

Utilisation of stochastic MT inversion results to constrain potential field inversion

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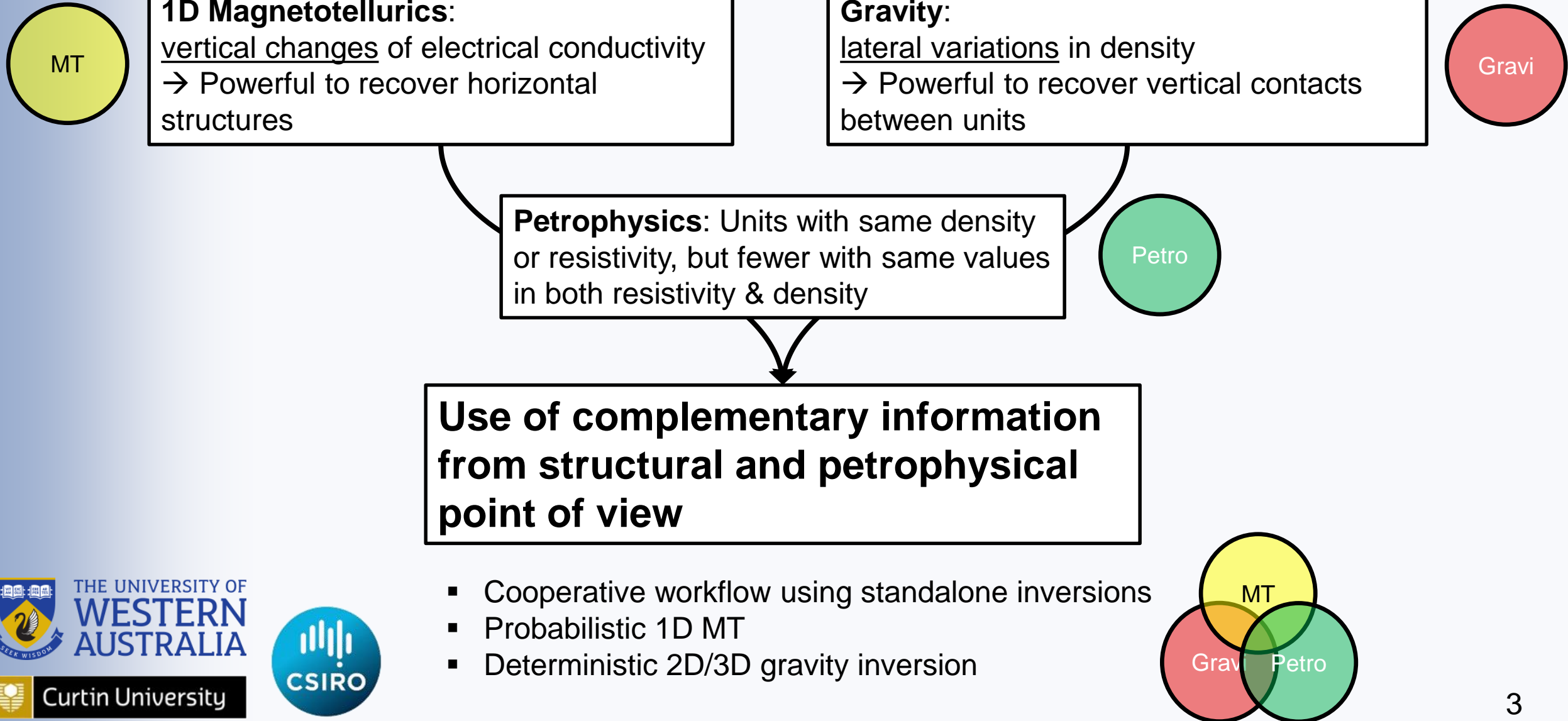


