



Cosmic-ray neutron sensing for hydrological observations: what could we learn by detecting different energy ranges?

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Cosmic-ray neutron sensing (CRNS) showed to be an effective approach for monitoring average soil moisture over hundreds of meters and providing a new perspective in hydrological observations. In this context, most of the studies are based on measurements obtained with moderated proportional counters filled with Helium 3 or Boron. The moderation is created by adding shielding material (mostly polyethylene) around the counter to increase the efficiency in detecting epithermal neutrons (in the energy range 1-1000 eV) that are more sensitive to soil moisture changes.

The combined use of thermal neutrons (<0.5 eV) as detected by the bare counter was suggested to be a promising approach for, among others, local corrections of the signal. So far, however, this application was limited by (i) different physical behaviors of the two energy ranges and (ii) insufficient knowledge of the detector energy response.

Within the present contribution, both topics are further addressed. On one hand, a new detector based on scintillators is presented with the capability to better identify different energies ranges. On the other hand, preliminary results obtained in laboratory and in the field are discussed to elucidate the different behaviors of the energy ranges. Possible improvements in the CRNS approach for hydrological applications are finally discussed.