Geophysical Research Abstracts
Vol. 16, EGU2014-4791, 2014
EGU General Assembly 2014

Temporal patterns of infiltration into a water repellent soil under field conditions

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Water repellency causes substantial economic losses for farmers in southern Australia through impacts on crop growth and weed germination. However, recent research has demonstrated that laboratory measurements of water repellency may not be a reliable indicator of the severity of symptoms experienced in the field. In particular, crop residue retention and minimal soil disturbance led to increased water repellency, but was also associated with higher soil water contents measured at strategic times of the year. Little is known about the temporal patterns of soil water storage close to the soil surface in a water repellent sand. In this research we measured soil water content at a depth of 0.05 m at 15-minute intervals from June 2011 to October 2012, under various treatment combinations of residue retention and soil disturbance. Measurements were made in both 'crop row' and 'crop inter-row' positions. For a rainfall event (9.2 mm) in March 2012, prior to crop seeding, plots previously established with no-till absorbed significantly more water (increase in soil water content of 0.074 v/v) than plots conventionally cultivated (0.038 v/v). In June 2012 (12.6 mm), 4 weeks after crop seeding, tillage was again significant, and there was a significant interaction between tillage and 'row' or 'inter-row' position. These results demonstrate the importance of crop management in modifying the response of water repellent soils to rainfall in the field.