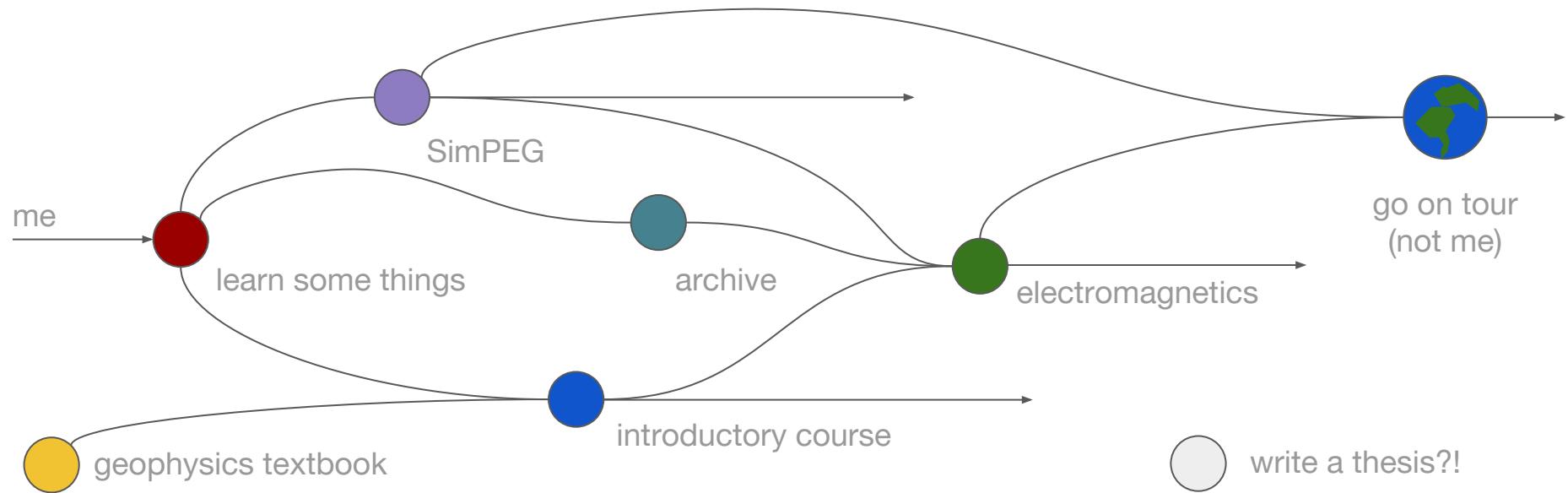


# Using open source tools to refactor geoscience education

Lindsey Heagy  
& GeoSci Team

my story

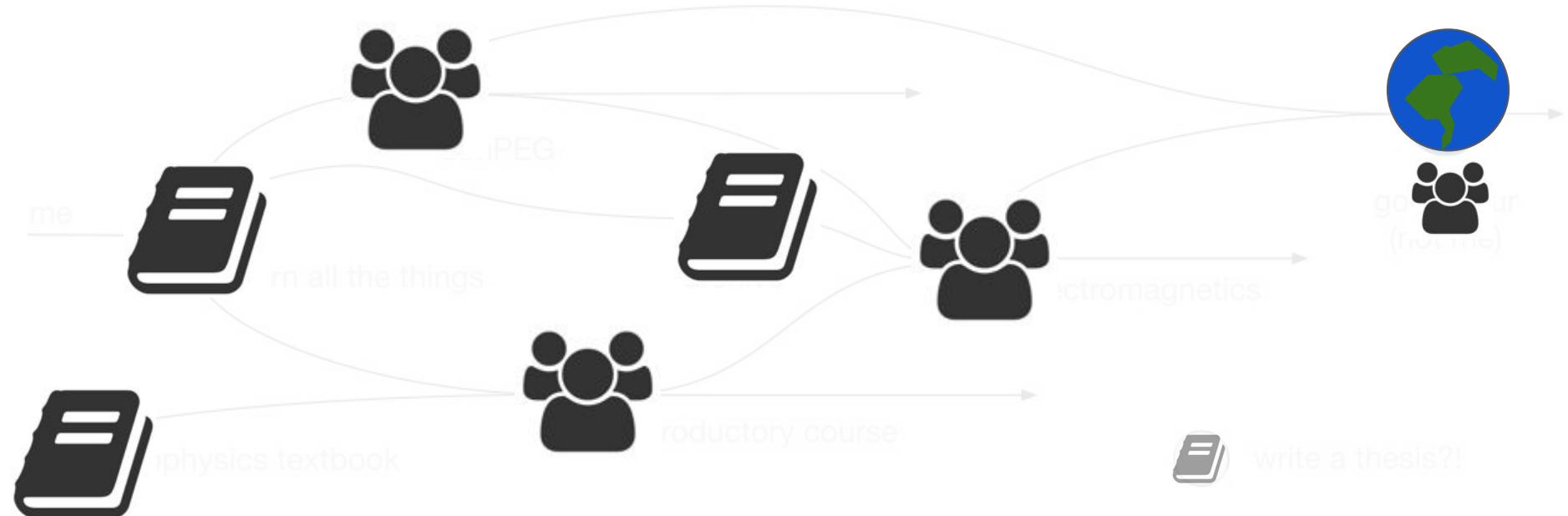


*gpg*

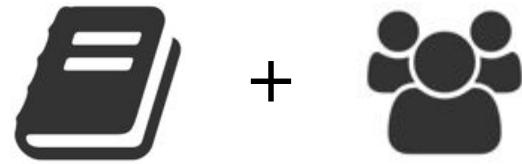


**SEG**  
SOCIETY OF EXPLORATION  
GEOPHYSICISTS

story



learning & teaching



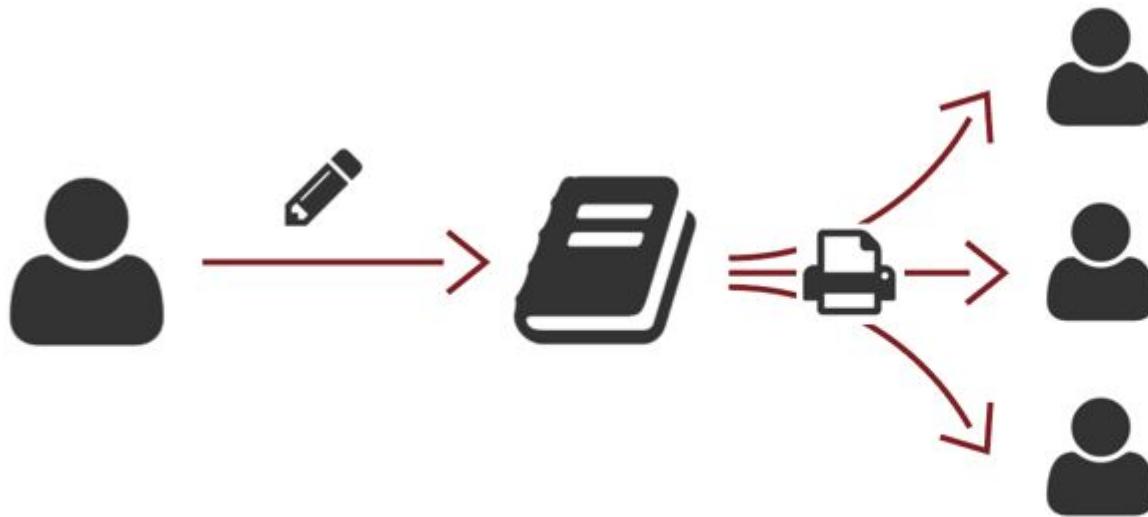
currently

learning & teaching



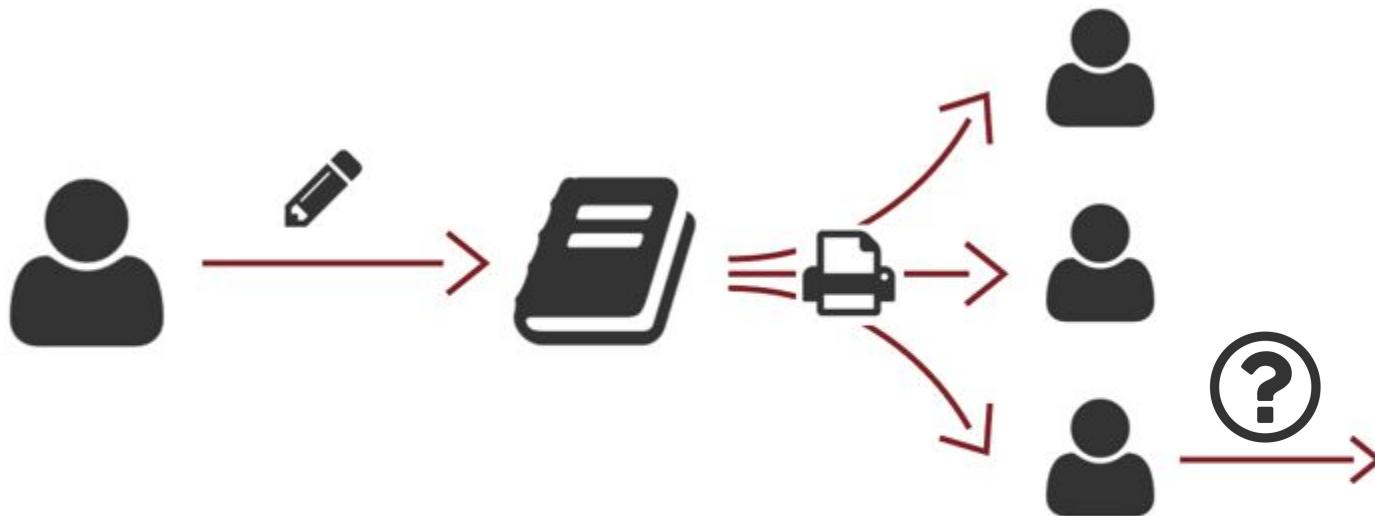
currently

## learning & teaching



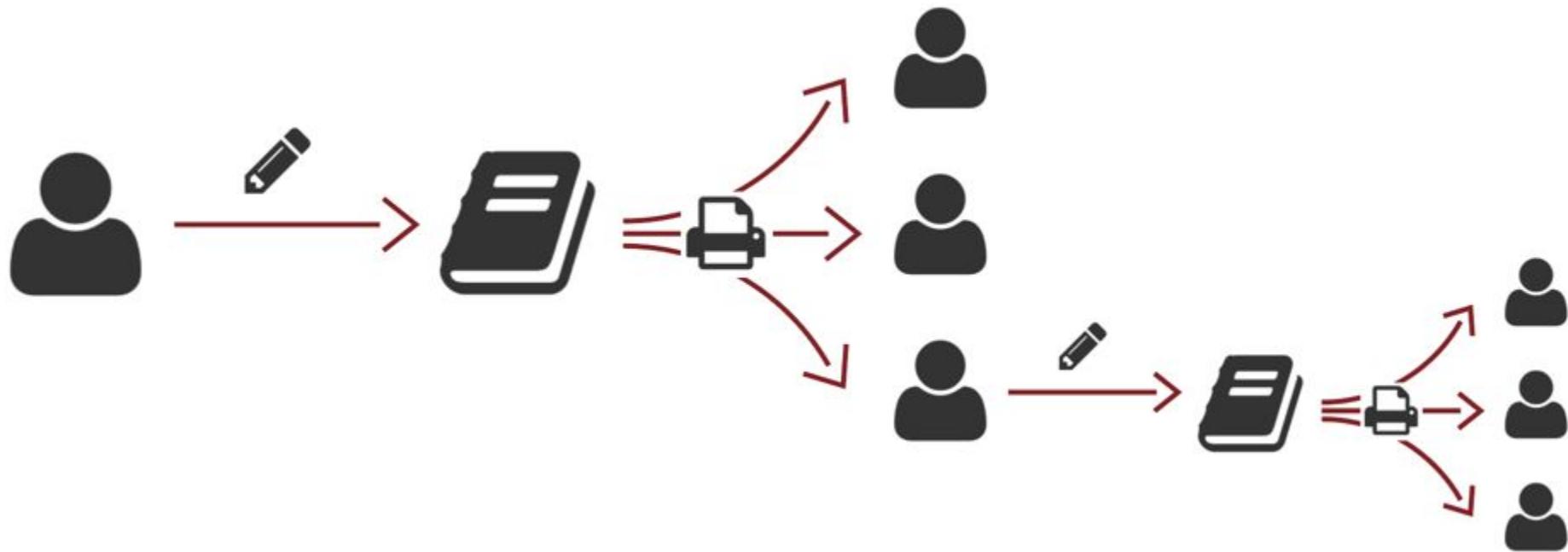
currently

## learning & teaching



currently

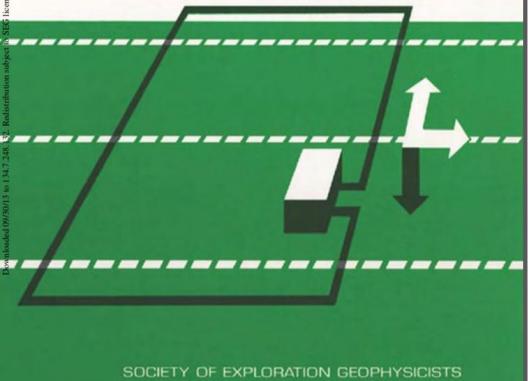
## learning & teaching



# ELECTROMAGNETIC METHODS IN APPLIED GEOPHYSICS

VOLUME 2, APPLICATION, PARTS A AND B

EDITED BY MISAC N. NABIGHIAN



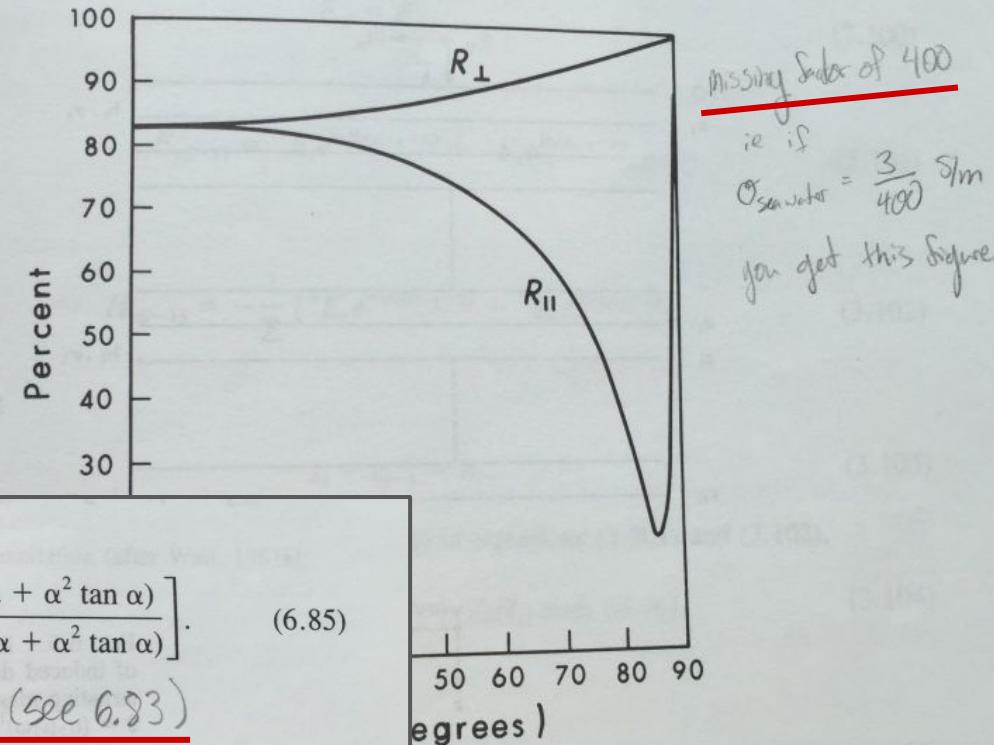
in which

$$M - iN = \left[ \frac{2\mu_2(\tan \alpha - \alpha) - \mu_1(\alpha - \tan \alpha + \alpha^2 \tan \alpha)}{2\mu_2(\tan \alpha - \alpha) + 2\mu_1(\alpha - \tan \alpha + \alpha^2 \tan \alpha)} \right]. \quad (6.85)$$

The field is given by

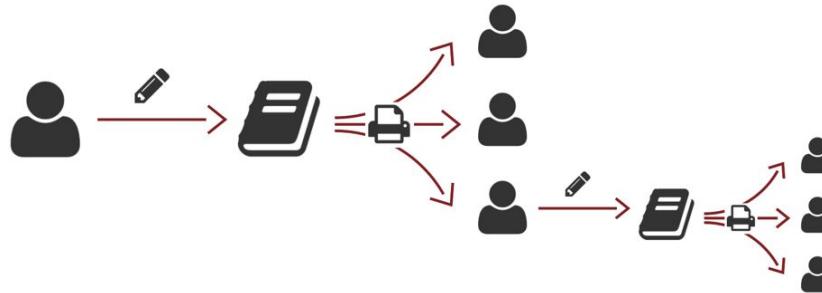
$$\mathbf{H} = H_0 R^3 (M - iN) \frac{(2x^2 - y^2 - z^2)\mathbf{u}_x + 3xy\mathbf{u}_y + 3xz\mathbf{u}_z}{r^5}, \quad (6.86)$$

The angle that this equation satisfies is known as the Brewster angle. For reflection from a conductive surface, there will be a minimum in  $R_{\parallel}$ , analogous to the Brewster angle, for some particular angle of incidence. No such minimum occurs in  $R_{\perp}$  (Stratton, 1941, p. 508). Figure 3.3 illustrates these features.