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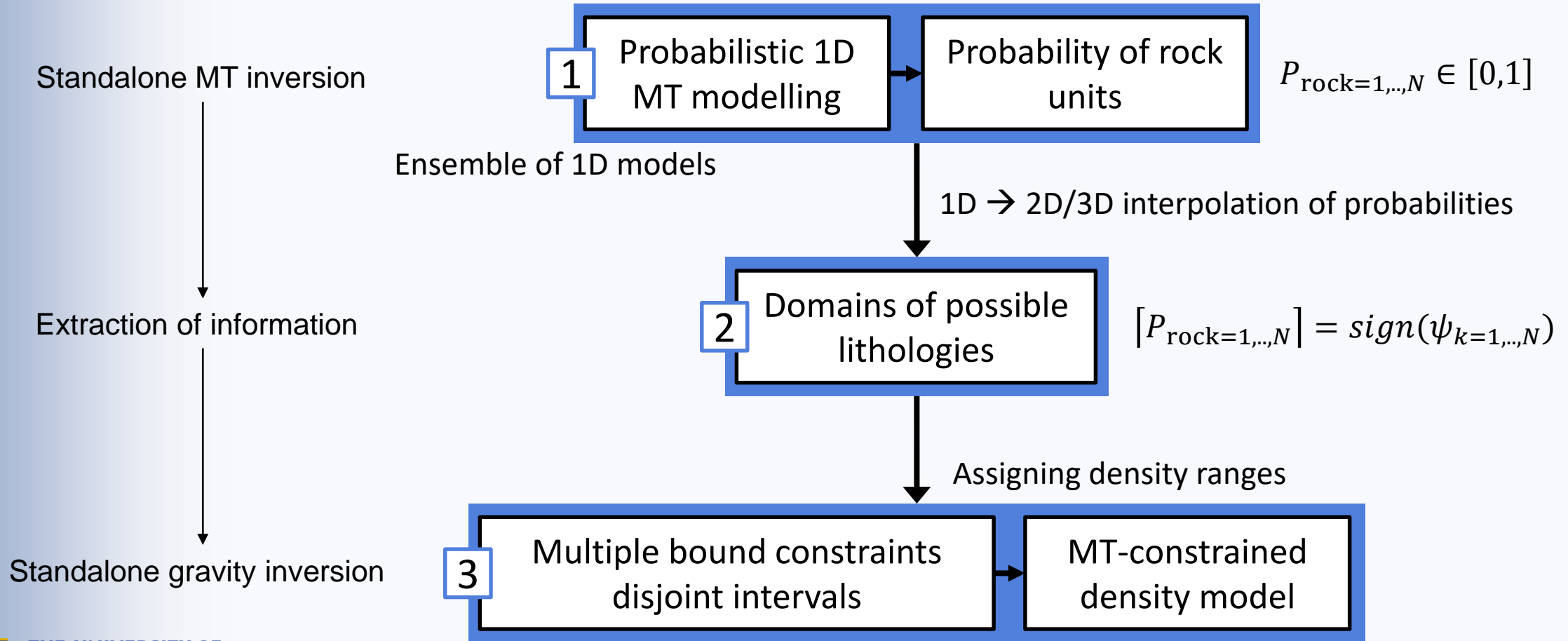


