A generic current source inversion algorithm for Mise-à-la-masse prospection

Tentatively in Computer and Geosciences

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Core ideas

* Propose an open source and generic algorithm to invert current source density in Mise-à-la-Masse prospection
* Model appraisal and uncertainties
* Show the application of the algorithm on three different contexts: plant root imaging, landfill leakage and salt intrusion monitoring
* Address pip to download the open source python package “pyMALM”: coming soon

Abstract

*Keywords:* Mise-à-la-masse, inversion, ERT, curent density

1. Introduction

Landfill MALM : (Binley et al., 1997), (Colucci et al., n.d.), (Binley et al., 1999),

Tracer injection:

Roots imaging MALM : (Mary et al., 2020, 2019, 2018)

Inversion MALM : (Shao et al., 2018)

Inversion code (Blanchy et al., 2020)

* 1. Background
  2. Potential of MALM
  3. Existing approaches for MALM inversion

1. Structure of the code
2. Applications
   1. Case of root system imaging
   2. Case of landfill leakage
   3. Case of salt intrusion monitoring

Acknowledgements

This project has received funding from the European Union’s Horizon 2020 research and innovation programme under the Marie Sklodowska-Curie grant agreement No 842922

Figures

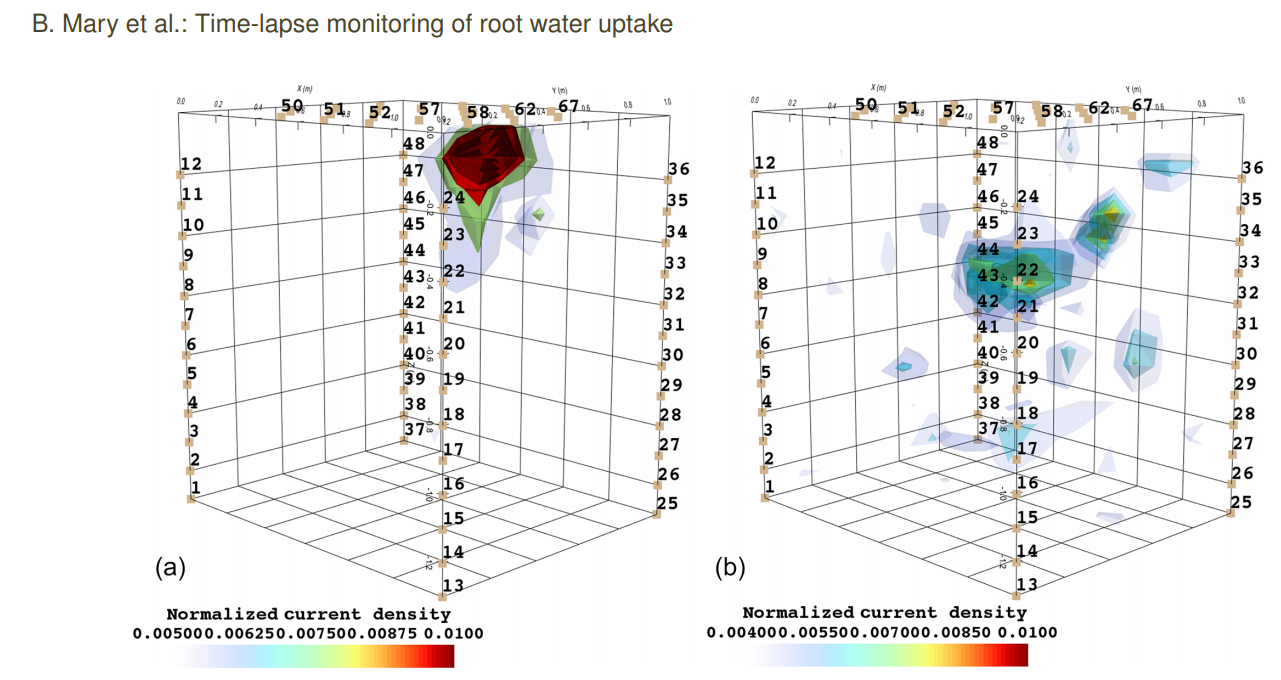
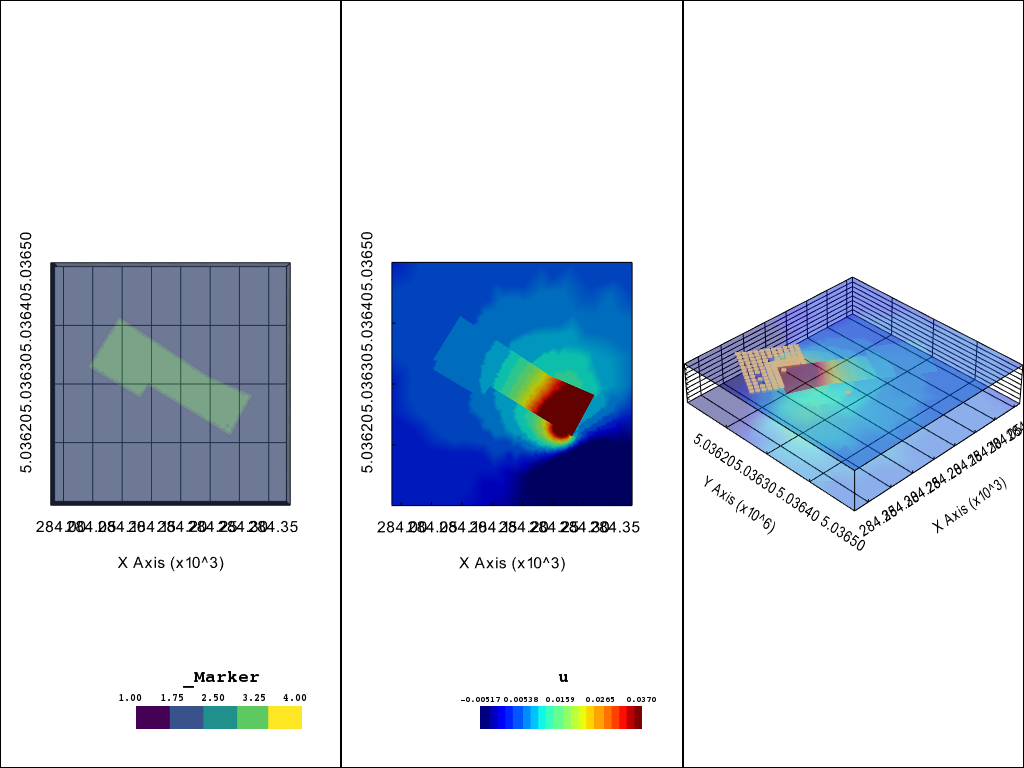
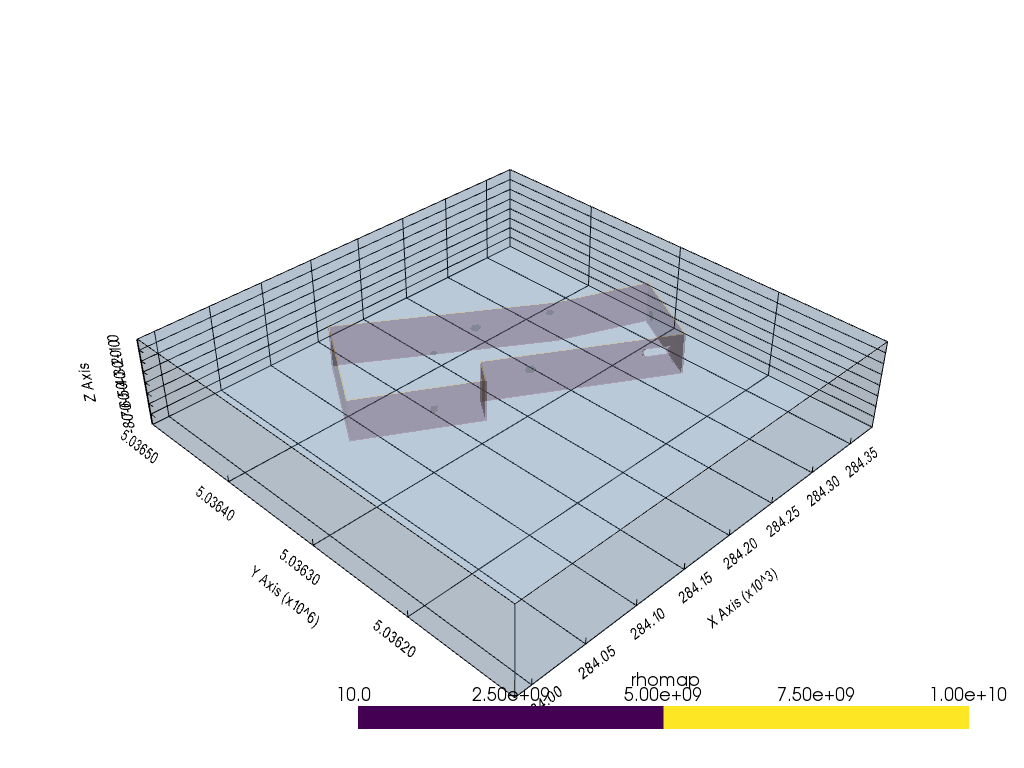


