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SEASONAL VARIATION OF PHYSICAL PARAMETERS OF SOILS

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The present study aims at investigating the seasonal effects of physical parameters of soils, such as soil temperature, soil moisture and, as a result of changing water content, soil electric conductivity. Two test sites in Styria were selected, one in Oberzeiring and one in Fohnsdorf, which had a size of 120 cm by 120 cm and were investigated from July to December 2003. The ideal meteorological conditions in 2003 supported the significance of the experiment. The summer months were extraordinarily hot and dry and provided anomalous low humidity values. Heavy rainfalls during autumn and the frequent changing of snowfall and melting from November to December resulted in a strong wetting of the investigated soils. It can be assumed, that the moisture contrast of this period topped the average annual contrast in this climatological region. The experiment was finished on the 1st of December. Freezing of the soil and a permanent snow cover made further measurements impossible.

Air temperature and soil temperature at surface and in the depths of 5 cm and 10 cm were measured with a digital thermometer and the temperature in 50 cm depth was measured with a HOBO H8 Temperature Logger. The conductivity measurements were performed with a ground conductivity meter EM38 two times per week in vertical and horizontal dipole mode, which provide different penetration depths and sensitivities. Soil moisture was determined with the gravimetric method. Therefore 4 soil sample cores were taken from the direct surrounding of the test sites once a week. In addition to that, the grain size distribution was determined for soil samples from both measurement areas.

The results showed a high moisture contrast from 10 to 47% (Oberzeiring) and 16 to 54% (Fohnsdorf), respectively. Due to the different depth-related sensitivities of H-mode and V-mode of the EM38 the infiltration of the water after the rainfalls was visible by the delayed conductivity behaviour of the corresponding depth sections. Finally, the good correlation between temperature-corrected conductivity and soil humidity allowed a depth-related estimation of soil humidity in depths of 2.5 cm and 7.5 cm.

To conclude, the study presented here describes the range of seasonal variations of physical parameters of soils of two locations. A greater knowledge of normal ranges of variation in different soils and geological environments could allow a subtraction of expected seasonal variations and an improvement of the comparability of measurements over a longer period. Additionally, the results showed again the applicability of conductivity measurements as an effective tool for water flux monitoring in unsaturated soils. The work was carried out in the frame of the MAGPROX project (EVK2-CT-1999-00019).