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Objectives



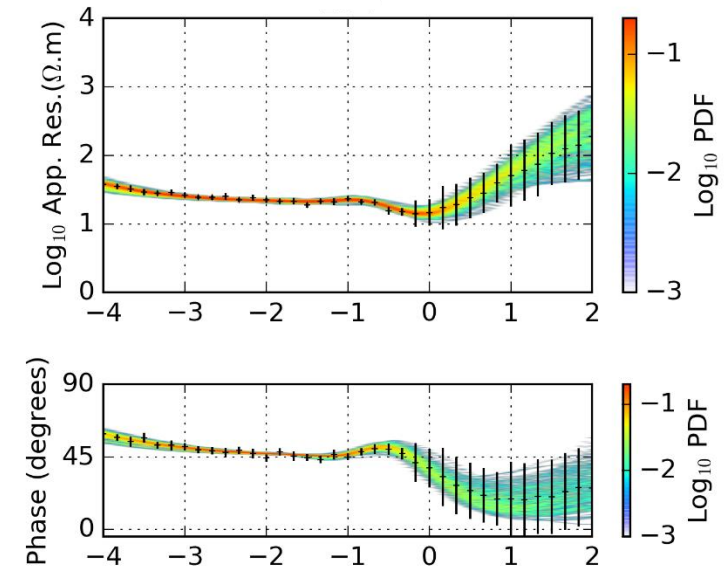
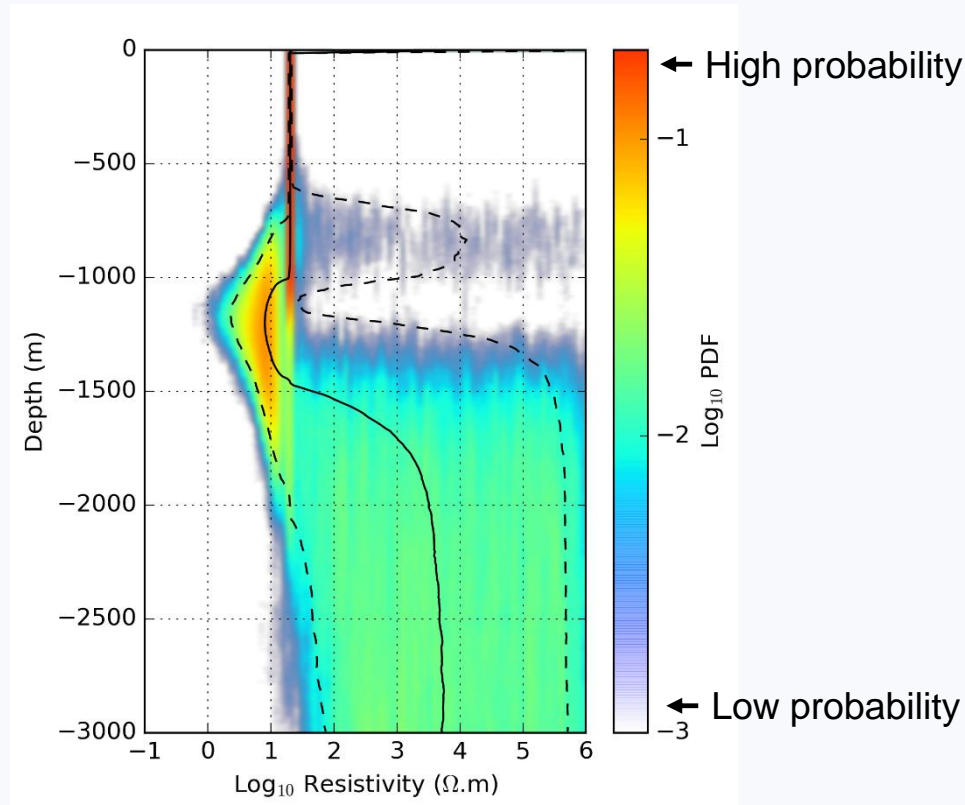
Workflow



1D probabilistic MT Data inversion



- 1D trans-dimensional Markov chain Monte Carlo sampler → collection of models fitting data
- Robust to non-1D effects present in the data (Seillé and Visser, 2020).