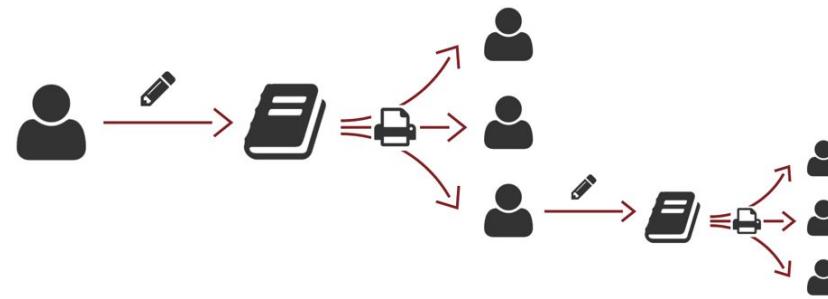
$R_{\perp}$  versus angle of incidence for plane waves at permittivity of sea water are taken to be 3 S/m,  $H_z$  (after Stratton, 1941).

currently



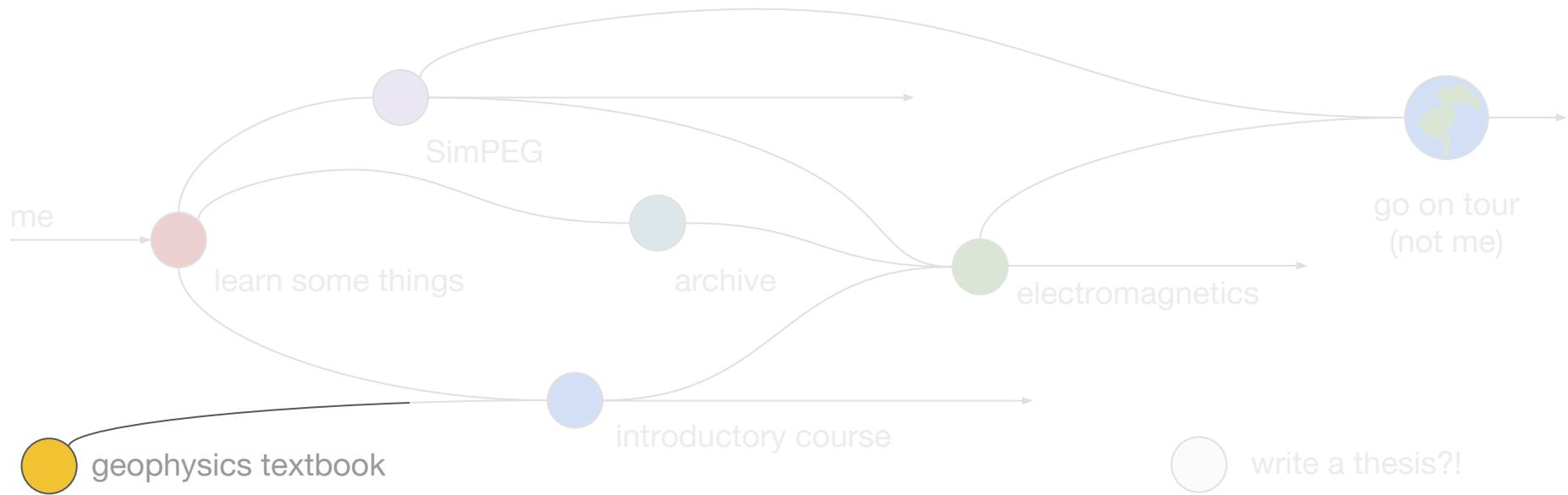
- Bugs
- Reviewed by ~2 people
- No discussion / issue board?
- How did they make that figure?
- Is it Current? out of date?
- Limited input / feedback
- Reuse is limited
  - copy paste writing
  - licensing restrictions
- Roadmap? Is there one?
- Who do I ask? are there stewards of this work?
- Limited collaboration opportunities
  - 1 or 2 (the good ones have 2)
- Diff? What changed in this version?
  - version 1 is in the used book store and is \$100 cheaper. What changed? - only question order?

currently



this is a  
problem

our story



*gpg*



**SEG**  
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GEOPHYSICISTS

starting points

Geophysics for Practicing Geoscientists

The UBC Earth and Ocean Sciences

GPG Contents

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1. + GPG Welcome  
2. + Foundations  
3. + Geophysical surveys  
4. + Inversion concepts  
5. + Exercises  
6. + Case histories  
7. + Software & manuals  
8. + Resources/Ref's

Click + topics to expand  
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## *Geophysics for Practising Geoscientists; Learning Resources about Applied Geophysics*

Version 1.0 (2007/11) ←  
by Francis H.M. Jones and D.W. Oldenburg,  
University of British Columbia,  
Department of Earth and Ocean Sciences.

