Geophysical Research Abstracts
Vol. 15, EGU2013-1230, 2013
EGU General Assembly 2013
© Author(s) 2012. CC Attribution 3.0 License.

An efficient method for deriving reliable field scale soil water contents from the GPR ground wave

Patrick Klenk (1), Yanfang Qin (2), Kefa Zhou (2), and Kurt Roth (1)

(1) Heidelberg University, Institute of Environmental Physics, Heidelberg, Germany (patrick.klenk@iup.uni-heidelberg.de), (2) Xinjiang Institute of Ecology and Geography, Chinese Academy of Sciences, Urumqi, Xinjiang, P.R. China

Over the last decade, significant advancements have been made for measuring soil water content across several spatial scales. Nevertheless, quantifying soil water content at the field scale (some ten to several hundred meters) still is a challenge.

Ground-Penetrating Radar (GPR) is a non-invasive electromagnetic geophysical method which is sensitive to variations of soil water content. Especially the GPR direct ground wave signal has repeatedly been employed for calculating near-surface soil water contents. However, traditional evaluation methods of common offset GPR ground wave datasets are typically hampered by insufficient time zero calibration.

After analyzing common pitfalls, we here present a novel calibration method for deriving reliable field scale soil water contents from evaluating the GPR direct ground wave signal. Our approach is based on employing independent information of two separate measurement channels of our multichannel GPR system. This method has been evaluated for center frequencies of 200 & 400 MHz. Employing antenna separations between 1 and 2 meters, the attainable accuracy is in the same range as can be achieved by point measurements with Time-Domain Reflectometry (TDR). The new possibilities are demonstrated by interpreting observed multiscale variations in the soil water content field at a semi-vegetated desert site in terms of the different generating processes.