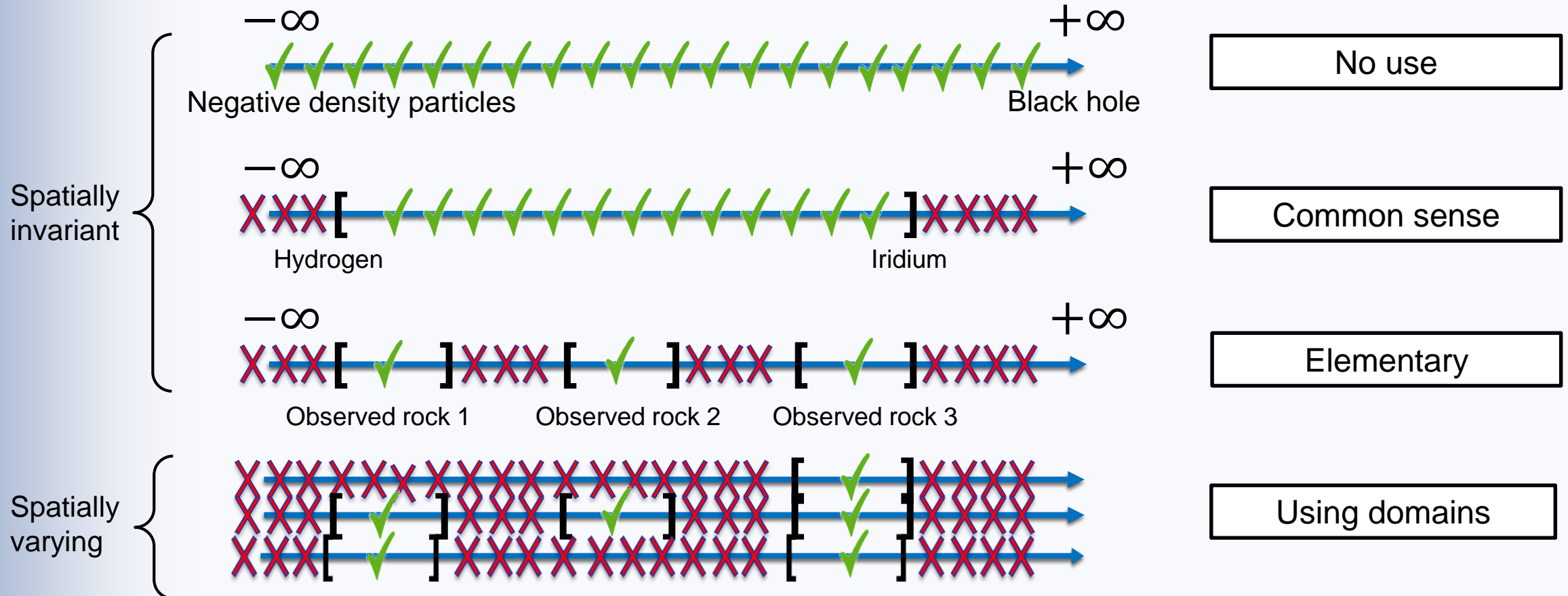


→ 1D MT probabilistic inversions are represented as ensembles of 1D models for each site, each of them satisfying the data within its uncertainty.

