

BIRS Workshop:

Open-Source Tools to Enable Geophysical

Data Processing and Inversion

Introductions

Devin Cowan



Background

- BSc Geophysics Co-op UVic (2012)
- MSc Geophysics UBC (2016)
- UBC-GIF (2013 - present)

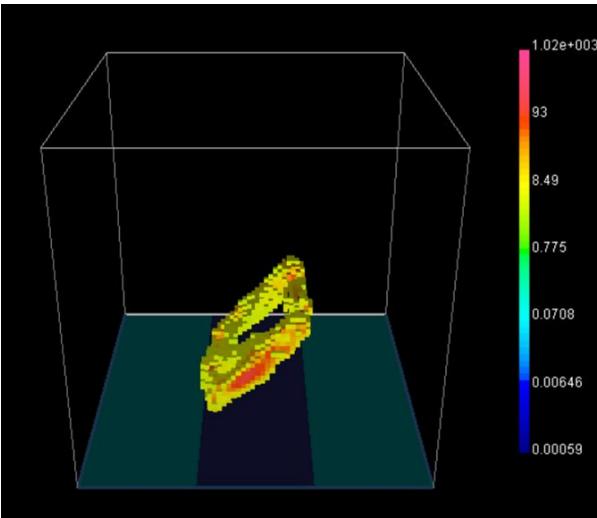
Who Am I?

- Research scientist
- SimPEG contributor
- Documentation, resources and tutorials

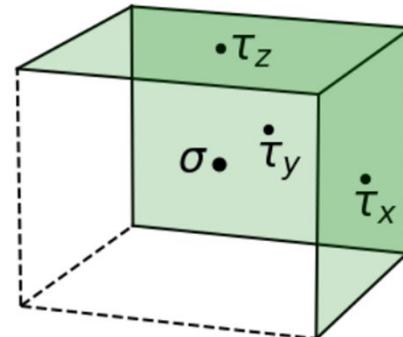
Research Interests

- Viscous remanent magnetization modeling/removal
- Pseudo-sensitivity weighting for EM problems
- TDEM modeling of high-conductive plate-like targets

Voxel inversion of borehole UTEM data



3D mesh cell with conductance on faces



Lindsey Heagy

Assistant Prof in Geophysics @ UBC

- PhD in computational electromagnetics
- helped start SimPEG with Rowan & Seogi
- interested in using & developing computational methods to help answer geoscientific questions that matter to society
- hoping to make a positive impact in the field by promoting open science
- and excited to be working with an incredible community in doing so!
- outside of geophysics... enjoy yoga, hiking, running, and recently stand-up paddleboarding. Also cooking (and eating :-)



Calgary, AB

Edmonton, AB (BSc)

Vancouver, BC (PhD)

Berkeley, CA (Postdoc)

Vancouver, BC (now!)

Mariana

PhD Student with thesis in Hydrogeophysics in coastal karstic aquifers using electrical methods | CICESE

- My open-source contributions are centered in build community that use it
- I am very interested in the well-being of the Fatiando project. Maybe that's why they made me a member of the Council. I would love to see Fatiando widely used in Latin American research centers
- Educational and scientific outreach projects are an important part of my life, currently I'm involved in [ClimateMatch Academy](#).
- Fun fact, I learn to swim until my 25' I was afraid to water, I'm still are, but I am a certified scuba diver, and is in the ocean where I have had my most fantastic adventures



Kalen Martens

Research Geophysicist at SJ Geophysics in Delta, BC.

- Involved with multiple R&D projects and software development as well as processing data from the field.
- Doing forward modelling and inversions for large loop EM is a major goal. Getting some basic experience with SimPEG when time allows.
- PhD from the University of Toronto in experimental high energy physics (aka particle physics). Changed focus to geophysics after a couple years at a junior mining firm.



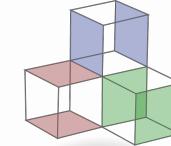
Santiago Soler

Physicist  and PhD in Geophysics  from Argentina



Postdoc in UBC .

