



Simultaneous measurement of soil moisture and biomass pattern with a CRNS rover

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While "classical" stationary cosmic-ray neutron sensors (CRNS) measure the temporal variability of soil moisture at the field scale, the mobile application of CRNS (CRNS rover) enables to capture the spatial variability of soil moisture across larger areas or transects. The CRNS rover consists of two components - a vehicle and a set of large neutron counters. The detectors need to have higher count rates in order to achieve sufficient sensitivity for very short recording periods (e.g. 1 min). To date, only few experiments have been conducted with the CRNS rover over a wide range of different land-use types. Such experiments are needed as the neutron intensity is not only sensitive to soil moisture, but also to all other additional sources of hydrogen (e.g. biomass), which need to be corrected for. Interestingly, the ratio between thermal and fast neutron intensity (N_r) seems to be a very good indicator for vegetation and can be used for the correction of aboveground biomass effects on soil moisture measurements with cosmic-ray neutrons. This enables the possibility for "on-the-fly" correction of soil moisture measurements without the need for laborious local biomass sampling during CRNS roving campaigns. In addition, using the N_r -information from CRNS roving would allow for the simultaneous measurements of soil moisture and biomass pattern at the regional scale.

In this contribution, we present results from a recent roving campaign at the TERENO test site Selhausen (about 1 km²). We used a new cosmic rover with 9 detectors and a total sensitivity of approx. 1350 counts per minute, which enables higher speed and larger coverage compared to other roving systems. In addition, the detectors can be modified to measure either thermal or fast neutron intensity measurements. During the two-week campaign a large set of different field sites with various vegetation covers has been repeatedly monitored. The preliminary results show that CRNS rover was able to capture the general soil moisture pattern and that the N_r -information could be used to improve the soil moisture estimation. In future we hope to enable the simultaneous measurements of soil moisture and biomass patterns at the regional scale with N_r -information from CRNS roving.