Multiple bound constraints using domains

Range of density contrast used allowed in **gravity inversion**

Usage of prior info

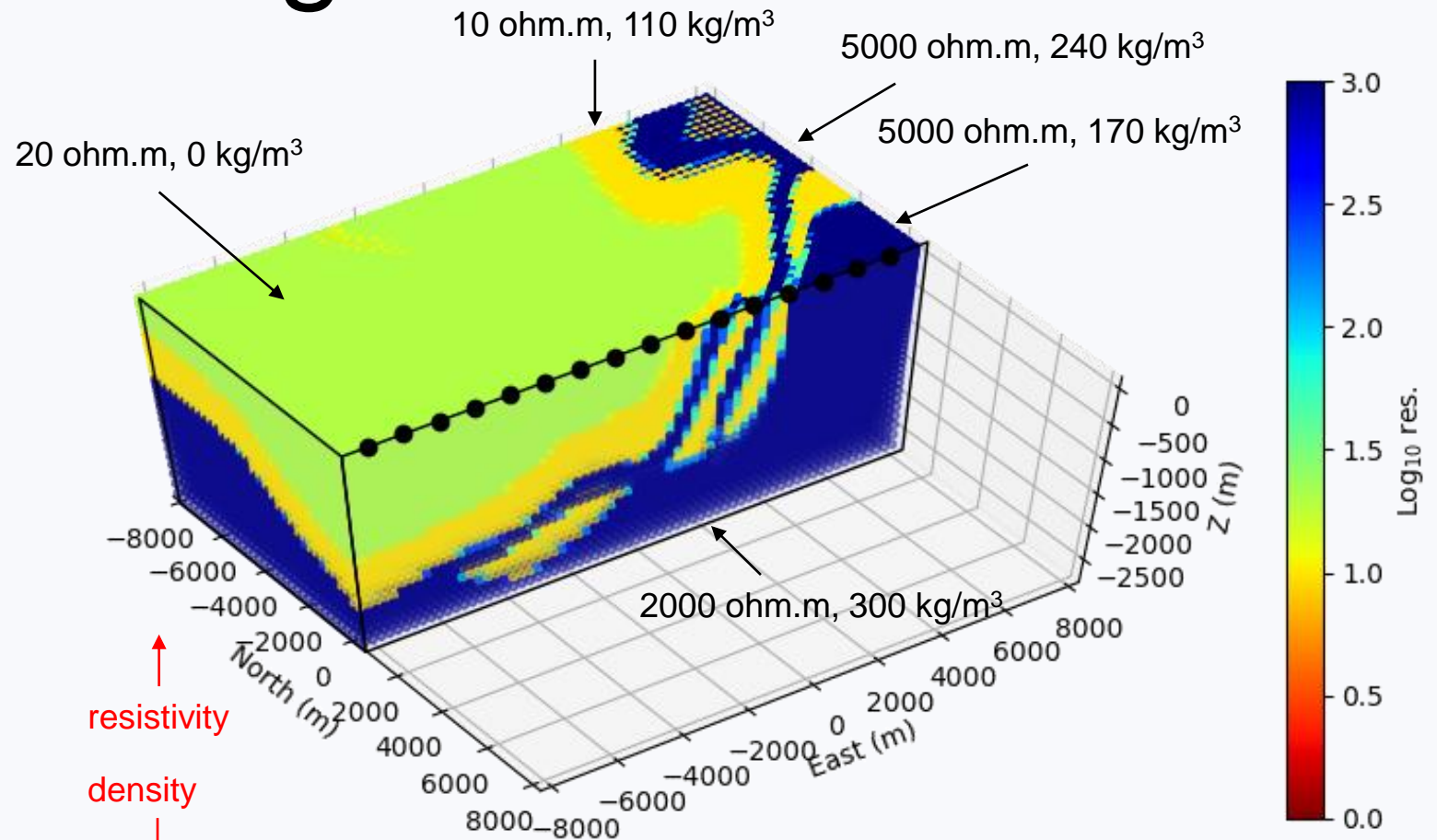


→ Values to choose from vary in space accordingly with domains ←

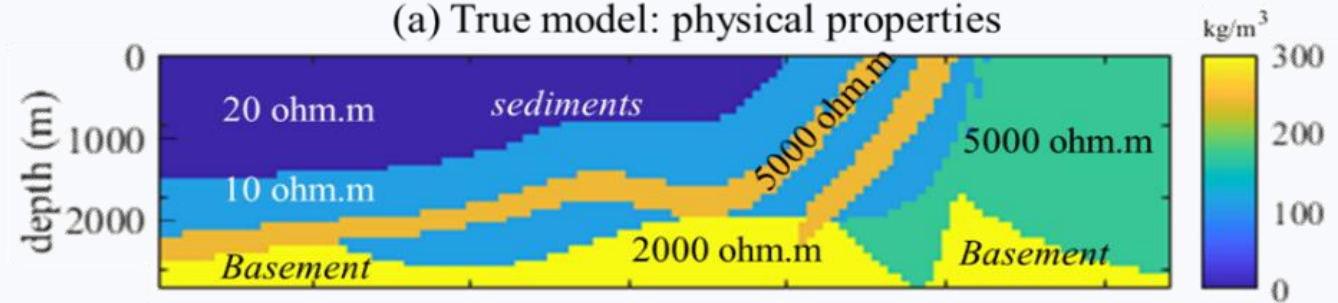
Proof-of-concept MT+gravi

