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COSMOS-UK incoming neutron intensity correction case study for soil moisture monitoring using cosmic-ray neutron sensors

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Cosmic-ray neutron sensors (CRNSs) provide state-of-the-art soil moisture measurements at a field scale. This sensing technique utilises cosmic-ray neutrons which need to be corrected for any temporal changes due to the external factors other than soil moisture. These typically include corrections for changes in humidity, pressure and the incoming flux of neutrons. The last correction is strongly linked with the changes in the solar activity and typically uses standardized neutron monitors (NMs), which are in operation around the world, as the reference signal. Different approaches have emerged for calculating the correction parameter, often referred to as 'tau', which accounts for location differences between the CRNS and NM stations. This work is a case study of the published incoming neutron flux correction parameters (taus) applied to the UK COsmic-ray Soil Moisture Observing System (COSMOS-UK) network. We investigate the impact of the different approaches on the resulting soil moisture and compare them against a correction parameter derived using the local CRNS data (gamma), and also against the available point sensor soil moisture measurements. We discuss the potential causes of discrepancies between the published (tau-based) methods and our insitu (gamma-based) method, especially in the context of soil moisture trends visible at some COSMOS-UK sites when using the tau-based methods.

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