SPATIAL VARIABILITY IN HYDROLOGICAL PROPERTIES AT THE PADDOCK SCALE USING EM SURVEYS

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A close-spaced (25 m x 50 m) electromagnetic induction (EM31) survey of a 700 ha property in the western basalt plains of Victoria (Figure 1) shows a high degree of spatial variation in inferred salt content (as ECa) and the degree of leaching of the upper 5 m of the regolith. ECa values can be regarded as a surrogate measure of the relative rate of water movement (vertical and lateral) within the regolith and hence have important implications for hydrological processes at the paddock scale as compared with regional or sub-catchment scales.

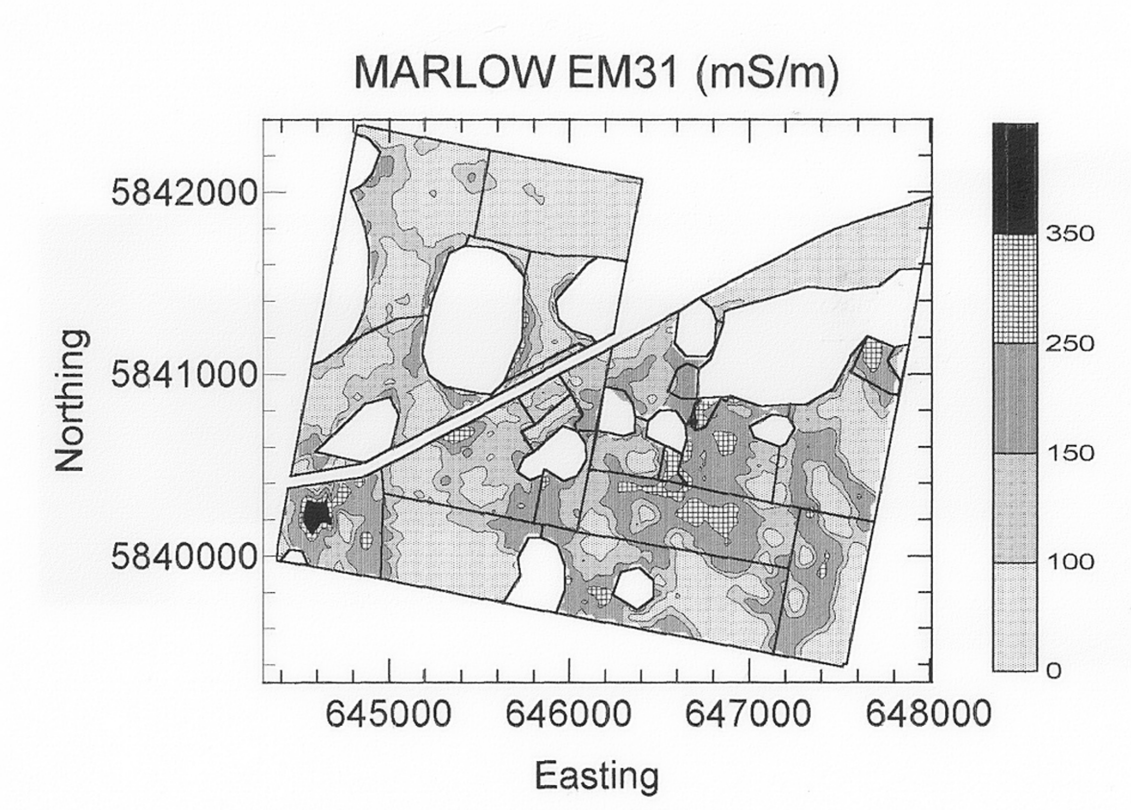

Figure 1: Isoconductivity map of "Marlow", Victoria.

In this example, ECa values ranged from <100 mS/m to greater than 400 mS/m and all parts of the property exhibited ‘sink holes’ and ‘mounds’ of relatively low and high ECa values, respectively. These hydrological features range in size from 200 to 500 m diameter and/or length and are not related to surface topography. There are clear indications of connectivity between the existing salt lakes as well as with neighbouring properties.

The sink holes (Figure 2) are preferred pathways for groundwater movement (both vertical and lateral) at a scale not previously recognized. Similarly the high ECa ‘mounds’ (Figure 3) indicate areas which are acting in a salt accumulation or discharge mode. Both have important implications for land management practices aimed at controlling groundwater recharge and discharge.

Predictions about the spread of salinisation based on hydrological models that operate at a regional or sub-regional scale do not handle spatial variability in soil hydrological properties at a paddock scale very well (e.g., the piston flow assumption in distributed parameter models). Thus, in situations where undetected sinkholes and mounds exist, modelled scenarios for salinity management could be misleading. Using ground based EM, a technique that is technically well proven and relatively simple to use in practice, it should be possible to devise solutions to plug the holes and reduce the development of discharge mounds that are

In: Roach I.C. ed. 2004. *Regolith 2004.* CRC LEME, pp. 400-401.

technically and financially acceptable to land managers. The benefits include landscape repair, more realistic modelling, improvement in production and the development of more sustainable on-farm management systems.