Synthetic model

- 3D MT forward simulation computed for 16 MT sites along a line (ModEM)
- Frequency range: 10kHz – 0.01Hz
- + 5% Gaussian noise
- 128 gravity measurements along line



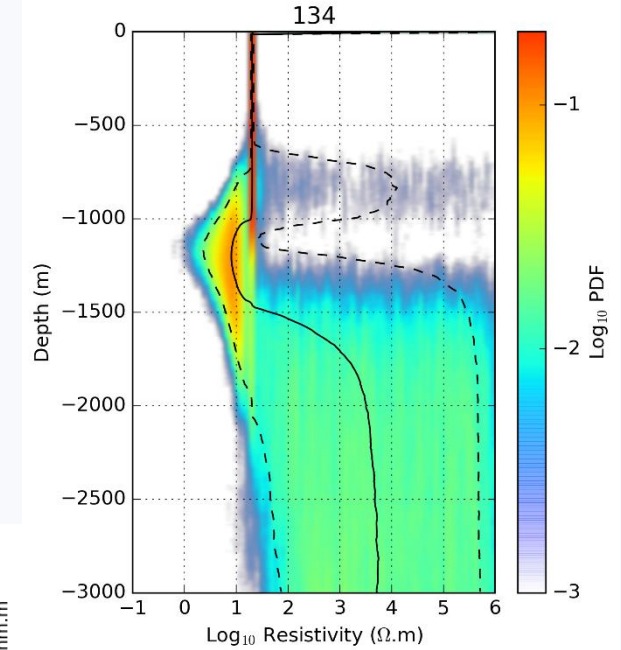
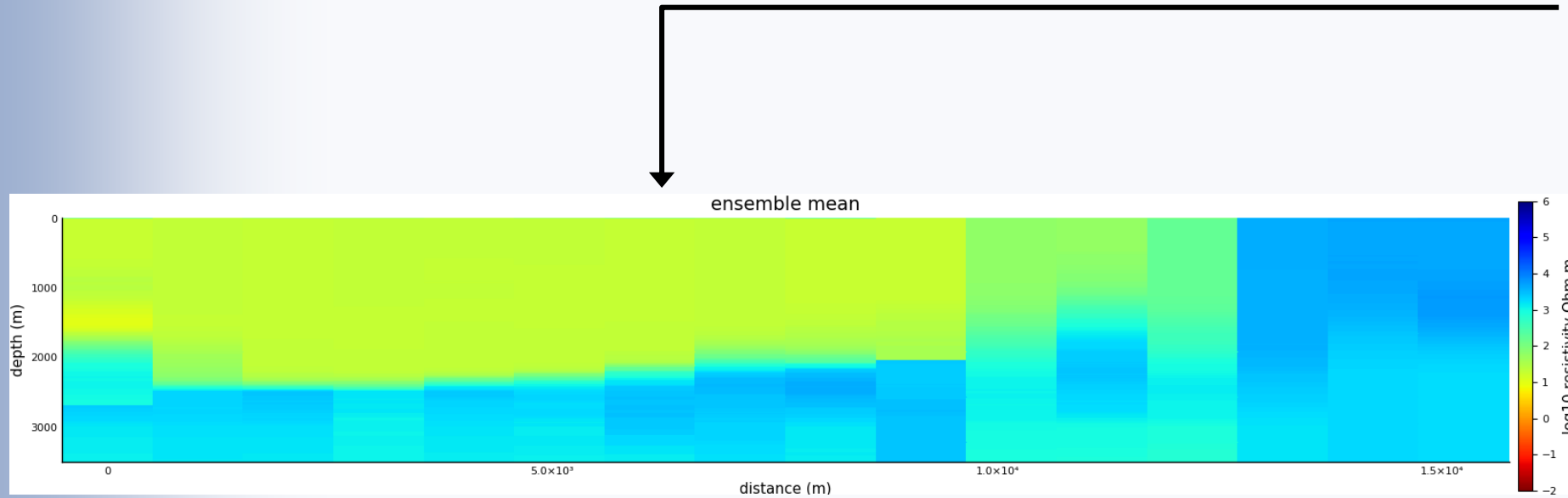
(a) True model: physical properties



