Geophysical Research Abstracts
Vol. 19, EGU2017-11780, 2017
EGU General Assembly 2017

Water Repellent Soils: The use of electrical resistivity tomography in a small scale catchment model to evaluate the effectiveness of surfactants.

Mary-Anne Lowe (1), Falko Mathes (1), Gavan McGrath (2), and Matthias Leopold (1)

(1) School of Earth and Environment, The University of Western Australia, Perth, Australia (mary-anne.lowe@research.uwa.edu.au), (2) Ishka Solutions, Nedlands, Australia

Soil water repellence effects large areas of land in Western Australia causing large forfeits in agricultural profit. Surfactants are a potential management tool, however, in field trials they have had varied success and their impact on water movement is poorly understood. This study employs a novel approach to determine the effectiveness of surfactants at modifying infiltration into water repellent soils. Using a physical catchment model (0.6 m $\times$ 0.6 m) with soils arranged in a ridge and furrow topography, irrigation and runoff were quantified. Electrical resistivity tomography (ERT) was used to measure changes in soil moisture patterns in two dimensions. Two sandy soils with contrasting severity of water repellence, as measured by the Molarity of Ethanol Droplet (MED) test, were assessed. The impact of two surfactants, at an equivalent rate of 1 L ha-1, and an untreated control were monitored over 5 wetting events. With surfactant application the very severely water repellent soil (MED 4.2 M) showed an increase in infiltration of up to 31%, which was concentrated under the area of surfactant application in the furrow. Volumetric water contents beneath the furrow increased up to 40% below 20 mm depth. Water infiltration into the untreated soil with low water repellence (MED 1.0 M) was 98%, and this did not significantly change with surfactant application. This physical catchment model, combined with hydrological and geophysical monitoring provides a useful tool to assess the effectiveness of surfactants in increasing water infiltration and subsurface soil moisture in water repellent soils. The work is part of the Australian CRC for Polymer project.