



Project 2.4: Joint Inversion of 3D Seismic and MT Data



PROGRAM 2: LOGGING & SENSING

Program Leader	Brett Harris (Curtin University)
Project 2.4	Joint Inversion of 3D Seismic and MT Data
Project Leader	Brett Harris (Curtin University)
Key Researchers	Andrew Pethick (Curtin University), Anton Kepic (Curtin University), Eric Takam (Curtin University)
Participants	Curtin University
Timing	1 March 2014 – 31 March 2018
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In Kind Funding	\$520,000
Review Panel Chair	TBC

“Cooperative inversion of 3D geophysical data harnesses the value of petrophysical, geo-statistical and structural constraints from multiple techniques. It will present geo-scientists with new and exciting options for deep exploration.” **Brett Harris, Curtin University**

OBJECTIVES

To investigate the advantages of co-located seismic and EM surveys in terms of mutual constraints and cooperative inversion that significantly improve geological interpretation over that which can be achieved from a single technique.

BACKGROUND AND AIMS

High quality geophysical data sets are collected around existing mines and mineral exploration targets. Such geophysical measurements are used to image the earth, often in three dimensions (3D), through a process called inversion. However, given the depth of many target regions, these images generally have poor resolution and suffer from an ambiguity of interpretation. Cooperative inversion is a hot area of geophysical research, combining more than one data set to produce a single geological model. Not only do we get more accurate models of the earth by using multiple data sets, we also benefit from the mutual constraints between data sets.

This project will combine existing 3D seismic and MT data sets to produce workflows capable of generating more accurate and better resolved models for deep mineral exploration and mineral resource targeting.

SERVICE SECTOR ENGAGEMENT AND COMMERCIALISATION

Outputs of interest to industry partners and potential commercialisation are:

1. Cooperative inversion workflows for collocated 3D seismic and EM data sets.
2. Examples and comparisons of cooperative inversion using, geo-statistical, structural and petrophysical constraint.
3. Examples demonstrating application of cooperative inversion strategies on industry scale co-located 3D seismic and EM data.

LINKAGES TO OTHER DET CRC PROJECTS

Of high importance to Project 2.4 are the near real time geo-statically, petrophysical and structural constraints (i.e. data) generated by DET CRC's next generative drill site technologies (e.g. Lab-at-Rig™ AutoSonde™ etc). Project 2.4 has particularly strong links with Project 2.3 and Project 3.1. The combination of cooperative inversion and new data, drive towards improved success for deep exploration.

YEAR 2 MILESTONES

- Manual for co-operative inversion workflows using a petro-physical approaches (e.g. geo-statistical constrains) is written, and a workshop developed and presented (e.g. ASEG 2015 in Perth).
- Research paper is submitted to a peer reviewed Geophysics Journal.
- Data archived under the arrangements of DET CRC's data management plan.
- Report on cooperative inversion schemes applied at Hillside or an alternative site (with co-located seismic and MT data over a recognised mineral terrain).

COMMONWEALTH AGREEMENT OUTPUT AND MILESTONES

- Cooperative inversion first used including structural and/or petrophysical constraints for 2D and 3D seismic and MT data.
- Training package developed and workshops conducted with industry on the application and use of the software.
- Cooperative inversion from seismic and MT datasets to produce a single image is demonstrated.
- Cooperative inversion workflow is documented and training package is made available.
- Cooperative inversion of MT and seismic data is provided to sponsor mining houses in relevant terrains and also used by state geological surveys in regional mapping.