not have a significant correlation with root conten in the terraced area. But in the forested slope, the SWC had a significant negative correlation with roots and did not have a significant correlation with SOC. Although it is feasible to use the representative locations of SWC to represent the mean SWC of a hillslope over a period of time, the cumulative absolute error increases with the cumulative number of days. In conclusion, the SWC at different soil depths and locations showed strong spatial and temporal patterns after rainfall.