Welcome to the GPG resource package for learning about applied geophysics. This collection of resources contains readings and exercises directed at undergraduates in the geosciences who are NOT majoring in geophysics. Basic content was developed for UBC courses [EOSC350](#) and [EOSC351](#). Geophysical inversion materials were developed for applied geophysics courses aimed at geophysics honours students, and graduate students.

The GPG is derived primarily from the [IAG](#) resource package (Inversion for Applied Geophysics) developed by F. Jones and D. Oldenburg of the UBC Geophysical Inversion Facility. Content about seismic refraction and GPR were produced specifically for eosc350.



**Version 1.0 (2007/11)**

The UBC Earth and Ocean Sciences

# Geophysics for Practicing Geoscientists

## Geophysics for Practising Learning Resources about

Version 1.0 (2007/ by Francis H.M. Jones and D. University of British Columbia Department of Earth and Ocean Sciences

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DC resistivity surveys

Amperes per square metre ( $A/m^2$ ; so the maximum shown is  $\log_{10}(J) = -3.33$ , or  $J = 0.000468 A/m^2$ .

Top North East

slice 1	slice 1	slice 1
slice 2	slice 2	slice 2
slice 3	slice 3	slice 3
slice 4	slice 4	slice 4
slice 5	slice 5	slice 5
slice 6	slice 6	slice 6
slice 7	slice 7	slice 7
slice 8	slice 8 *	slice 8
slice 9	slice 9	slice 9
slice 10	slice 10	slice 10
slice 11	slice 11	slice 11
slice 12	slice 12	slice 12
slice 13	slice 13	slice 13
shell	slice 14	slice 14
	slice 15	slice 15
	slice 16	slice 16

There is no need to click: moving your mouse over the links simulates animations.

Vector plots of current distribution were generated using 3D EM modeling code developed by the UBC Geophysical Inversion Facility.

Normally the earth is NOT uniform. Galvanic currents will flow towards regions of high conductivity and away from regions of high resistivity, as illustrated in Figure 2.

Figure 2. Click buttons for images a. through e.

- The Elura ore body. Depth to top of gossan (in blue) is approximately 100 m.
- A DC resistivity survey involves injecting current at one location and measuring resulting potentials at another location.
- Current will flow. Current density increases within conductive regions, and decreases within resistive regions.
- Charges build up at interfaces between regions of different electrical conductivity.
- Variations in charge distribution are detected as variations in distribution of potential, or voltage, at the surface.

Elura Orebody Electrical resistivities

Rock Type	Ohm-m
Overburden	12
Host rocks	200
Gossan	420
Mineralization (pyritic)	0.6

Geophysics for Practicing Geoscientists

The UBC Earth and Ocean Sciences

GPG Contents

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2. + Foundations  
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4. + Inversion concepts  
5. + Exercises  
6. + Case histories  
7. + Softw & manuals  
8. + Resources/Ref's

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starting points

Geophysics for Practicing Geoscientists

The UBC Earth and Ocean Sciences

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gpg



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GEOPHYSICISTS





# simpeg

pypi v0.1.3

downloads 832/month

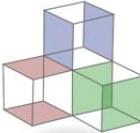
license MIT

build passing

coverage 77%

<http://simpeg.xyz>

 simpeg DOCS CODE JOURNAL CONTACT



## Simulation and Parameter Estimation in Geophysics

An open source python package for simulation and gradient based parameter estimation in geophysical applications.

### Installation

The easiest way to install SimPEG is from PyPI, using pip:

```
> pip install SimPEG
```



Read more detailed installations instructions in the [documentation](#).

Get the source code at [Github](#).

SimPEG

Search docs

- Why SimPEG?
- License
- Authors
- Projects Using SimPEG
- Installation
- SimPEG Meshes
- Differential Operators

[Read the Docs](#) v.latest

Docs » SimPEG Documentation [Edit on GitHub](#)

## SimPEG Documentation

 simpeg

SimPEG: Simulation and Parameter Estimation in Geophysics

Rowan Seogi Lindsey Guðni Brendan Adam Doug

```
In [1]: import SimPEG
```

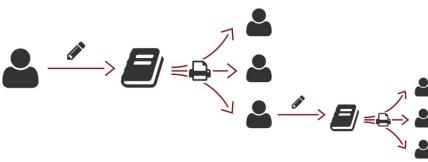
```
In [ ]: SimPEG.
```

SimPEG.DataMisfit  
SimPEG.Directives  
SimPEG.Fields  
SimPEG.InvProblem  
SimPEG.Inversion  
SimPEG.Maps  
SimPEG.Mesh  
SimPEG.Models  
SimPEG.Optimization  
SimPEG.Problem

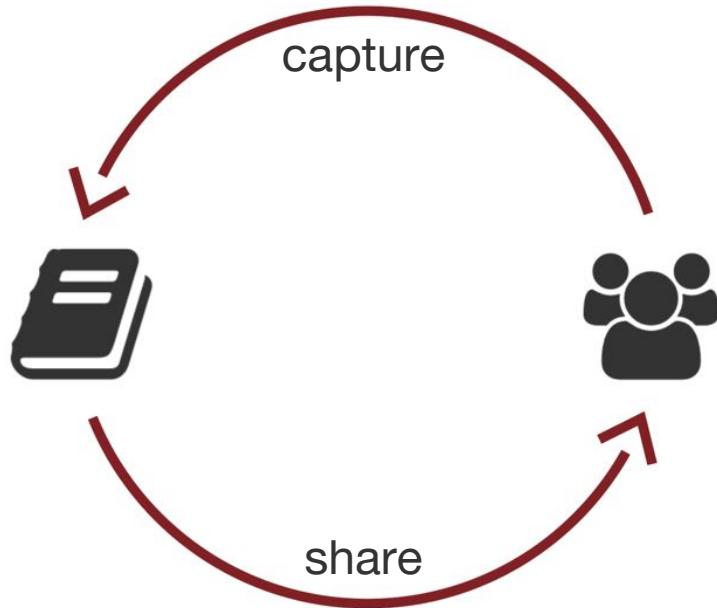
Package	State
SimPEG	✓
SimPEG.EM	✓
SimPEG.FLOW	↻
simpegMT	↻
simpegDC	🧪
simpegPF	⚠
simpegSEIS	🔧
simpegGPR	🔧



starting points



wouldn't it be nice



- iterate in place
- versioned
- reproducible
- tested
- collaborative
- track issues
- continuous peer review
- feedback
- interoperable
- extensible
- multiple media types
- ...

for def class import pip



## practices

versioning  
issue tracking  
peer review  
pull requests

## tools

forking  
testing  
deployment  
licensing

git  
Github  
Sphinx  
Read the Docs

Travis CI  
PyPi  
licenses  
Google App Engine

for → def

# for → def

# separate style and data

refactoring

A screenshot of a code editor showing a complex HTML file named DC\_html\_page3\_version3\_arbc.html. The file contains numerous inline styles (e.g., `style="width: 100px; height: 100px;"`) and scripts (e.g., `onmouseover="MM_swapImage('currents','');`) throughout the document structure. The code is heavily nested, with many `<div>`, `<table>`, and `<td>` elements.

html + css + javascript + text

A screenshot of a code editor showing a clean restructured text file named DC\_measurements\_and\_data.rst. The file is organized into sections: `DC resistivity: measurements and data`, `Introduction`, `Measurements`, `Data`, `Survey`, `Plotting`, `Processing options`, and `Interpretation`. The content is descriptive text with some code snippets and figures. The code editor interface shows line numbers and various code highlighting.

my\_data

# for → def

# separate style and data

refactoring

On this page:

- | Introduction
- | Current in the ground
- | Sources
- | Measurements: voltage
- | Data: apparent resistivity
- | Survey configurations
- | Plotting raw data
- | Processing options
- | Interpretation

## DC resistivity: measurements and data

### Introduction

All geophysical surveys involve energizing the earth in order to generate signals, which will contain information about the types and distributions of subsurface physical properties.

For DC resistivity surveys, the energy source is a generator which injects a constant current into the ground using two electrodes. The "signals out" (data) are voltages measured at various places on the surface, along with strength of the known current source (in Amperes) and details about relative geometry of the four electrodes.

In order to create maps or graphs of raw data for quality assessment or for direct interpretations, measurements are converted into a form that is related to the relevant physical property. For each measurement, a 3D version of Ohm's Law is used to generate a datum with units of resistivity (or conductivity). These transformed data are called **apparent resistivities** because they represent the earth's true resistivity only if the ground is uniform within range of the measurement. When subsurface resistivity varies, interpretation must be based upon the way in which apparent resistivity varies as a function of electrode geometry and position. The commonly used survey procedures are explained later on this page, after discussions about current flow, sources, measurements, and conversion to apparent resistivities.

### Current flow in the ground

The path of the current in the earth after it is injected with two electrodes depends upon the distribution of electrical resistivity. If the Earth is uniform, current flows in a regular three dimensional pattern under the electrodes as illustrated Figure 1. The north slice number 8 (flagged with a \*) is similar to the type of image commonly shown in texts to indicate how current flows in two dimensions under a pair of source electrodes.

Figure 1. These figures show slices through a uniform Earth with current flowing out of the right-hand (near) electrode and back into the left-hand (far) electrode. A connecting red line substitutes for a real generator. Vectors with white dots for heads show the direction of current flow, while their colour indicates the strength (or current density) in units of  $\text{Log}_{10}(\text{J}) = -3.33$ , or  $\text{J} = 0.000468 \text{ A/m}^2$ .

