



## **A view on developments and increasing hydrological applications of cosmic-ray neutron sensing**

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Cosmic-ray neutron sensing (CRNS) as method to observe soil moisture at the land surface has been investigated and broadened a lot in the last decade. On the one hand, the method has seen frequent changes to its application, correction formulas, calibration approaches and interpretation of signal in respect to different water pools. On the other hand, however, it also starts transferring its results to hydrological applications and related disciplines. In Europe and especially Germany the method has received considerable interest and several groups have seriously engaged in it during the last years. A cross-section of field investigation by cosmic-ray neutron sensing will be presented, for a range of sites in Germany and beyond, to demonstrate recent developments and applications. Examples will include different land-use types and landscapes with a focus on cropped fields which show complex and non-unique response because of dynamic hydrogen pools in different depths and distances, resulting from vegetation and irrigation. In this context, a recent assessment conducted on CRNS retrieved time-series collected at two experimental sites was used to identify underlying causes of uncertainty. Different factors can be analyzed, and for example, the effect of vertical soil moisture profile, bulk density, incoming neutron correction were found to play an important role. By that, current limitations and possible improvements in CRNS approach will be discussed.