- PhD research:
methods for **processing and modelling gravity and mag data**.
- Current Research:
carbon sequestration potential with grav+mag inversions.
- One of the main developers of **Fatiando a Terra** (since circa 2015)
- Recently, part of the **SimPEG** Admins group.
- Free and Open Source Software enthusiast.
- Love outdoor activities:
hiking, rock climbing, kayaking, cycling, skiing (since last winter!)
- Fun fact:
 - bike trip from the northmost to the southmost point of Argentina
 - no geophysics involved, but I was encouraged to carry a magnetometer



Anran Xu



MSc student at UBC-GIF

- BSc from University of Toronto (Physics & Mathematics)
- I'm interested in applying Machine Learning techniques to solve Physics-related problems.
- Currently working on 2D DC resistivity inversion.
- Using SimPEG a lot. Hope to learn more about Fatiando.
- Fun fact: I enjoy travelling, swimming, and hiking.

Jiajia Sun

Born and raised in China. Currently assistant professor of geophysics at University of Houston, US.

- Fascinated by 3D inversions in my junior year at college and decided to pursue a PhD in geophysics.
- My students and I use SimPEG for research on 3D joint inversions, uncertainty analysis, integrated Earth model building and machine learning.
- Never had formal education on Python programming but will be teaching a Python programming course in the coming fall semester (need some help from pros!)
- Have traveled to five countries so far and they happen to be in five different continents (Canada will be the sixth country, a long overdue visit)



Parth Pokar

Masters Student at UBC-GIF

- BSc Univ. of Manitoba (2019)
- Four years in mineral exploration at Vale and currently part-time at Ronacher McKenzie Geoscience.
- Interested in EM problems and possible ways to speed up computations.
- Previous exposure to proprietary software -> new to open-source geoscience ecosystem.
- Now proselytizing open-source.
- Off-geophysics time spent running; cooking; learning Spanish and swimming; juggling grad student priorities.



India Uppal

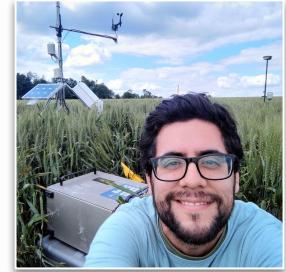
Background:

- BSc Geophysics, University of Liverpool, 2018-2021
- PhD, University of Liverpool, 2021-
 - My project involves using magnetic data to look at Antarctica.
- Graduate teaching assistant (GTA), University of Liverpool, 2021-
- I use Fatiando for my research and hope to contribute to it in the future.



Jorge Lopez Alvis

Postdoc @ UBC



Background

- Geophysical engineering and MSc groundwater (UNAM - Mexico)
- PhD Applied Geophysics (UGent - Belgium)

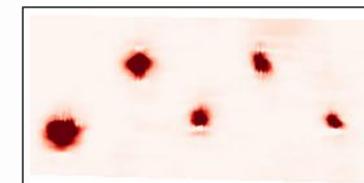
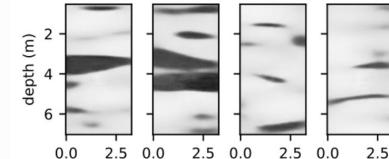
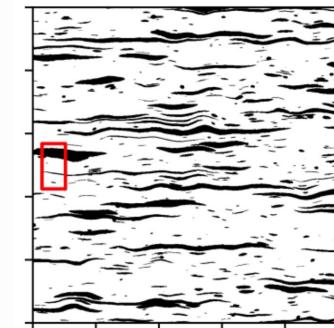
Past projects

- Developing regional groundwater models
- Imposing geological patterns to geophysical inversion with deep generative models

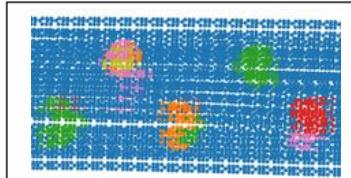
Current project

- UXO detection and classification using electromagnetic data and neural networks

enjoy hiking, cycling, board games, reading



EM data



classes

Joe Capriotti

- Postdoctoral Fellow at UBC (until Friday), then Research Associate at Colorado School of Mines
- Longtime (2016-) contributor to SimPEG #2 on overall commits (Behind LINDSEY!!)
- SimPEG Director of Operations
 - Managing code releases and PR reviews
 - contribute much of my own scattered interests (joint inversion, parallel computing, mesh design, etc.)