Top	North	East
slice 1	slice 1	slice 3
slice 2	slice 2	slice 4
slice 3	slice 3	slice 5
slice 4	slice 4	slice 6
slice 5	slice 5	slice 7
slice 6	slice 6	slice 8 *
slice 7	slice 7	slice 9
slice 8	slice 8	slice 10
slice 9	slice 9	slice 11
slice 10	slice 10	slice 12
slice 11	slice 11	slice 13
slice 12	slice 12	slice 14
slice 13	slice 13	slice 15

html + css + javascript + text

On this page:

- | Introduction
- | Current in the ground
- | Sources
- | Measurements: voltage
- | Data: apparent resistivity
- | Survey configurations
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### Introduction

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Top	North	East
slice 1	slice 1	slice 1
slice 2	slice 2	slice 2
slice 3	slice 3	slice 3
slice 4	slice 4	slice 4

html = sphinx(my\_data, style='nicer')

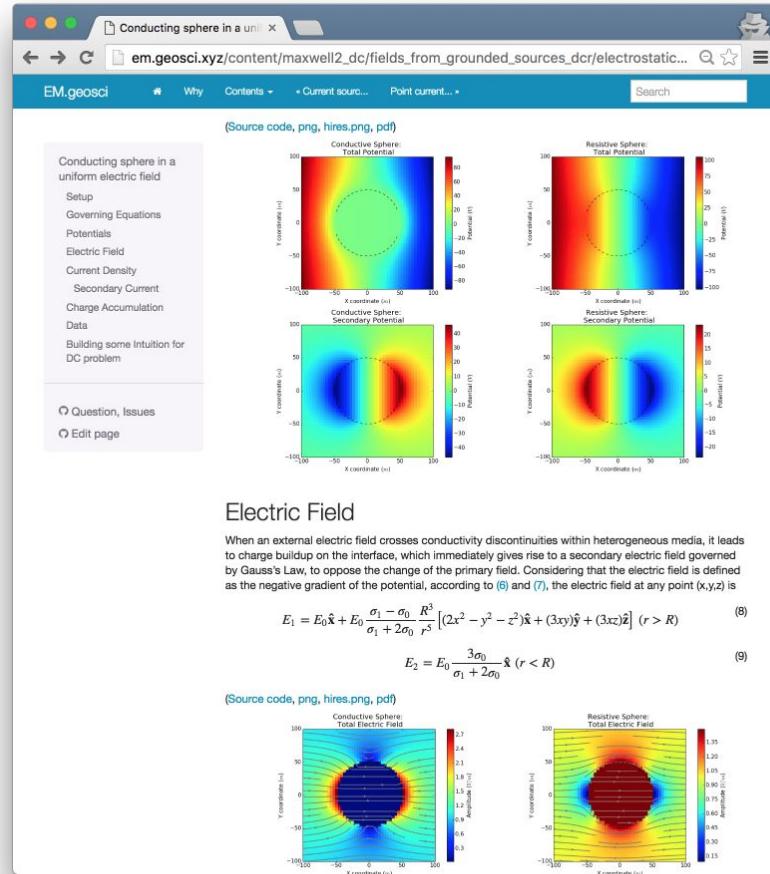
# for → def

# capture inputs and functions

# refactoring

```
electrostatic_sphere.rst
```

```
89 Potentials
90 _____
93 Assuming an x-directed uniform electric field and zero potential at infinity,
94 the integration from :eq:`V_{from-e}` gives
95
96
97 .. math::
98     V_p = -E_0 x = -E_0 r \cos\theta
99     :label: Primary_Potential
100
101 ... plot::
102
103     from examples.sphere import *
104
105     sig0 = 10.***-3.      # conductivity of the whole-space in S/m
106     sig1 = 10.***-1.      # conductivity of the sphere in S/m
107     R   = 50.             # radius of the sphere in m
108     E0  = 1.              # inducing field strength in V/m
109     n   = 56               # level of discretization
110     xr = np.linspace(-2.*R, 2.*R, n) # X-axis discretization
111     yr = xr.copy()        # Y-axis discretization
112     zr = np.r_[0]          # identical to saying `zr = np.array([0])`
113     XYZ = ndgrid(xr,yr,zr) # Space Definition
114
115     fig, ax = plt.subplots(1,1, figsize = (8,6))
116     ax = Plot_Primary_Potential(XYZ,sig0,sig1,R,E0,ax)
117
118     plt.show()
119
120 The total potential outside the sphere :math:`(r > R)` is
121
122 .. math::
123     V_1 = -E_0 \left(1 - \frac{R^3}{r^3}\right) r^3 \frac{\sigma_1 - \sigma_0}{(\sigma_1 + 2\sigma_0)} \ln r
124     :label: totalP_outside
125
126 and inside the sphere :math:`(r < R)`
127
128 .. math::
129     V_2 = -E_0 \frac{3(\sigma_0 - (\sigma_1 + 2\sigma_0)r \cos\theta)}{\sigma_1 + 2\sigma_0}
130     :label: totalP_inside
131
132
133 ... plot::
134
135     from examples.sphere import *
136
137     sig0 = 10.***-3.      # conductivity of the whole-space in S/m
138     sig1 = 10.***-1.      # conductivity of the sphere in S/m
139     sig2 = 10.***-5.      # conductivity of the sphere in S/m
140     R   = 50.             # radius of the sphere in m
141     E0  = 1.              # inducing field strength in V/m
142     n   = 56               # level of discretization
143     xr = np.linspace(-2.*R, 2.*R, n) # X-axis discretization
144     yr = xr.copy()        # Y-axis discretization
145     zr = np.r_[0]          # identical to saying `zr = np.array([0])`
146     XYZ = ndgrid(xr,yr,zr) # Space Definition
147
148 Comparing against : HEAD, Line 470, Column 1    431 misspelled words    Spaces: 4    reStructured
```

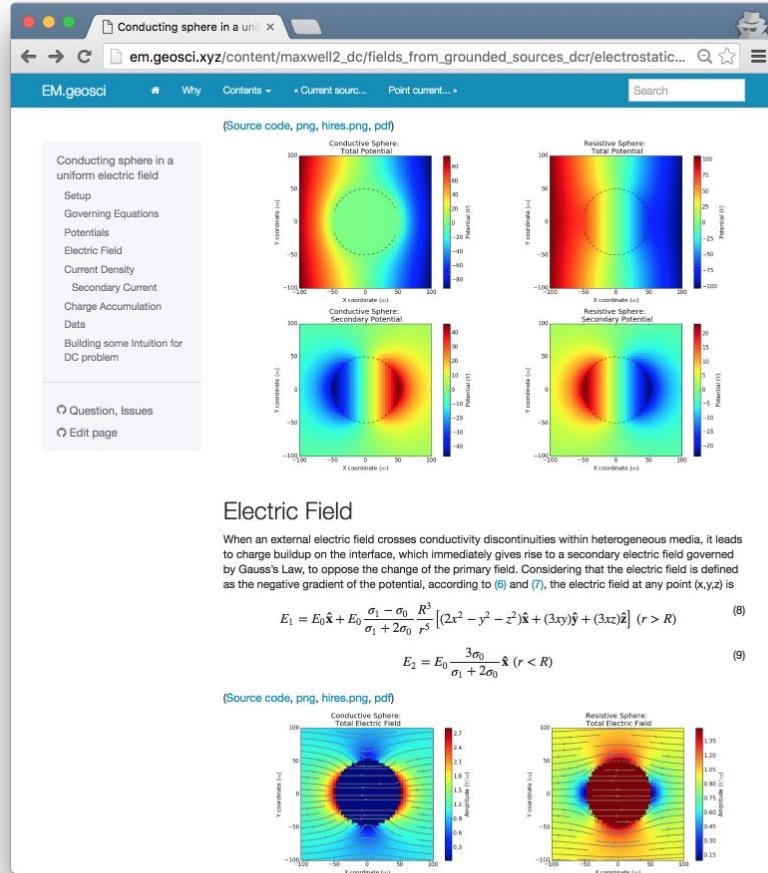
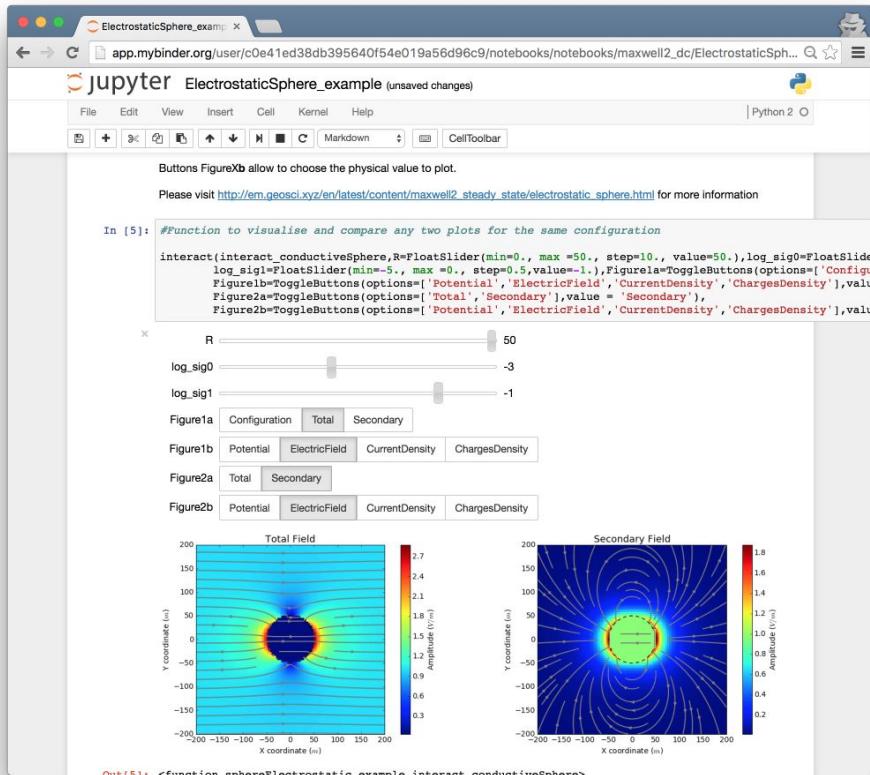


# for → def

# change inputs

# refactoring

launch binder



# for → def

## test functions

## refactoring



Build #1789 - ubcgif/em - <https://travis-ci.org/ubcgif/em/builds/143969966>

Travis CI | Blog Status Help Sign in with GitHub

Help make Open Source a better place and start building better software today!