Figure 1: application on root system (ref Mary et al. 2020)



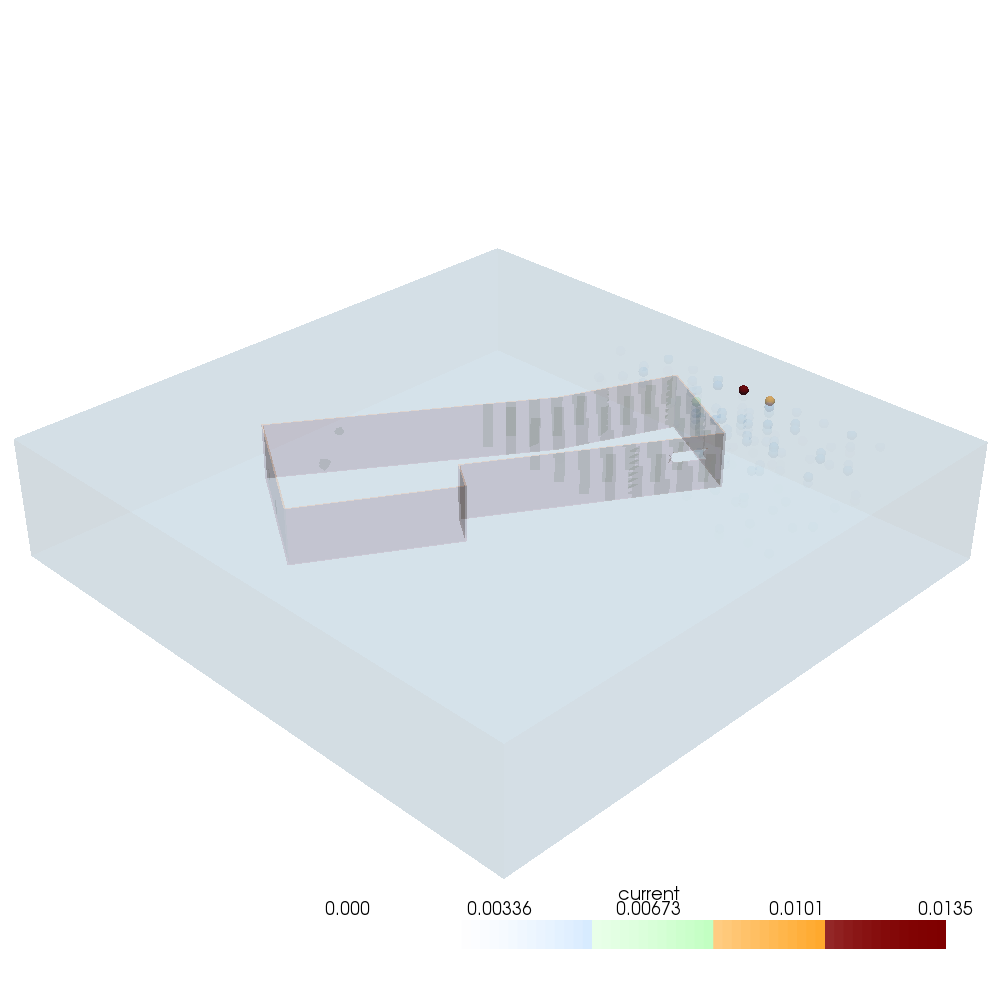
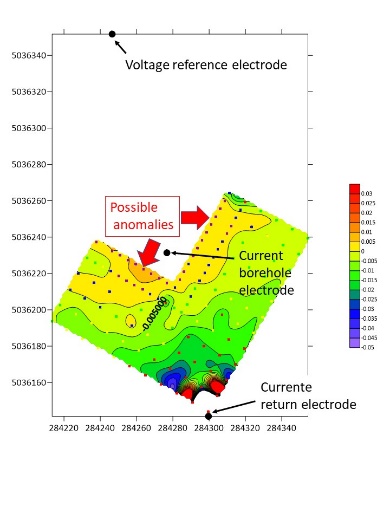
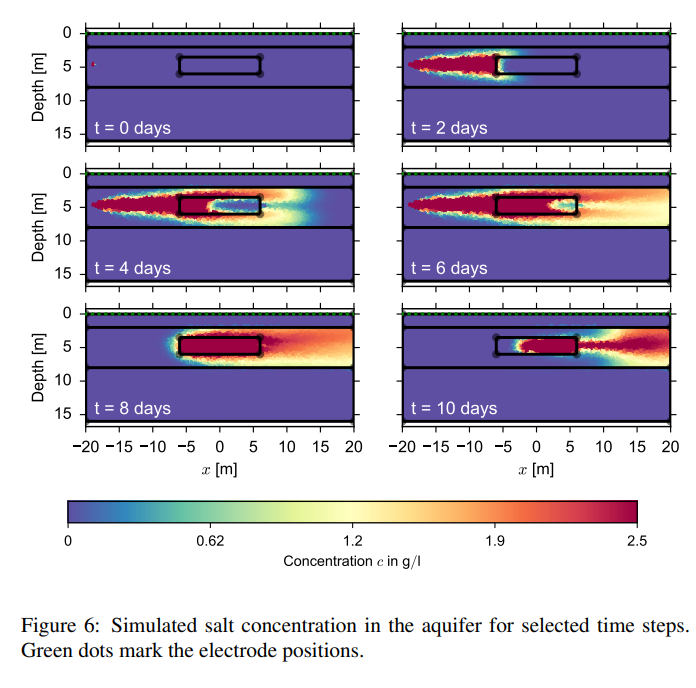
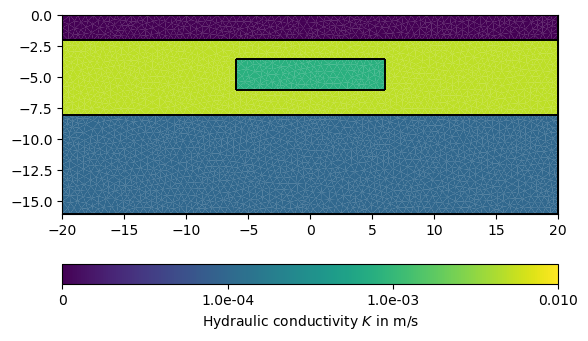