Random tidbits:

- Started contributing to SimPEG at the last BIRS conference (made it python3 compatible in a weekend).
- I can play many different music instruments (Not mastered them, but can stumble my way through them!)
- Also love to play boardgames (and just an all around nerd)



Andrea Balza Morales

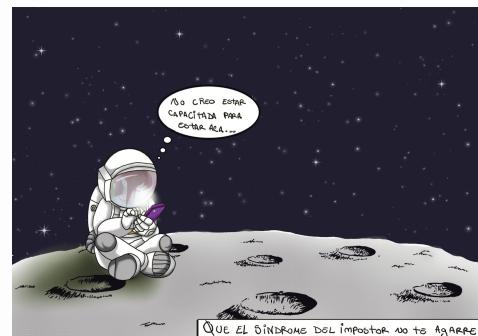
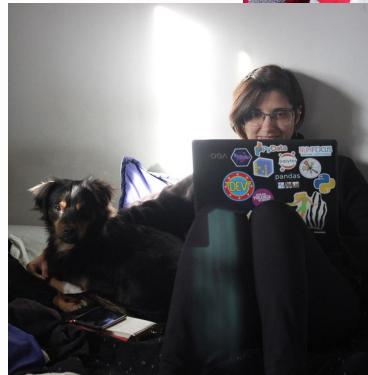
Geophysicist, PhD Researcher in RWTH Aachen 🇩🇪, ETH Zurich 🇨🇭

- Before:
 - Masters Geophysics (Colorado School of Mines in Golden, United States) 🇺🇸
 - Bachelor in Geophysical Engineering (Universidad Simon Bolivar in Caracas, Venezuela) 🇻🇪
- My research is focused on potential field methods and how to integrate a priori geology to get a better image of the subsurface. I have worked with Fatiando and SimPEG before :) I mainly use pyGIMLi and GemPy now.
- Fun facts:
 - I learned Python 🐍 during the pandemic. It was the best time invested besides learning how to make fancy cocktails and bread.
 - I am a certified yoga instructor! 🧘
 - I love to dance Salsa and merengue but have no formal training. 💃



