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Understanding the role of soil moisture in landslide research: Application of Cosmic Rays Neutron Sensing (CRNS) on a slow-moving landslide in Lower Austria

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Soil moisture plays a crucial role in landslide research as it directly influences slope stability and the occurrence of landslides. The amount of water present in the soil significantly impacts its strength and cohesion. Excessive soil moisture, especially during periods of heavy rainfall, can reduce the frictional resistance within the soil, leading to a decrease in shear strength and an increased likelihood of landslides. The province of Lower Austria is situated in a region highly prone to landslides due to its specific geological characteristics. The prevailing geological formations consist mainly of the Flysch and the Klippen Zone, characterized by mechanically weak units comprising intercalated limestones and deeply weathered materials. These geological conditions, coupled with hydrological factors, changes in land use, and various anthropogenic influences, collectively contribute to the inherent instability of the region.

Monitoring and understanding soil moisture levels provide valuable insights into the predisposing and triggering factors, potentially enhancing the prediction and mitigation of these hazardous events. Advancements in technologies like Cosmic Rays Neutron Sensing (CRNS) enables to obtain spatially averaged soil moisture measurements, offering a more comprehensive understanding of moisture distribution across different scales. The defining characteristic of (CRNS) technology lies in its ability to directly measure water content, naturally averaged within a volume known as the footprint. This volume encompasses a horizontal extension with a radius spanning up to hundreds of meters and penetrates the soil to depths of tens of centimeters. This is widely acknowledged as the primary advantage of the CRNS probe compared to point-scale measurements, as it yields a valuable representative value for water availability in the designated area. In this study, we apply CRNS at a slow-moving landslide in Lower Austria and explore its potential.