

Using geoelectrical methods (EMI and ERT) to better understand soil moisture characteristics of gilgai soils under native vegetation.

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The growing availability of rapid electromagnetic induction (EMI) methods to measure soil electrical conductivity (EC), has enabled the potential to further understand the soil moisture characteristics of gilgai in shrink-swell soils. Two geophysical surveying tools were used to assess various soil attributes linked to soil EC— an EMI derived depth weighted average of apparent electrical conductivity (ECa) and an absolute value of true electrical conductivity (EC) derived from electrical resistivity tomography (ERT). This approach added visual insight into the moisture mechanisms of wetting/drying associated with Vertosols. In this study an EM38 was used over multiple dates in an area of native vegetation (brigalow/belah), on a Grey Vertosol in the Border River region displaying classic mound and depression type gilgai. An ERT 90 meter survey line running through both mounds and depressions provided an image of the subsurface soil. This occurred after the final EM38 survey date when the survey site had experienced a large rainfall event. The results from the EM38 sample dates demonstrated a clear pattern of mound and depression and the wetting up patterns after rainfall. Spatio-temporal moisture dynamics, microrelief patterns and subtle effects on water movement in the landscape caused by gilgai could be identified. The ERT survey line identified clear division between surface 0-50cm, and a subsurface moisture band (50-100cm) under depression microrelief and lower moisture content under the mound microrelief. Using both methods provided additional information on the spatio-temporal moisture dynamics in the landscape caused by gilgai. Together with traditional soil sampling to ground truth the imagery this could aid in not only further understanding variations in water movement/storage in native vegetation but in agricultural practices where the underlying strong (prominent) gilgai soil physical factors still remain after laser levelling.