



Inverting Electromagnetics - Faraday's Law Measures Groundwater Flow

Groundwater is a precious natural resource but we lack tools to efficiently monitor the health of groundwater and hard-to-reach aquifers. Globally, governments and water authorities are struggling to measure and manage groundwater resources as they face the impacts of groundwater contamination, climate change and more frequent droughts.

Lincoln Agritech is leading a research programme to develop electromagnetic sensors to measure groundwater flow velocity and direction that incurs minimal environmental impact and requires negligible establishment requirements. The sensors will enable a substantial increase in the number of measurement sites to assist water resource management practices.

The technology positions a large electromagnet below the water surface, which generates an

electric field caused by the interaction of the magnetic field with water velocity. Measuring the extremely small signals induced by the slow-moving groundwater is very challenging and takes Faraday's law of induction to new levels of measurement accuracy; this has required us to design new equipment and develop new signal processing techniques that can measure the very small speeds needed to accurately gauge groundwater flow velocity.

The programme is funded by the National Science Challenge, Science for Technological Innovation, and includes researchers from Canterbury, Victoria, Waikato and Otago Universities and GNS.