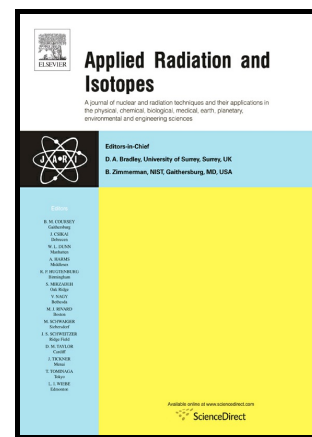


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A neutron scattering soil moisture measurement system with a linear response

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Abstract

A prototype moisture measurement system was designed and constructed, based on neutron scattering, for performing measurements in the laboratory. The system consisted of a rectangular soil container, an ²⁴¹Am/Be neutron source and two parallel ¹⁰B_F detectors (one near the source and the other far from it). Neutrons from the source are moderated and backscattered within the soil sample before being detected by two parallel counters, whose count ratios are shown to be linearly related to the soil moisture even within short measurement times. The system's performance was demonstrated using the Monte Carlo simulations, and a series of measurements on soil samples made of clay (40 wt%) and sand (60 wt%), mixed with different percentages of water. The results showed that the detectors response ratio is linear, up to about 25% of water content.

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