

SOIL AND SNOW MOISTURE MEASUREMENT SYSTEM WITH SUBSURFACE TRANSMISSION LINES FOR REMOTE SENSING AND ENVIRONMENTAL APPLICATIONS

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The knowledge of soil and snow water content is essential to many applications in meteorology, agriculture, hydrology and civil engineering. Most of the measuring techniques known to date are unable, however, to meet the user requirements in terms of accuracy, spatial resolution and measurement volume. Therefore a new moisture sensor technology has been developed. It is used for a broad range of applications, like ground truth measurements for the calibration of radar remote sensing systems, snow hydrology or monitoring of water infiltration in dikes to assess their stability. The moisture sensor system consists of transmission lines (multiwire flat band cables, twin rod probes) which are buried in the soil or enclosed by snowfall. Electromagnetic pulses are applied to the transmission lines and reflections are observed with a time domain reflectometer. With a new inversion algorithm the spatial variation of the dielectric properties of the soil or snow respectively the water content around the transmission lines can be determined in one dimension. The length of the transmission lines are up to 100 m depending on the surrounding material, which is especially suited for large area moisture monitoring and for comparison with remote sensing measurements in artificial constructions. Natural-occurring soil forms can be monitored with up to 47 twin rod probes per cluster. This large amount of data represents a substantiated form of ground based truth. Results of snow moisture measurement campaign and field investigations on a full-scale dike model demonstrate the capabilities of the new sensor system in monitoring transient hydrological processes with high resolution in space and time.