ubcgif / em build failing

Current Branches Build History Pull Requests > Build #1789

✓ master Merge pull request #193 from ubcgif/minorSpellingFix

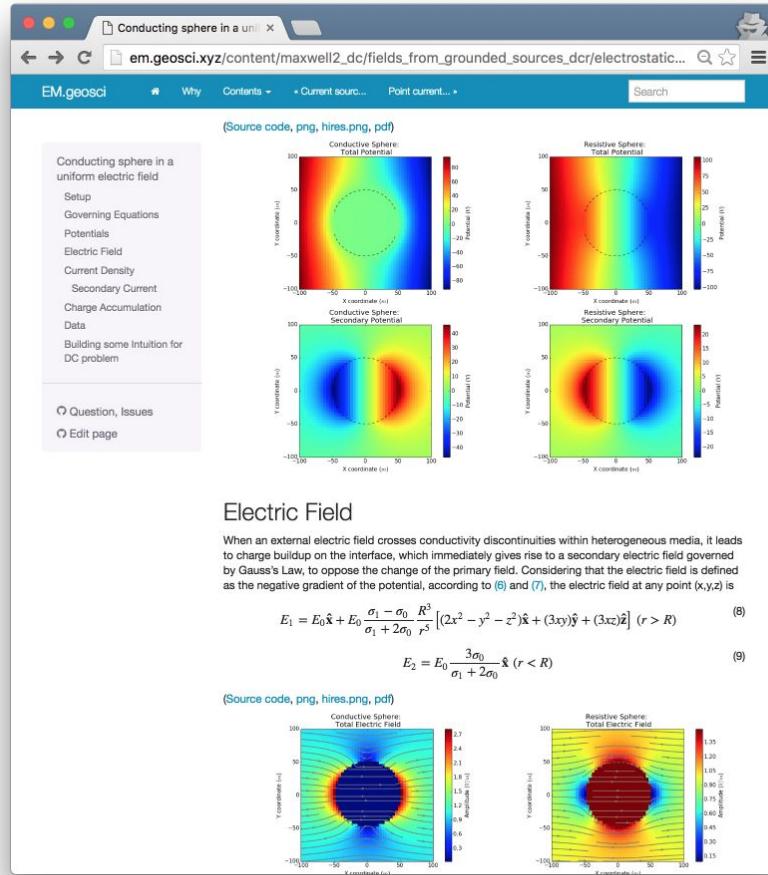
→ #1789 passed

Elapsed time 5 min 36 sec  
a day ago

Commit 8710562  
Compare 5e91e4a...8710562  
dfournier authored Github committed

Raw log

```
1 Using worker: worker-linux-docker-5b334dd.prod.travis-ci.org:travis-linux-14
2
3 Build system information
4
5 system.info
6
7
8 $ export DEBIAN_FRONTEND=noninteractive
9 f1x.CVE-2015-7547
10 $ git clone --depth=50 --branch=master https://github.com/ubcgif/em.git ubcgif/em
11 glt.checkout (5.33s)
12
13 This job is running on container-based infrastructure, which does not allow use of 'sudo', setuid and setgid executables.
14 If you require sudo, add '#sudo: required' to your .travis.yml
15 See https://docs.travis-ci.com/user/workers/container-based-infrastructure/ for details.
16
17 Setting environment variables from repository settings
18 $ export encrypted_69967e53c837_key=[secure]
19 $ export encrypted_69967e53c837_iv=[secure]
```



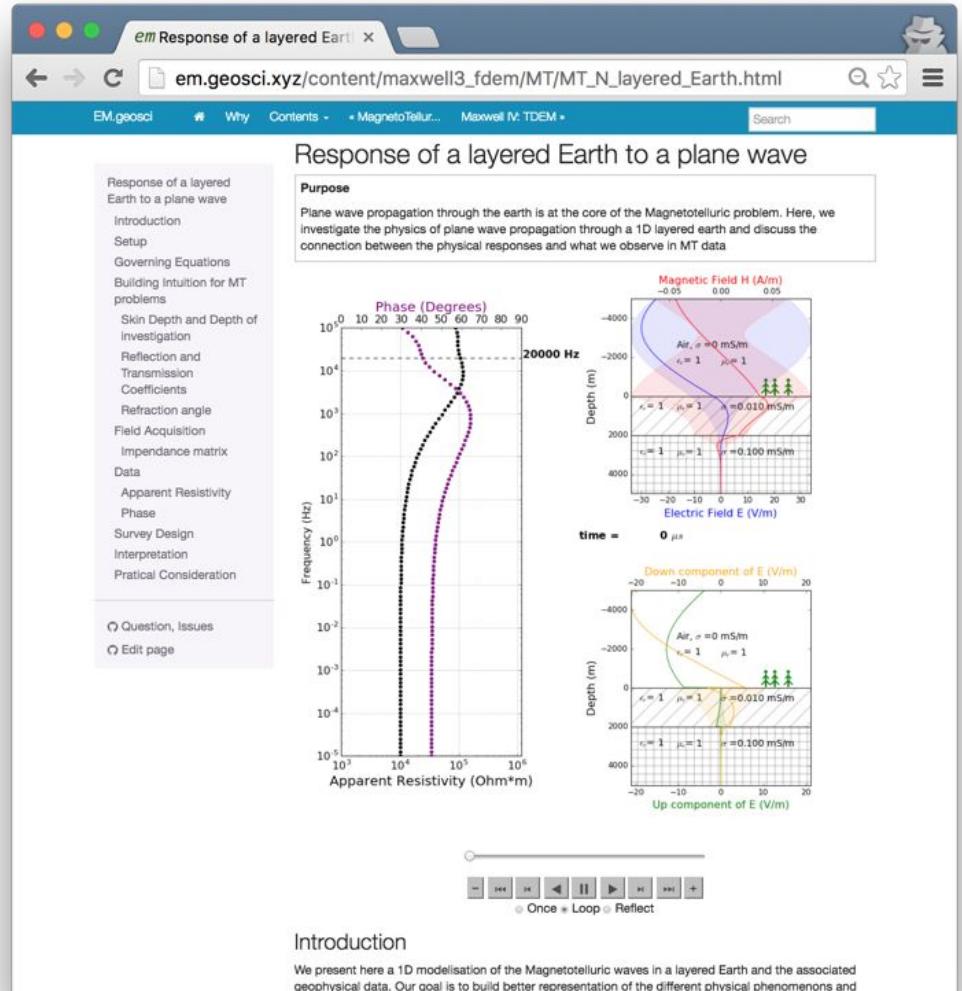
- human readable
- explorable
- testable

def → class

# def → class

Page:

- Title
- Contributors
- Purpose
- Introduction
- Content
- Images
- Movies!



# def → class

what is a base class?

refactoring

Outline

- Formative Laws
  - Gauss's Law for Electric Fields
  - Gauss's Law for Magnetic Fields
  - Faraday's Law
  - Ampere-Maxwell
  - Conservation of Charge
  - Biot-Savart
  - Lenz's Law
  - Interface Conditions
  - Details
- Maxwell's equations
  - Time Domain Equations
  - Frequency Domain Equations
  - Maxwell's Equations in Homogeneous Media
    - Frequency Domain
      - Plane wave source (has wavenumber, skin depth... on one page)
      - Dipole sources (as per notes)
        - Electric
      - What is it

Quick guide to Maxwell's equations (differential/integral equations in time/frequency; constitutive equations, BC, source terms... an easy reference to get started.

- Maxwell's Equations in homogeneous media
  - intro
  - Damped wave equation
  - Plane wave solution
  - Propagation in free space
  - Effects of conductivity
    - Skin Depth
    - wavenumber
  - Quasi-static Maxwell's equations
  - Dipole sources
    - Electric dipole
    - Harmonic
    - Transient
  - Magnetic dipole
    - Harmonic
    - Transient

Doug Oldenburg 18:27 10 May Resolve  
Let's move this to FDEM and TDEM.  
Reply...

Lindsey Heagy 13:04 11 May  
Delete: "Dipole sources Electric dipole"

# def → class

what is a base class?

refactoring

The screenshot shows a GitHub issue page for 'Transient Magnetic Dipole' (issue #136). The page includes a sidebar with navigation links like 'index', 'what\_is\_it', 'analytic\_solution', 'vector\_potential', 'fields', 'asymptotics', and 'field\_transformations'. A list of 'Pages that need to be filled in:' is also present. The main content area shows a timeline of events:

- lheagy commented on May 16 • edited**: Content for time domain magnetic dipole
- lheagy opened this issue on May 16 · 0 comments**
- lheagy added needs champion Fundamentals labels on May 16**
- sgkang self-assigned this on May 25 (is champion)**
- sgkang removed the needs champion label on May 25**

A large arrow points from the text "thanks matplotlib!" to the 'needs champion' label in the timeline.

Transient Magnetic Dipole #136

lheagy commented on May 16 • edited

Content for time domain magnetic dipole

Pages that need to be filled in:

- index
- what\_is\_it
- analytic\_solution
- vector\_potential
- fields
- asymptotics
- field\_transformations

Located in

```
maxwell1_fundamentals/
    maxwells_equations/
        maxwells_equations_in_homogeneous_media/
            time_domain/
                dipole_sources/
                    magnetic_dipole/
```

See attached notes:

- transient\_magnetic\_dipole.pdf

lheagy added needs champion Fundamentals labels on May 16

sgkang self-assigned this on May 25 (is champion)

sgkang removed the needs champion label on May 25

thanks matplotlib!

# def → class

needs review

reviewed

practices



sdevriese commented on May 16 • edited

Wave equation material updated and reworked into new Fundamentals framework

- Doug's edits + flow suggestions incorporated
- Needs apps.
- Need to add wave propagating figures (they are in image folder, just need to link them in the text)

Suggested reviewers:

- @dougoldenburg
- @micmitch
- @fourndo

3loops by sgkang · Pull Request · GitHub, Inc. [US] https://github.com/ubcgif/em/pull/89

Labels: FDEM, needs review

Milestone: No milestone

Assignees: dougoldenburg

3 participants: sdevriese, iheagy, ubcgif member

92 +Considering Faraday's law:  $V = -\text{imath}\omega\Phi^p$ , then recognizing factor of  $\text{imath}^{-1}$  makes  $\frac{\pi}{2}$  lag of phase in the induced current. And  $\tan^{-1}(\frac{\omega L}{R})$  lag of phase is induced by the Loop2.

iheagy added a note on Apr 12 ubcgif member  
could you add a link back to the Faraday's law page?

iheagy added a note on Apr 12 ubcgif member  
A couple things here: the grammar of the first sentence is a bit off, I would re-word to say something like

Considering Faraday's law:  $V = -\text{imath}\omega\Phi^p$ , the factor  $\text{imath}^{-1}$  is responsible for the phase lag of  $\frac{\pi}{2}$  in the induced current.

for the second sentence, I think "lag of phase is induced" could be confusing (lots of inducing happening, currents, now phases?). How about something like

An additional phase lag of  $\tan^{-1}(\frac{\omega L}{R})$  is introduced by 1

Also: do you have a diagram you could add showing phase lag and what is meant by that? (There is a lot happening in this statement, and a picture would do a lot to help the reader). I am thinking something along the line of showing a sine wave and then the relative shift at the target (if this makes no sense, we can chat about it!)