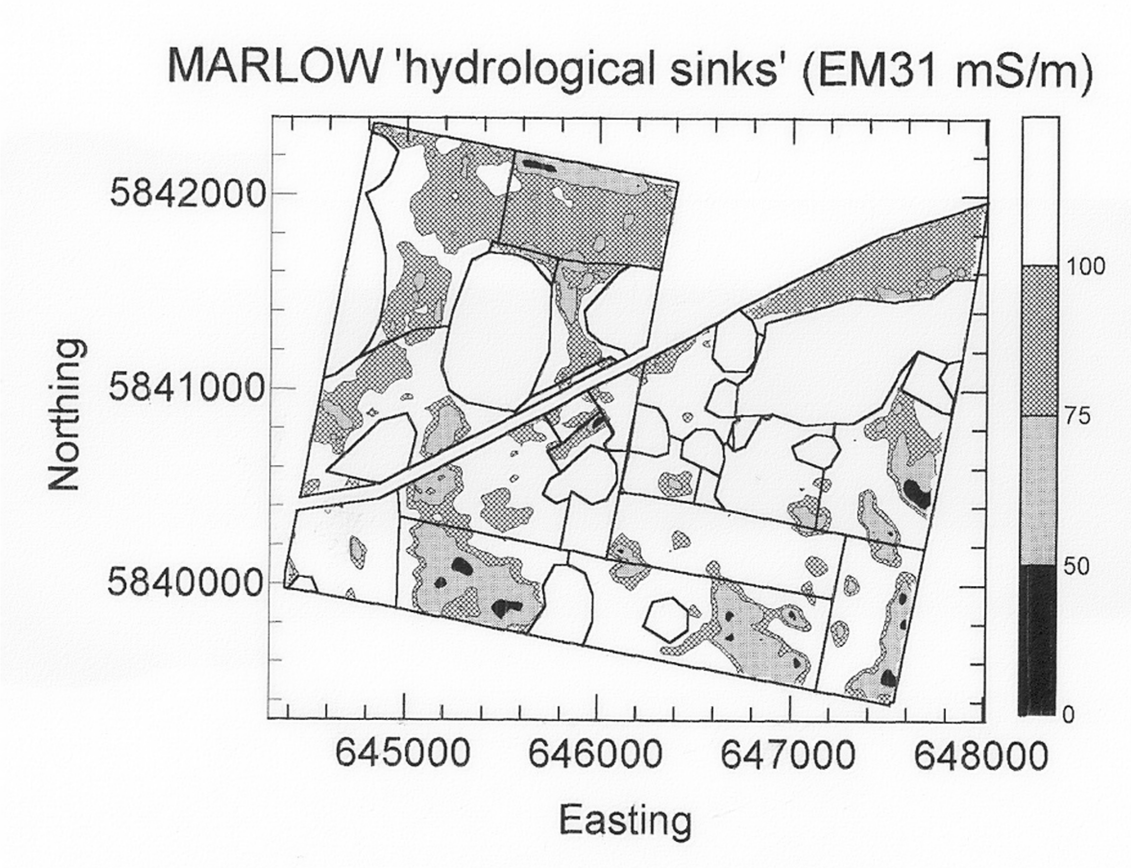

Figure 2: Hydrological "sinks" as defined by EM31 (mS/m).

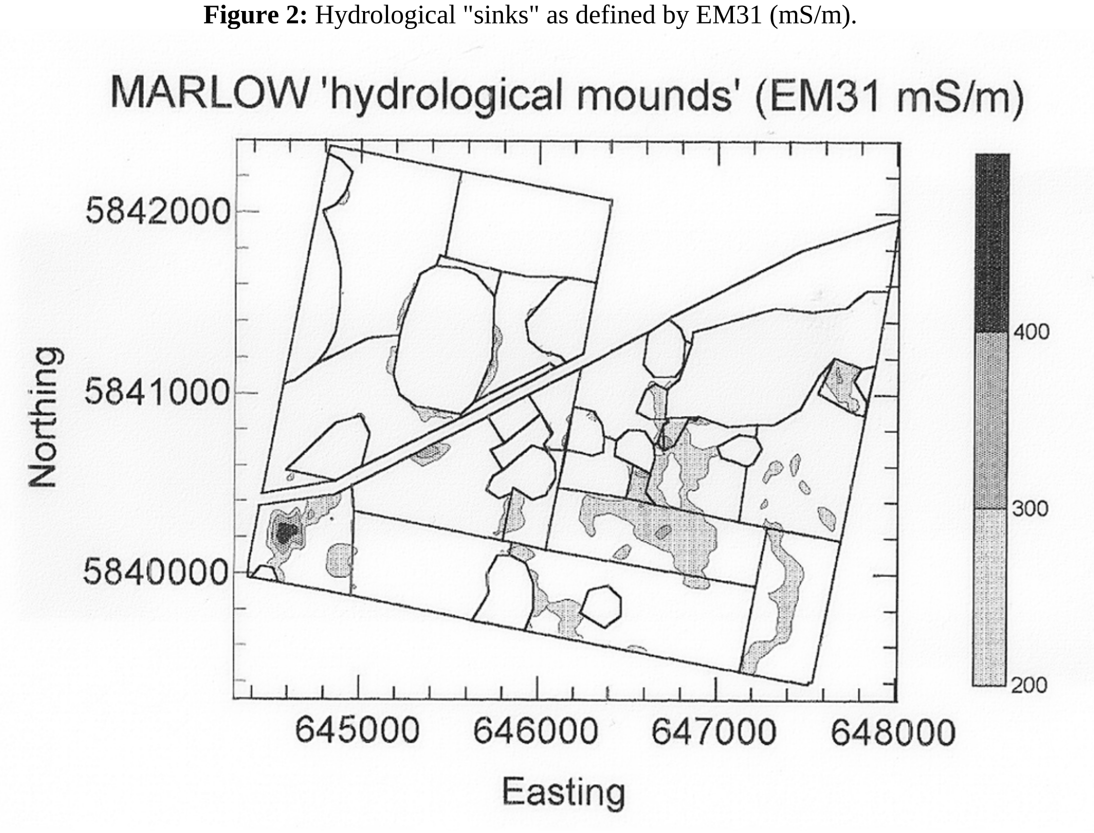

Figure 3: Hydrological "mounds" as defined by EM31 (mS/m).