Mapping salinity and groundwater systems- a multi-disciplinary approach integrating geophysics and regolith geoscience

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In Australia, regolith (the soils, sediments, weathered bedrock and sediment, that lie between fresh air and fresh bedrock) is the major salt store in the landscape. Groundwaters move through these regolith materials, mobilising the salt which salinises our groundwaters, waterways and land. Yet today there is little more than surficial knowledge of regolith landscapes and materials, little appreciation of the distribution of salt or saline groundwaters buried in the landscape, and even less information on the dynamics of water-rock-salt interactions in these environments. This paucity of information restricts management options.

CRC LEME's approach integrates new bedrock and regolith science knowledge, in a flexible, multi-disciplinary approach that utilises a variety of remote sensing (eg Landsat, ASTER) and geophysical technologies (eg high resolution DEMs, electromagnetics, magnetics and radiometric data) appropriate to particular landscapes and problems. Airborne and ground geophysical data are typically acquired at sub-catchment scales in key study areas considered representative of the catchment and problem to be addressed. When validated by surface and drilling data, these data can provide 2D and 3D maps of key elements of salinity and groundwater systems.

Importantly, interpretation of these geophysical data is assisted by an understanding of regolith geoscience. Multi-disciplinary studies that include landscape evolution, geomorphology, sedimentology, sequence stratigraphy and weathering history provide a knowledge framework for resolving the distribution of materials in the sub-surface. This is particularly useful in mapping and predicting the connectivity of aquifers and aquicludes, and in identifying and mapping units of similar hydraulic conductivity and potential groundwater flow paths in the sub-surface. These data in turn provide information that constrains models of groundwater flow and salt mobilisation. This approach builds on existing groundwater flow system and catchment characterisation frameworks, and provides a basis for assessing the risk of salinity within catchments at a range of scales and in a variety of landscapes.