Figure 2: Application of the algorithm on a 3d landfill leakage (Landfill Porto Marghera). (a) initial map of resistivity showing the landfill delineation and the presence of a hole in the liner. (b) result of potential field u for the MALM simulation (c) voltage distribution from field acquisition (d) source current density after inversion of synthetic data. The ICSD shows here all its usefulness when the remote electrodes are not enough distant and pollute the signal and interpretation of equipotential.



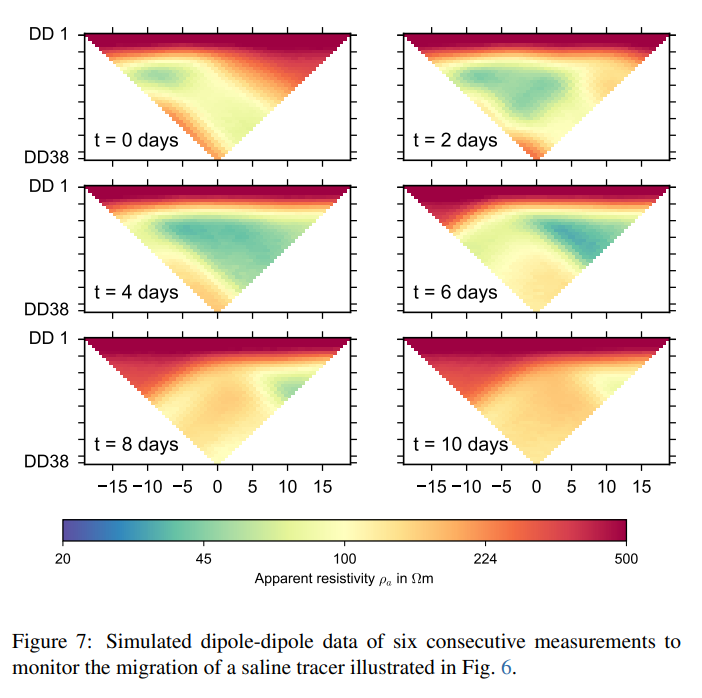


Figure 3: Time-lapse ERT simulation measurements during a saline tracer injection. (a) initial model of hydraulic conductivity (b) simulated salt concentration for selected time steps (c) Simulated dd data. The figures were generated with pygimli and are also described in the pygimli article

|  |  |  |  |
| --- | --- | --- | --- |
|  | Initial resistivity model | Voltage distribution | Fraction of current density (scale from 0 to 25%) |
| T1 |  |  |  |
| T3 |  |  |  |
| T6 |  |  |  |

Figure 4: Result of the inversion of current density (column 3) for different initial resistivity models (column 1) corresponding to different time steps after salt tracer injection.

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Recent paper of Blanchy and pygimli team

Paper Revil

Papier Maria Theresa

Papier Abdoulsamad et al 2019 leak in a dam