Geological structural model from Pakyuz-Charier 2018;
Gravity and density model from Giraud et al. 2019

Proof-of-concept

1D probabilistic MT Data inversion and fusion into 2D



- 1D ensembles of each MT site are filtered given prior assumption on the lithologies' resistivities and fused along the 2D line given prior assumption on spatial lateral continuity (Visser 2019)

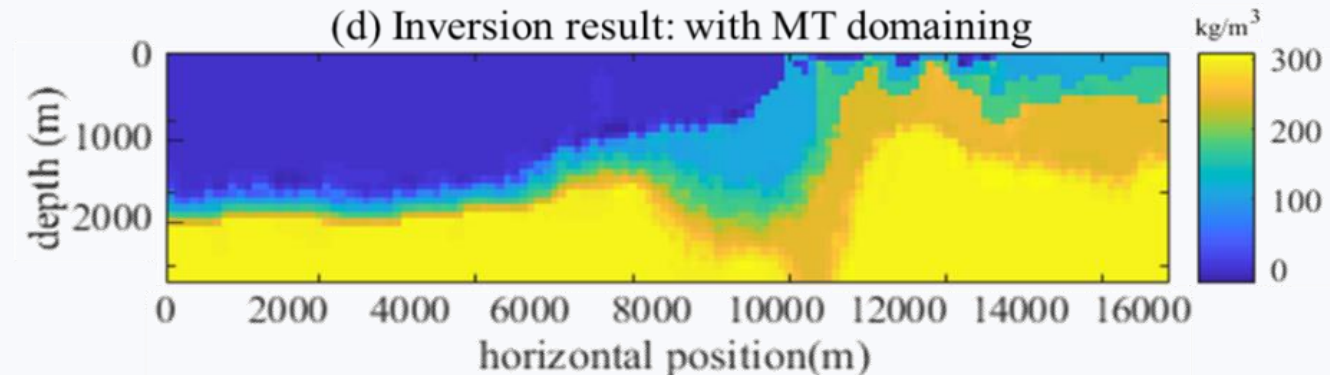
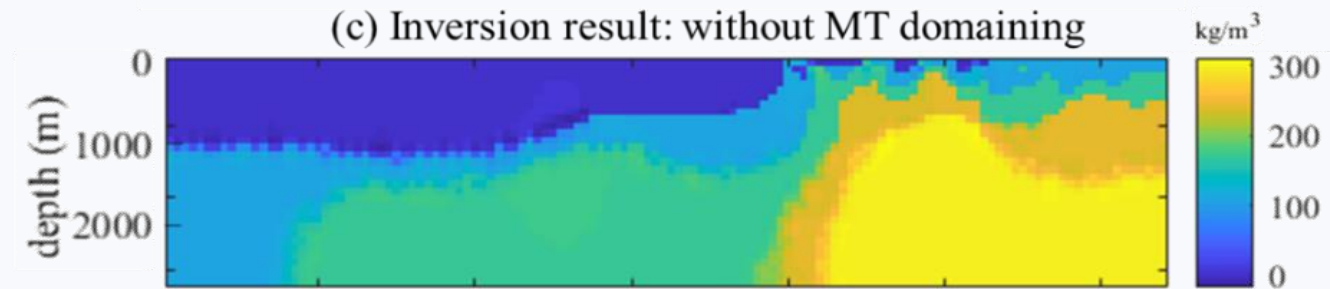
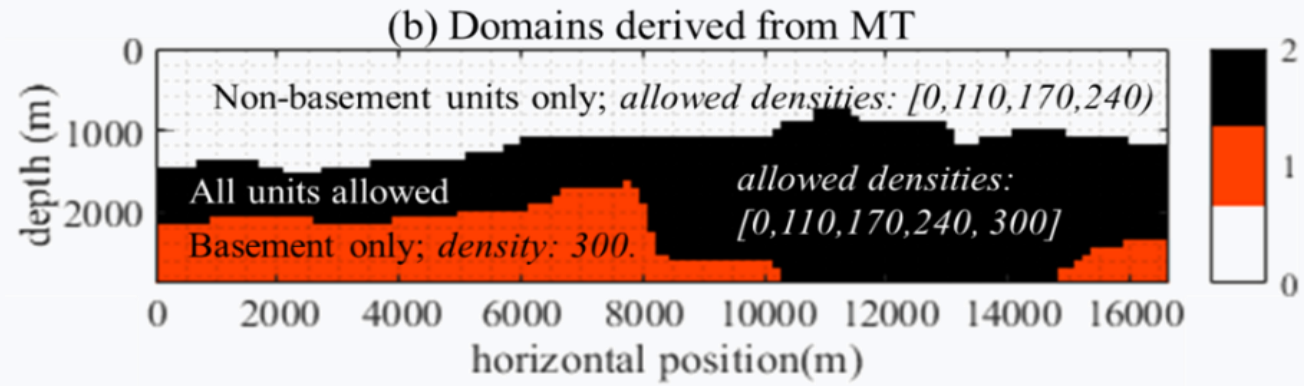
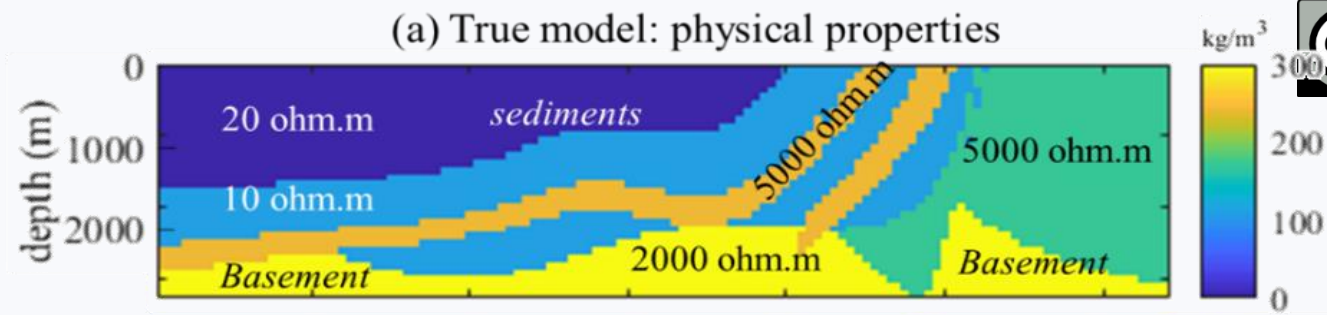
Proof-of-concept

Inversion results



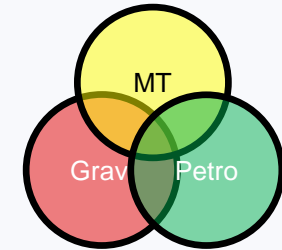
Domains using all model realizations from probabilistic MT inversion

