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Temporal pattern of soil matric suction in the unsaturated soil slope under different forest cover

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In the vadose zone, usually, soils experience high matric suction during dry periods which results in a significant additional soil strength component (i.e. apparent cohesion) and thus plays a crucial role in the stability of unsaturated soil slopes. But, in the wet periods, when rain-water infiltrates into the soil, the matric suction of the soil dissipates partially or completely. It is a well-understood concept that vegetation can modify the hillslope hydrology and subsequent stability conditions by increasing soil matric suction through both interception of rainfall and depletion of soil water content via transpiration. Anthropogenic pressures, particularly clear-cutting and deforestation, affect many hydro-geomorphological processes including catchment and hillslope hydrology and stability. However, quantifying the changes in soil hydrologic conditions and the resulted stability of slopes due to these degrading activities remained an unresolved problem. To address this gap, a continuous measurement of soil water dynamics has been conducted at two adjacent hillslopes (one forested hillslope and one degraded hillslope) using PR2/6 profile probe for a 9-month period of time to demonstrate the forest cover-specific influence on the hillslope hydrology and stability during different seasons. The results have been then presented in terms of estimated soil matric suction to facilitate analyzing the resulted stability states due to the changes in soil water balance with time in the two studied hillslopes. The data were tested to check whether there are any differences between the forested and degraded hillslopes in terms of soil matric suction and augmented soil cohesion during different seasons. Finally, the response of soil hydrologic condition and the resulted slope stability for the 9-month period were analyzed and discussed for the different hillslopes.