Contribution ID: **584** Type: **Poster**

Low Cost Neutron and Muon Detectors for Soil Moisture Monitoring

Friday 16 July 2021 19:18 (12 minutes)

Water scarcity is a significant challenge for the world's population. With the likelihood of extreme droughts increasing each year, technologies to promote sustainable irrigation and improve resilience to water shortage are needed. Continuous monitoring of soil moisture in arid regions is a major problem as existing techniques such as point sensors or satellite mapping can have high associated costs per hectare.

Cosmic Ray Neutron Sensing (CRNS) of soil moisture is a well established technique in the hydrological community. Helium-3 CRNS probes placed above a site can detect cosmic ray neutrons backscattered from the surrounding soil 130-240m away. By monitoring the variation in the total neutrons observed over time (and correcting for cosmic ray intensity) it is possible to estimate the average volumetric soil moisture content for a site. With a large detector footprint, the technique can bridge difference in length scales between point probes and satellite data, however the high cost of Helium-3 is a barrier for adoption outside of the hydrological community.

We are currently developing new boron-nitride based cosmic ray detectors as alternatives to expensive Helium-3 detectors. Taking advantage of developments in scintillator composites within the nuclear industry, and low power single photon counting instrumentation, these cost efficient detectors will be specifically optimised for use on smallholder farms. In this talk, I will present the optimisation and testing of these new systems before discussing the use of low cost muon sensors to automatically correct for temporal variations in the incoming cosmic ray intensity.

Keywords

Instrumentation; Neutron; Scintillator; Industrial Application; Soil Monitor;

Collaboration

other Collaboration

Subcategory

Outreach and Education

Primary authors: STOWELL, Patrick (University of Durham); Prof. CHADWICK, Paula M. (Durham University); BROWN, Anthony (University of Durham); Dr RULTEN, Cameron B. (Durham University)

Presenter: STOWELL, Patrick (University of Durham)

Session Classification: Discussion

Track Classification: Scientific Field: SH | Solar & Heliospheric