time harmonic signals where things are happening

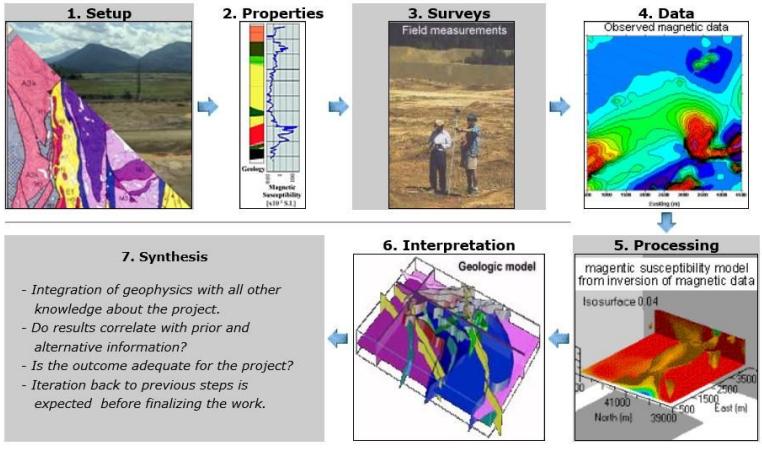
sdevriese added a note on Apr 21

# def → class

## define and inherit structure

## refactoring

### 7 step framework for Case Histories

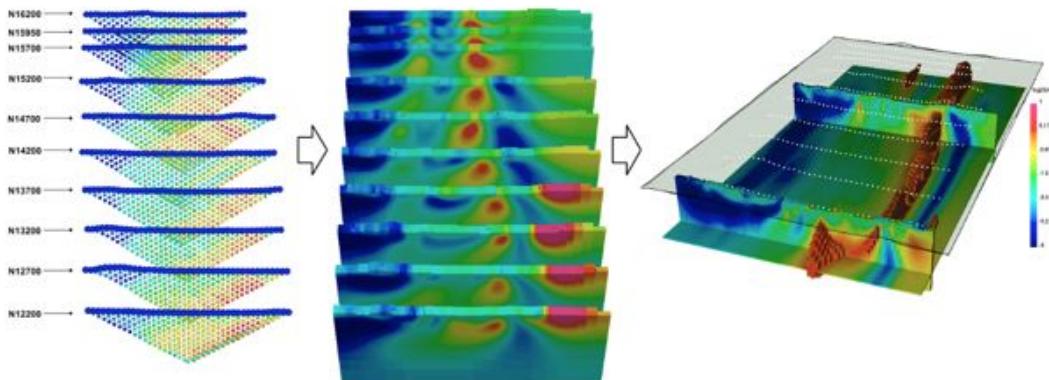


The screenshot shows two browser tabs. The top tab is for 'Bookpurnong' and the bottom tab is for 'Mt. Isa'. Both tabs have a sidebar with navigation links: 'Question, Issues', 'Edit page', 'Prelude', and a list of steps: 'Setup', 'Properties', 'Survey', 'Data', 'Processing', 'Interpretation', 'Synthesis', and 'Lessons worth highlighting'. The main content area for 'Bookpurnong' includes a map and text about airborne EM surveys. The main content area for 'Mt. Isa' includes a map and text about inverting DC/IP field data to recover 3D distributions of resistivity and chargeability, mentioning Rutledge, Oldenburg, and Shekhtman (ROS01). At the bottom, there are three 3D geological models showing subsurface structures across different depth slices (N13500, N13600, N13700, N13800, N13900, N14000, N14100, N14200, N14300, N14400, N14500).

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Pages created using Sphinx 1.4.1.

Page Source | GeoSci Home

# We want your case histories!



- see the current case histories
- view the request for case histories
- start from the case history template
- contact us with questions

<http://disc2017.geosci.xyz>



# def → class

refactoring

- organization
- template
- collaborate

class → import

refactoring

# class → import

don't repeat

refactoring

A screenshot of a GitHub repository page for 'ubcgif / em'. The commit history shows several changes made by 'lheagy' to 'equation\_bank'. The code snippets show imports and sections for Maxwell's equations.

```
6 In this section we first present a synopsis of Maxwell's equations in th
7
8 (a) :ref:`differential_equations_time`
9 (b) :ref:`integral_equations_time`
10 (c) :ref:`differential_equations_frequency`
11
12 These are designed to be a quick access to the relevant equations with pr
13 :ref:`notation<introduction_notation>` and units. Each of the four fundam
14 Maxwell equations, as well as the conservation of charge, is then explore
15 more detail to promote a physical understanding and provide insight as to
16 where the law is useful. In addition we provide a short synopsis of the
17 scientists involved in discovering the law.
18
19 Maxwell's equations connect electric and magnetic fields, fluxes and phys
20
21 .. include:: maxwell_variables.rst
22
23 .. _differential_equations_time:
24
25 Differential equations in time
26
27
28
29
30
31
32 - :ref:`Faraday's Law <faraday_differential_time>`  
.. include:: ../equation_bank/faraday_time.rst
33
34
35
36 - :ref:`Ampere Maxwell Law <ampere_maxwell_differential_time>`  
.. include:: ../equation_bank/ampere_maxwell_time.rst
37
38
39
40 - :ref:`Gauss's Law for Electric Fields <gauss_electric_differential>`  
.. include:: ../equation_bank/gauss_electric_time.rst
41
42
43 - :ref:`Gauss's Law for Magnetic Fields <gauss_magnetic_differential>`  
.. include:: ../equation_bank/gauss_magnetic_time.rst
44
45
46
47 .. _integral_equations_time:
48
49 Integral equations in time
50
51
52
53 .. summary of relevant equations
54
```

A screenshot of a website titled 'EM.geosci' under 'Physical Properties'. It lists physical constants and provides links to differential and integral equations in time.

- $\sigma$  : electric conductivity [S/m]
- $\rho$  : electric resistivity [Ω m]
- $\mu$  : magnetic permeability [H/m]
- $\epsilon$  : dielectric permittivity [F/m]

## Differential equations in time

- Faraday's Law

$$\nabla \times \mathbf{e} = -\frac{\partial \mathbf{b}}{\partial t} \quad (1)$$

- Ampere Maxwell Law

$$\nabla \times \mathbf{h} = \mathbf{j} + \frac{\partial \mathbf{d}}{\partial t} \quad (2)$$

- Gauss's Law for Electric Fields

$$\nabla \cdot \mathbf{d} = \rho_f \quad (3)$$

- Gauss's Law for Magnetic Fields

$$\nabla \cdot \mathbf{b} = 0 \quad (4)$$

## Integral equations in time

- Gauss's Law for Magnetic Fields

f... (5)

# class → import

em Data — EM.geosci

em.geosci.xyz/content/case\_histories/mt\_isa/data.html

EM.geosci Why Contents Survey Processing Search

Data DCR IP

Question, Issues Edit page

## Data

The [MIMDAS](#) system collects both a pole-dipole (P-DP) and a dipole-dipole (DP-P) configuration in general. Furthermore, both DC and IP data were collected through the system. The data are viewed prior to quality control measures.

## DCR

In preparation for the inversion, a first-pass assessment of data quality is completed via visualization. While sensing the same Earth, these two configurations can yield different apparent conductivity values and consequently be subject to different noise levels. The [DC data were first separated](#) from the survey configuration.

Note that a large portion of the DP-P shows higher apparent conductivity data than the P-DP configuration. This may be explained by the presence of conductive units or current channeling through the Shale unit and the mineralization at depth may considerably reduce the measured anomalies.

Table 3 : DCR data separated in its P-DP and DP-P configuration

Observed DP-P

Observed P-DP

Depth (m)

App

Line 104

10<sup>-4</sup> 10<sup>0</sup>

10<sup>-4</sup> 10<sup>0</sup>

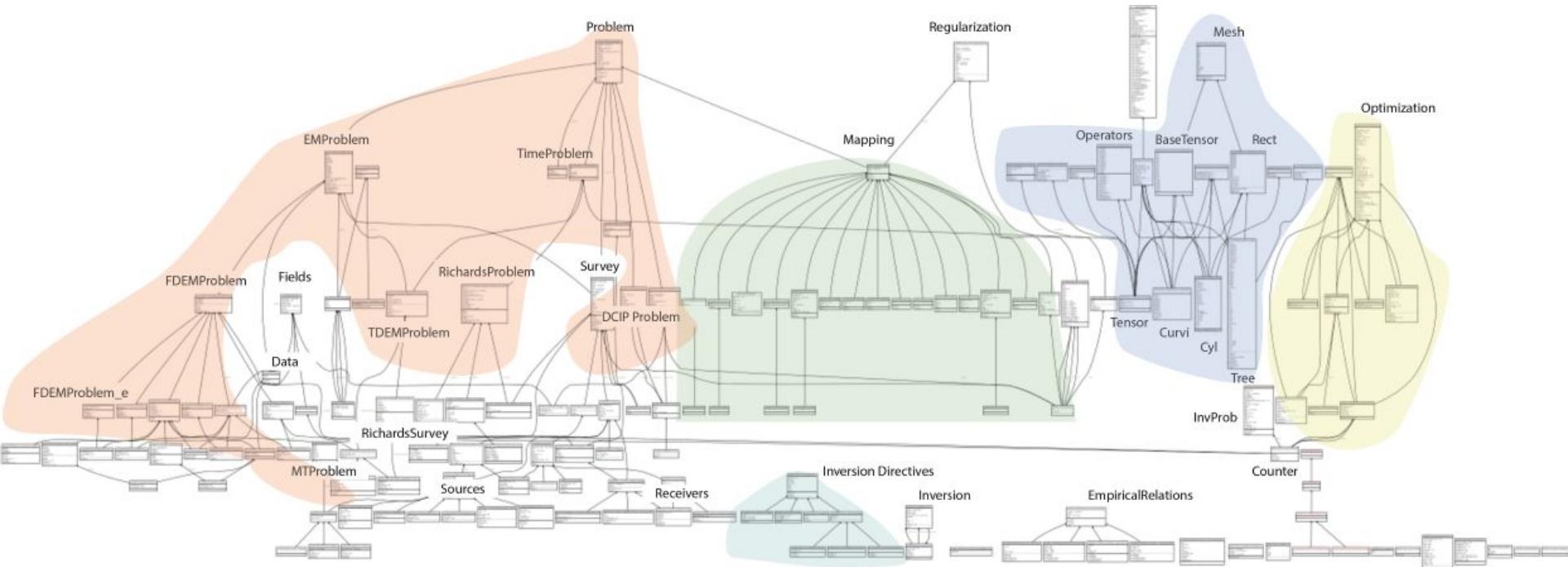


```
3099 updating environment: 0 added, 1 changed, 0 removed
3100 reading sources... [100%] content/equation_bank
3101 looking for now-outdated files... none found
3102 pickling environment... done
3103 checking consistency... done
3104 preparing documents... done
3105 writing output... [ 0%] content/case_histories/bookpurnong/data
3106 writing output... [ 0%] content/case_histories/bookpurnong/index
3107 (Line 29) redirect http://library.seg.org/doi/abs/10.1071/EG08027 - with Found to http://library.seg.org/act...
3108 (Line 31) ok http://www.hgg.geo.au.dk/ref_manager/VIEZ20L1Z010C.pdf
3109 (Line 48) ok http://www.cowt.dk/menu/nyhederogmedier/nyheder/vandogmiljoe/lavtflyvende-helikopter-kort...
3110 writing output... [ 1%] content/case_histories/bookpurnong/interpretation
3111 writing output... [ 1%] content/case_histories/bookpurnong/processing
3112 writing output... [ 2%] content/case_histories/bookpurnong/properties
3113 writing output... [ 2%] content/case_histories/bookpurnong/setup
3114 writing output... [ 3%] content/case_histories/bookpurnong/survey
3115 writing output... [ 3%] content/case_histories/bookpurnong/synthesis
3116 writing output... [ 4%] content/case_histories/index
3117 writing output... [ 4%] content/case_histories/mt_isa/data
3118 (Line 6) ok http://www.smedg.org.au/Sym01NS.htm
3119 writing output... [ 5%] content/case_histories/mt_isa/index
3120 (Line 8) ok http://gif.eos.ubc.ca/sites/default/files/EG01156.pdf
3121 writing output... [ 5%] content/case_histories/mt_isa/interpretation
3122 writing output... [ 6%] content/case_histories/mt_isa/lessons
3123 writing output... [ 6%] content/case_histories/mt_isa/process
3124 (Line 96) -ignored- http://www.ga.gov.au/metadata-gateway/metadata/record/gcat_aac46307-fce8-449d-e044-00144f...
3125 (Line 171) -ignored- http://www.ga.gov.au/metadata-gateway/metadata/record/gcat_aac46307-fce8-449d-e044-00144f...
3126 writing output... [ 6%] content/case_histories/mt_isa/properties
3127 writing output... [ 7%] content/case_histories/mt_isa/setup
```