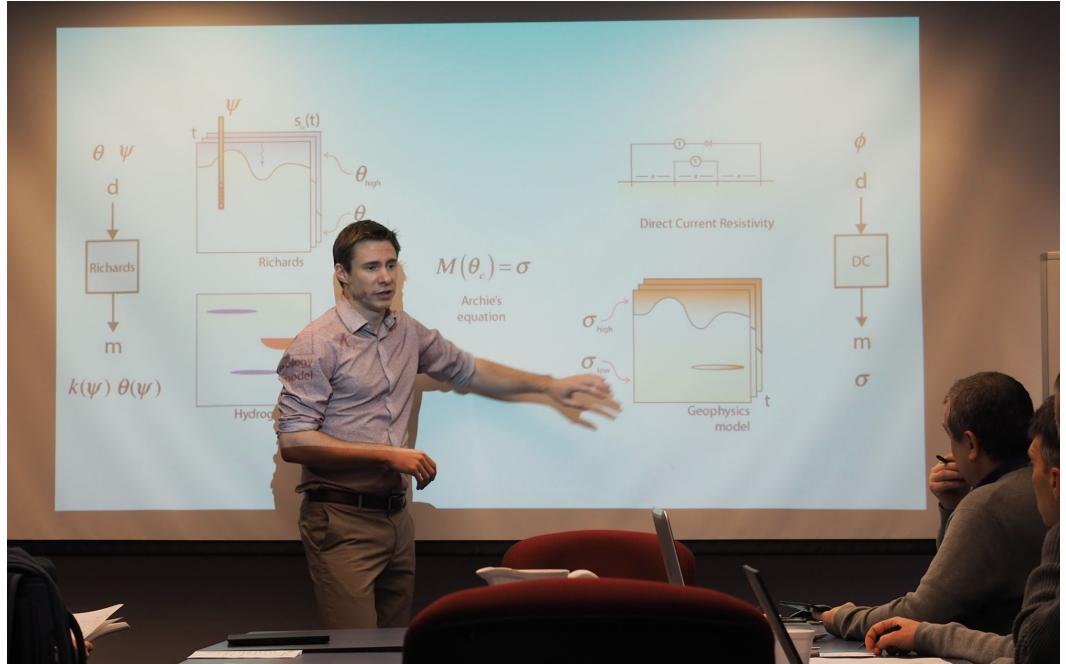
Agustina Pesce

- I am a Physicist and PhD in Geophysics from Argentina 🇦🇷.
- During my PhD research, I used Fatiando a Terra to manage the gravity data and make some inversions.
Now I am also part of the Steering Council of Fatiando a Terra.
- I made a post-doctoral scholarship to study subduction zones through geodynamical numerical modelling using Open source software developed in IAG-USP, Brazil.
- Recently I've started working at SJ Geophysics helping them to develop their software and learning about electromagnetic methods.
- I like to spend time outdoors doing rock climbing, trekking and kayaking.
- I consider myself an amateur artist as well in paper or digital.



Rowan Cockett

- Helped create SimPEG in 2015
- PhD in Computational Geophysics from UBC (hydrogeophysics + vadose zone flow)
- Started 3point Science (3D visualization company)
- Founder of Curvenote, a writing and publishing tool to help with open science and reproducibility
- Work on the MyST Markdown project and Jupyter Book



Leo Uieda

Brazilian geophysicist. Really into open-source, open-science, and open-education. Been hacking on stuff since undergrad. Recently acting primarily as Yara's dad.



- Until Monday: Lecturer at University of Liverpool.
- From mid-August: Professor at Universidade de São Paulo.
- **Founder of Fatiando a Terra.** Created PyGMT, Tesseroids, and others.
- **Fun facts:**
 - Very into Smash Bros. Ultimate (not any good at it, though)
 - Made it to level 12 of the [Python Challenge](#)
 - Was in Honolulu when they sent a "[ballistic missile warning](#)" by [mistake](#)... That was a fun day for coming to terms with my mortality

Dom Fournier

Scientific Programmer

- MSc. and PhD. in geophysics at UBC between 2013-2019 - with Doug and the rest of the SimPEG crew.
- Currently at Mira Geoscience - manager for Python R&D projects.
- Actively working on UI and code efficiency for SimPEG. The goal is to scale up open-source codes to industry “production” level.
- Do not, and never will have **wisdom teeth**.
I have yet to find another freak. Where are you my fellow x-men?



Sean Walker

Consulting geophysicist working in mineral exploration based in Edinburgh, Scotland (Campbell & Walker Geophysics Ltd)

- Originally from Toronto, Canada. BSc (McMaster '96), MSc (UBC '99)
- Enjoy thinking about (and sometimes implementing) ways to improve geophysical data processing and inversion workflows
- I would call myself a supporter and aspirational user of SimPEG. Have not used Fatiando.
- Geoscience professionals are all trying to solve the same problems so I feel we should share our knowledge openly.
- Besides geophysics I enjoy trail running, watching rugby and brewing beer. Unfortunately, two of these things will cause me to miss some of the workshop this weekend.



Hélène Le Mével

Scientist at the Carnegie Institution for Science in Washington DC (US)

- PhD in Geophysics (U. of Wisconsin-Madison, US), used InSAR/GPS data and numerical models to study the surface deformation measured at Laguna del Maule volcanic field in Chile.
- Three ongoing projects involving gravimetry: continuous gravity at Villarrica volcano (Chile), field Bouguer gravity survey at Three Sisters volcano in Oregon, and using gravity data from satellite altimetry to study various submarine volcanoes.
- Using SimPEG and a bit of Fatiando (and lots of GMT) in my workflow. Hope to solve many problems in volcanology with open-source codes.
- Fun fact: I first used a baby carrier backpack to carry my gravimeter around volcanoes. I recently switched to baby carrying ⇒ the latter is more comfortable and shows signs of enjoyment.



Gelson F. Souza-Junior

Who am I?

