Studying irrigation using the HF-MASW method

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Management of water resources to sustain increased agricultural production requires new and improved technologies. For this purpose, ARS National Program Action Plan NP211 Action Plan 2021-2025 of the Component 1 has established the objectives: “More effective management of water in agricultural irrigation, drainage and dryland/rain-fed systems, including development of easy-to-use, location specific sensors and sensor-driven decision support systems;” and “Combine static sensors and mobile proximal sensing to generate soil water and nutrient profile maps and prescription maps for variable-rate irrigation and fertigation;”. To achieve the above objectives, it is desirable to develop a subsurface soil water status sensing system that can noninvasively generate soil water profile map and to monitor and evaluate the performance of agriculture irrigation, drainage, and rain-fed system. A portable high-frequency multi-channel analysis of surface waves (HF-MASW) method has been developed with several enhanced techniques. In this study, we applied this enhanced HF-MASW method to measure instantaneous variations of soil profiles during irrigation. The testing site was located on the campus of the University of Mississippi, near the NCPA building. Five TDRs were installed to measure moisture contents at different depths. The HF-MASW measurements were conducted continuously before, during, and after rainfall events under different initial soil conditions. The typical overtone images and movies, soil profile images, and moisture contents were reported and discussed. The study demonstrated that the HF-MASW method has the capability to capture the temporal variations of soil profile in responding to irrigation procedure.