# class → import

## introspect

refactoring



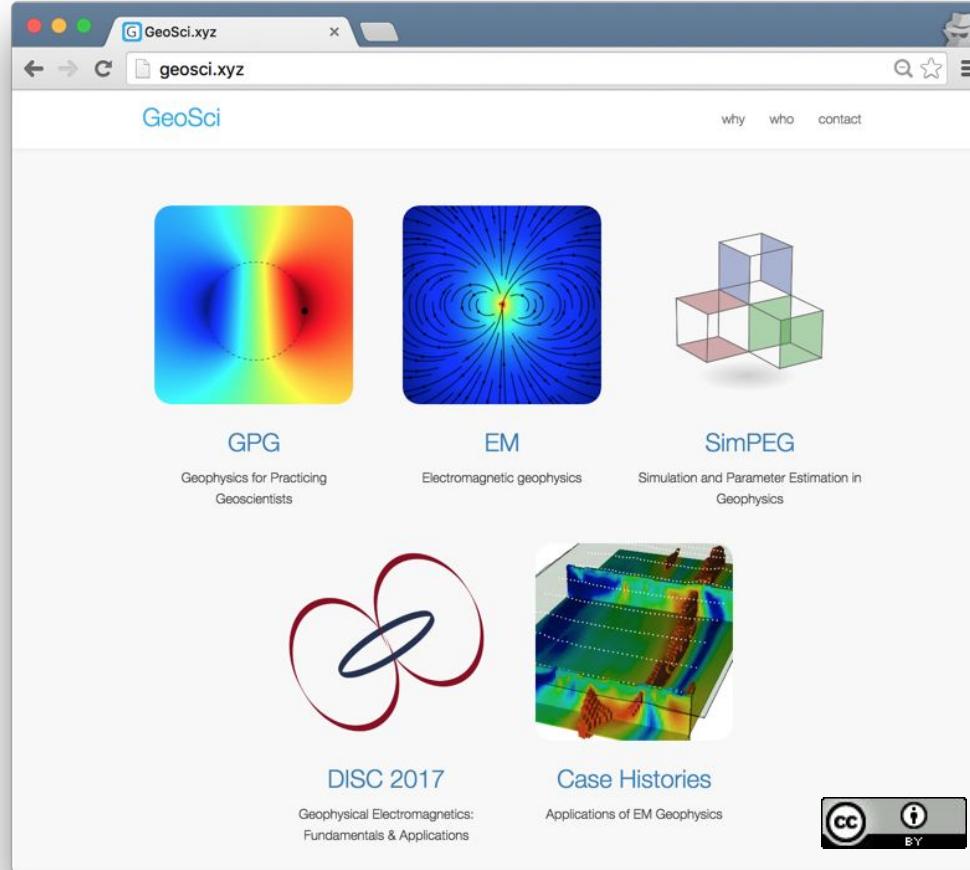
- Conceptual requirements
- Inheritance

`import → pip`

refactoring

# import → pip

refactoring



# import → pip

refactoring

- licensing
- dependencies
- versioning

for def class import pip



## practices

versioning  
issue tracking  
peer review  
pull requests

## tools

forking  
testing  
deployment  
licensing

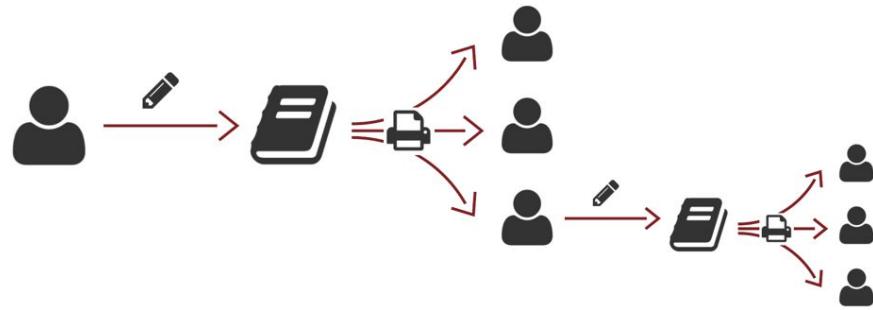
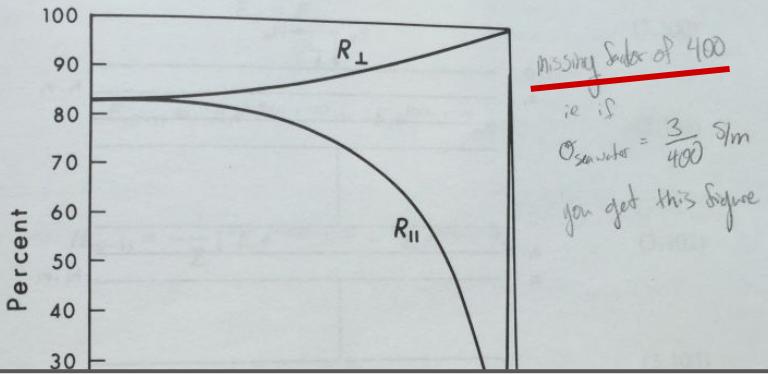
git  
Github  
Sphinx  
Read the Docs

Travis CI  
PyPi  
licenses  
Google App Engine

(3.91)

(3.91)

that this equation satisfies is known as the Brewster angle. From a conductive surface, there will be a minimum in  $R_{\parallel}$ , analogous to the angle, for some particular angle of incidence. No such minimum occurs in  $R_{\perp}$ . (41, p. 508). Figure 3.3 illustrates these features.



in which

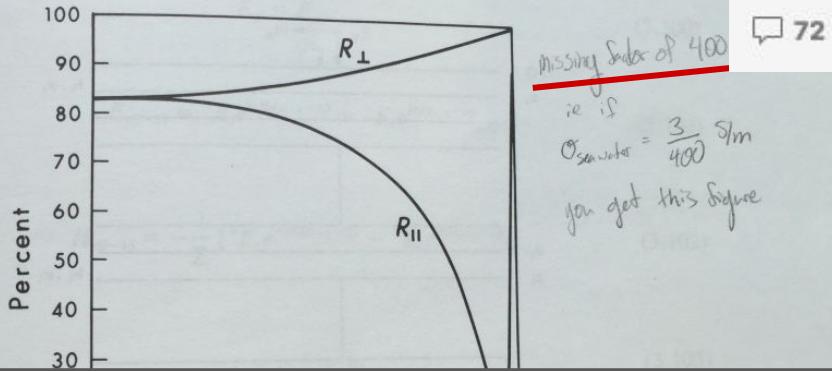
$$M - iN = \left[ \frac{2\mu_2(\tan \alpha - \alpha) - \mu_1(\alpha - \tan \alpha + \alpha^2 \tan \alpha)}{2\mu_2(\tan \alpha - \alpha) + 2\mu_1(\alpha - \tan \alpha + \alpha^2 \tan \alpha)} \right]. \quad (6.85)$$

The field is given by

$$\mathbf{H} = H_0 R^3 (M - iN) \frac{(2x^2 - y^2 - z^2)\mathbf{u}_x + 3xy\mathbf{u}_y + 3xz\mathbf{u}_z}{r^5}, \quad (6.86)$$

should be + (see 6.83)

that this equation satisfies is known as the Brewster angle. On from a conductive surface, there will be a minimum in  $R_{\parallel}$ , analogous to the angle, for some particular angle of incidence. No such minimum occurs in  $R_{\perp}$  (41, p. 508). Figure 3.3 illustrates these features.

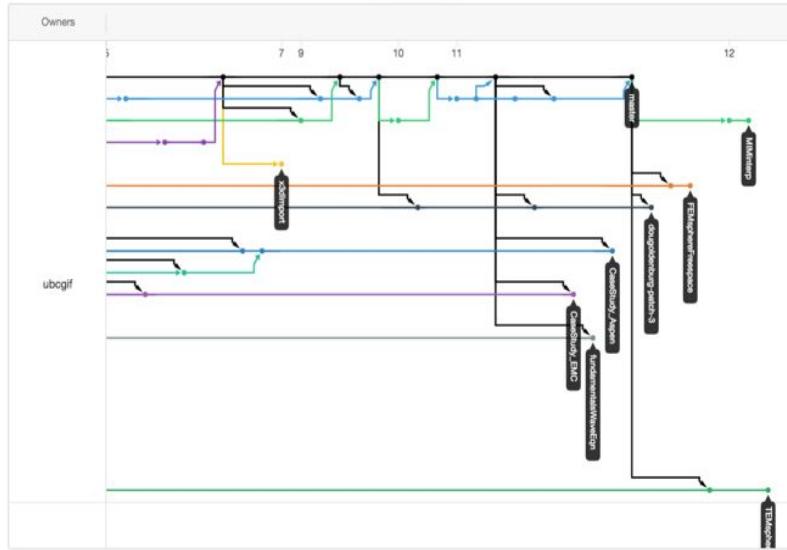


in which

$$M - iN = \begin{bmatrix} 2\mu_2(\tan \alpha - \alpha) - \mu_1(\alpha - \tan \alpha + \alpha^2 \tan \alpha) \\ 2\mu_2(\tan \alpha - \alpha) + 2\mu_1(\alpha - \tan \alpha + \alpha^2 \tan \alpha) \end{bmatrix}. \quad (6.85)$$