- Bachelor's Degree in Geology;
- Master's Degree in Geophysics at Universidade de São Paulo;
- Currently a Ph.D. candidate at Universidade de São Paulo.

Research: magnetic microscopy + data inversion + paleomagnetism



Research Interests

- Paleomagnetism and rock magnetism;
- Magnetic and Gravitational fields;
- Structural geology;
- Open-source.

Muhammad Toqeer

Background

- Ph.D Geophysics (2012)

Who Am I?

- Assistant Professor at Quaid-i-Azam university, Islamabad

Research Interests

- Various aspects of seismic reservoir characterization
- Hydrogeology
- Remote sensing

Use Fatiando a Terra and SimPEG

to teach python and computational geophysics to undergraduate and graduate students

Fun Fact

- Speaks French fluently

Prithwijit Chakraborti (Prithwi)

- PhD student at University College Dublin
- My research focuses on 3D geologically and petrophysically constrained geophysical inversion to model the subsurface volcanics in Limerick Basin, Ireland
- Have been using SimPEG for more than 1 year now
- Particularly interested in gravity, magnetic and FDEM inversion
- Had a crush on Astrophysics but ended up marrying Geophysics



Matt Tankersley

I am a geophysicist/geologist interested in large scale exploration with airborne surveys, and using various geophysical techniques to study the cryosphere!

- PhD (submitted, not yet defended) in Geophysics at the Victoria Uni of Wellington, New Zealand.
 - Used airborne gravity and magnetics to model the sediment thickness and shape of the seafloor beneath Antarctica's Ross Ice Shelf.
- BA in Geology at Colorado College, USA.
- Use Fatiando packages extensively, and have starting to contribute to them.
- Developed a Python package **Antarctic-Plots** to help conduct Antarctic Research.
 - <https://antarctic-plots.readthedocs.io/>
- Fun Fact: I'm lucky enough to have lived on 5 continents and have been to all 7.
- I love spending time outdoors; mountain biking, climbing, skiing, hiking etc.



Michel Nzikou



- Research Fellow at UWA since Aug 2022
Developing QGIS plugins focusing on the 3D modelling of both geologically and geophysically for the loop project.
- Previously worked as Geophysicist for Epiroc until Aug 2022.
- PhD graduate @ Curtin University, Perth, WA
 - FWI of ultrasound through different medium
 - Estimated VP/VS and attenuation factor in different confining pressure

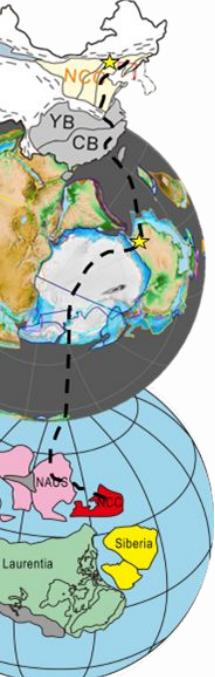


facts:

- Currently the ASEG WA president.
- I am a team member of Fury River Dragon Boat club
- Soon to be working on ATV/OPTV data while on paternity leave

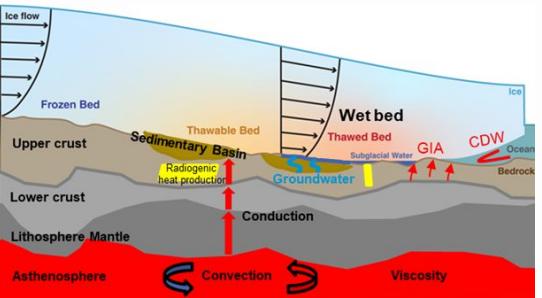
Lu Li

I'm a geophysicist, PostDoc at UWA, Australia. I'm interested in using geophysics to understand ice sheet dynamics, and recently been having fun (and trouble) to link geophysics with petrophysics



➤ My Journey so far...

- Born and raised in North China Craton (Yeah~~)
- 2018-Study Antarctic lithosphere heterogeneity at Perth, Australia
- 2022-PostDoc to understand Proterozoic rift basins in North Australia Craton (and what does my beautiful geophysical blue & red blob mean?)



➤ Proud to be part of **Fatiando** team

➤ You could find me..