Gravity inversion using disjoint multiple bound constraints

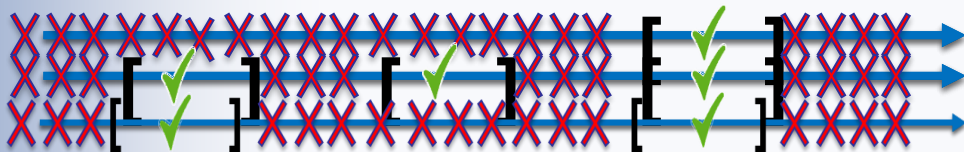


Conclusion and discussion

- Undercover imaging, basement
- Results from probabilistic MT inv
- Constraints for gravity \rightarrow basement

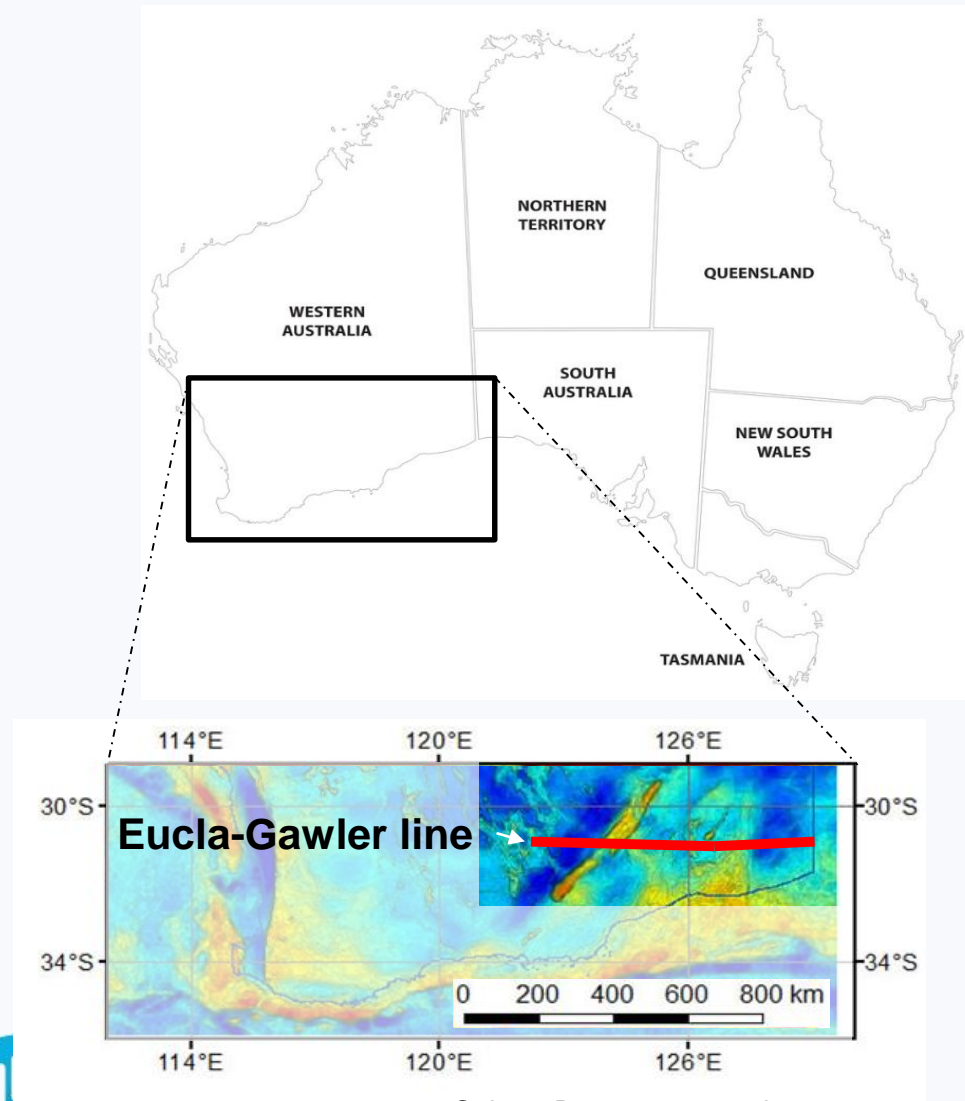


- Cooperative workflow using standalone inversions
- Probabilistic 1D MT
- Deterministic 2D/3D gravity inversion using MT domaining



- Next step – field application, Eucla-Gawler line in Western Australia, depth of cover estimation

Finish note: current investigation



Real-world application

130+ broadband MT sites
High resolution gravity

→ Thickness of cover
→ Depth to basement

Colour: Bouguer anomaly.
Courtesy of Geological Survey of Western Australia (GSWA)

References



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Questions