The field is given by

$$\mathbf{H} = H_0 R^3 (M - iN) \frac{(2x^2 - y^2 - z^2)\mathbf{u}_x + 3xy\mathbf{u}_y + 3xz\mathbf{u}_z}{r^5}, \quad (6.86)$$



## Typo in apparent conductivity? #38

 **Closed** lheagy opened this issue on Nov 7, 2015 · 0 comments

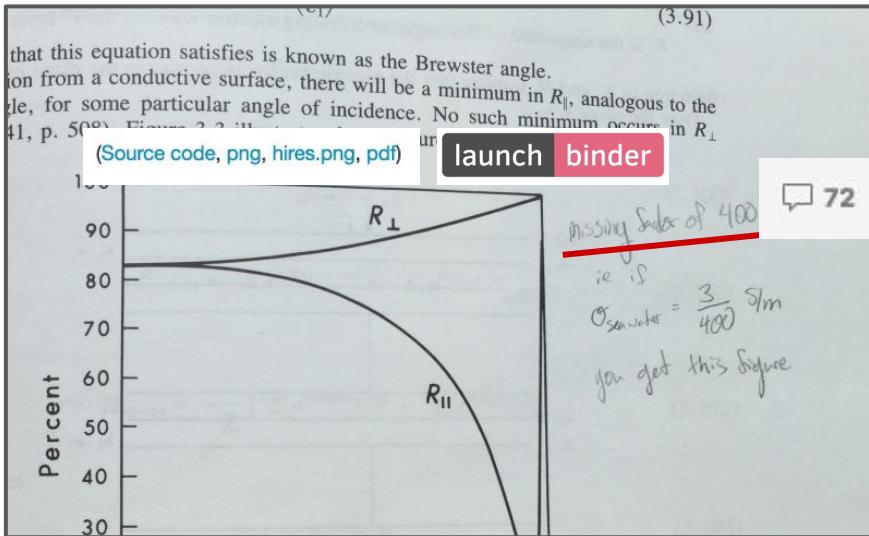


**Iheagy** commented on Nov 7, 2015

ubcgif member + 

In the formula for apparent conductivity, the second term should be  $\sigma_2 * \phi_v$ , not  $\phi_h$ .

([http://gpg.geosci.xyz/en/latest/content/electromagnetics/electromagnetics\\_fk\\_domain\\_systems.html#multilayer-earth-structures](http://gpg.geosci.xyz/en/latest/content/electromagnetics/electromagnetics_fk_domain_systems.html#multilayer-earth-structures))



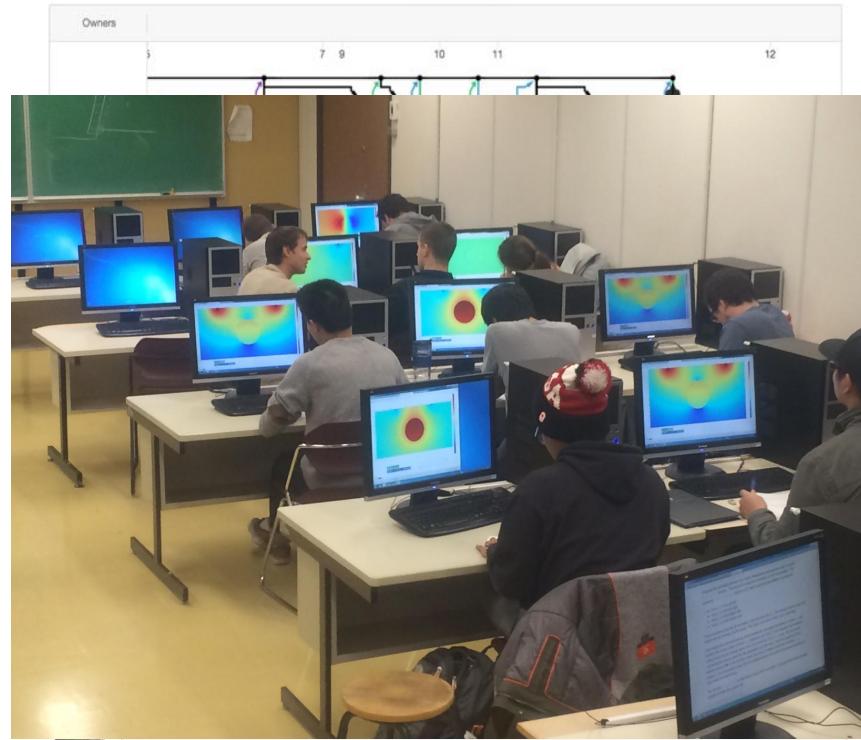
in which

$$M - iN = \left[ \frac{2\mu_2(\tan \alpha - \alpha) - \mu_1(\alpha - \tan \alpha + \alpha^2 \tan \alpha)}{2\mu_2(\tan \alpha - \alpha) + 2\mu_1(\alpha - \tan \alpha + \alpha^2 \tan \alpha)} \right]. \quad (6.85)$$

The field is given by

should be + (see 6.83)

$$\mathbf{H} = H_0 R^3 (M - iN) \frac{(2x^2 - y^2 - z^2)\mathbf{u}_x + 3xy\mathbf{u}_y + 3xz\mathbf{u}_z}{r^5}, \quad (6.86)$$

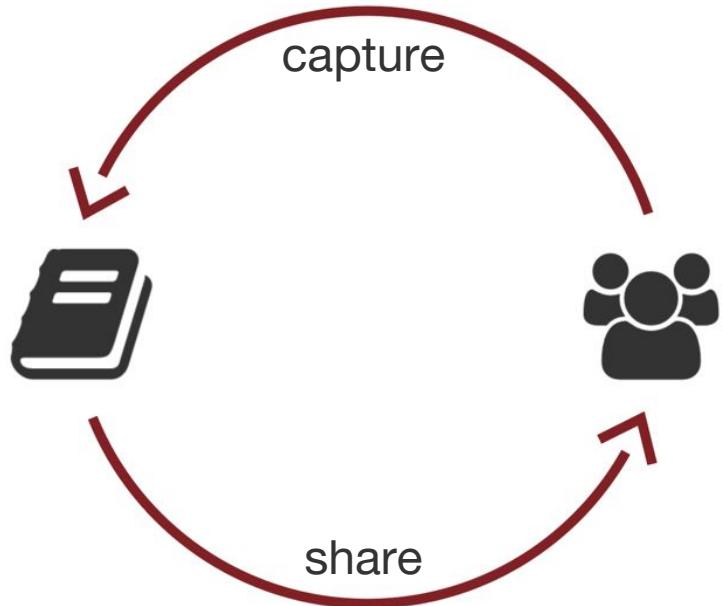


lheagy commented on Nov 7, 2015

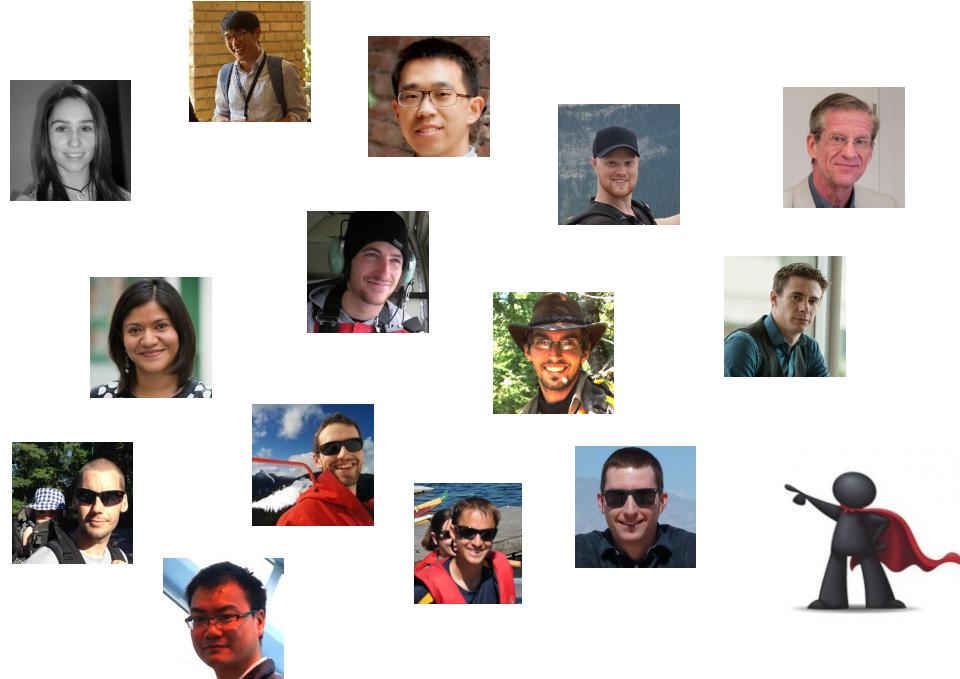
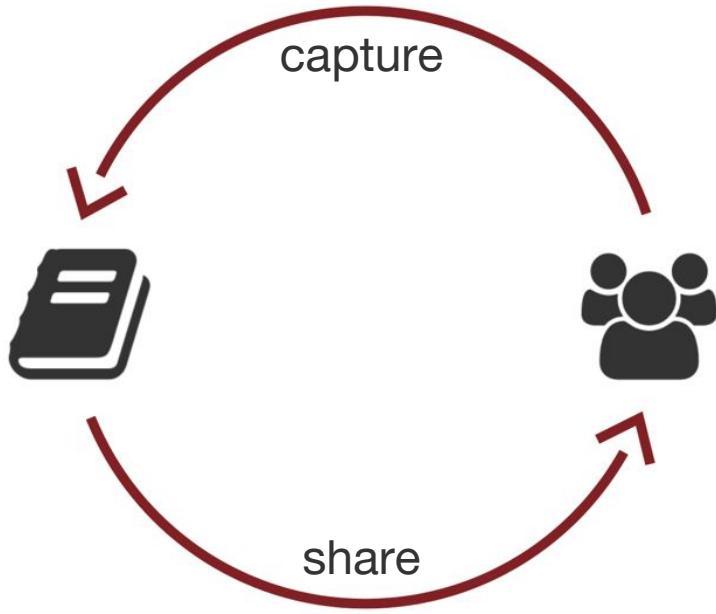
In the formula for apparent conductivity, the second term should be  $\sigma_2 * \phi_v$ , not  $\phi_h$ ?

([http://gpg.geosci.xyz/en/latest/content/electromagnetics/electromagnetics\\_fk\\_domain\\_systems.html#multilayer-earth-structures](http://gpg.geosci.xyz/en/latest/content/electromagnetics/electromagnetics_fk_domain_systems.html#multilayer-earth-structures))

wouldn't it be nice



- iterate in place
- versioned
- reproducible
- tested
- collaborative
- track issues
- continuous peer review
- feedback
- interoperable
- extensible
- multiple media types
- ...



(end)



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