At **tennis** court, on my **bike**, or in the **mountain**... :)



Vinicius Antunes



Past:

- BSc in Geology @ UFPR
- MSc in Geology @ UFPR
 - mag + radiometric signatures of the Ponta Grossa Arch Alkaline Province.

Now:

- PhD research @ UWA: grav + mag inversions in Ivory Coast.

Fatiando and/or SimPEG experience:

- Never used, but keen to start.

Interests:

- videogames, movies, TTRPG, boardgames, football, traveling.

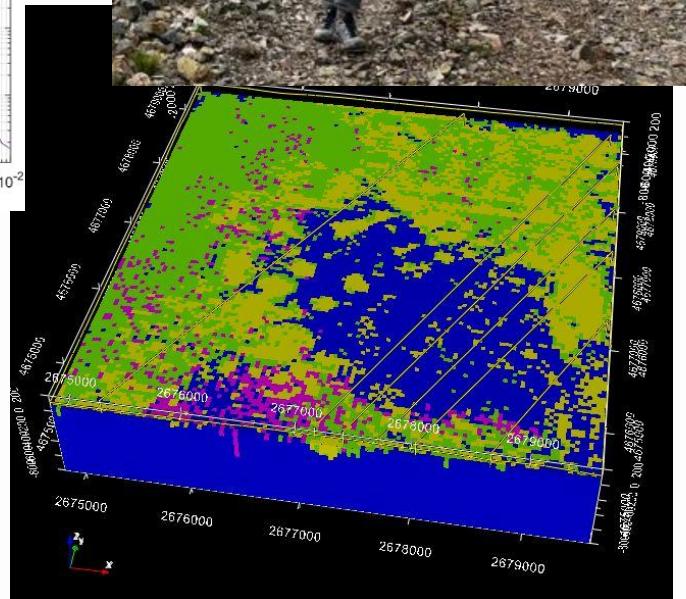
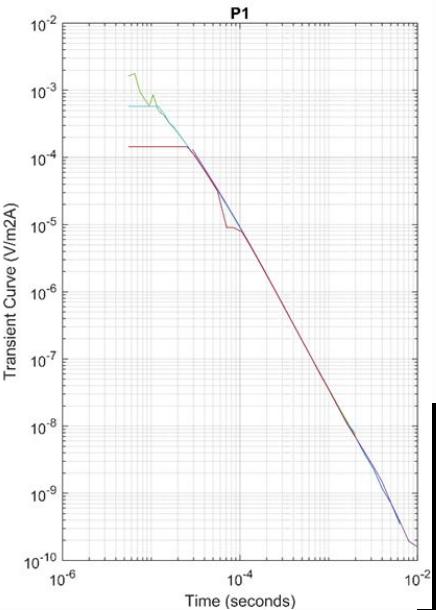
Fun fact:

- Addicted to football in the past, playing infinite hours of Championship Manager 01/02 until my PC monitor ‘melted’.



Renzo Furlani

- Professional in Geophysics, for manly mining exploration geophysics, for epithermal deposits. Also, PhD in geophysics, and researcher as a part-time job.
- **Consultant for mining companies in Argentina, doing hardware and specific software for acquisition and processing of geophysical data. Working with open source software such as OpenHVS, ObsPy, among others.**
- Fatiando is very well known in Argentina, due to Santiago Soler. Also, SimPEG seem to be a wonderful tool for doing research.
- Hobbies, now, it is about test new inversion codes, test and develop instrumentation in geophysics, and probe some new inversion models with borehole or other geological data. Cooking, travelling.



Chukwukelu Johnpaul Odiegwu

- Lecturer and PhD student at Dept of Applied Geophysics Nnamdi Azikiwe University Awka Nigeria.
- Worked as a hydrogeologist with RUWASSA Anambra State Government.
- Keenly interested in learning python for data analysis and machine learning.
- Interested in open source softwares for geophysical data analysis, modelling and inversion.
- Seeking for better opportunities (scholarships) to learn and improve my skills as a geoscientist.
- I love mathematics and like solving difficult task.
- I love playing chess.
- It's also my ambition to have a taste of Western education.

