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# Using Spectral Induced Polarisation for water detection:

An example from the Mound Springs,  
South Australia.

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## Abstract

Inland Australia is characterised by low rainfall and high evaporation rates making the knowledge about the location and quality of groundwater very important. The Great Artesian Basin (GAB) covers approximately 25% of Australia, and is central Australia's major source of groundwater, thus making it the most important source of water for this region. The springs of interest for the purpose of this study are located along the South-western margin of the basin within the Wabma Kadarbu Mound Springs Conservation Park. Our aim is to further our understanding of the spring systems within the GAB.

Groundwater and near surface geophysical surveys were used to develop parameters and state variables that aid in characterising near surface groundwater systems. Most electrical geophysical surveys designed to characterise hydrological problems measure only resistivity. This study employs the complex resistivity or Spectral Induced Polarisation (SIP) method as it provides the complete set of IP and resistivity data over a large range of frequencies and is therefore considered to be an added dimension to galvanic measurements.

There is a growing body of literature suggesting that the imaginary component of the IP and SIP response has a direct relationship with the hydraulic conductivity, however these studies have been carried out in controlled lab conditions. A major focus of this project is therefore to see if SIP can be used on a larger scale (i.e. field scale). As IP and SIP may be useful, there are several significant problems that have limited its success, with the key issue being contamination of data by electromagnetic (EM) coupling. Two attempts were made to evaluate and decouple the SIP data collected for this survey. The first was the residual analysis method and the second is based on the paper published by Pelton (1978). Our data analysis suggests that the EM coupling parameters are being resolved well. IP parameters however, require further investigation.

**Key words:** Great Artesian Basin, Induced Polarisation, Spectral Induced Polarisation, Electromagnetic Coupling

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