

# Week 9

## Literature search & reading

GEOL 4397: Electromagnetic Methods for Exploration

GEOL 6398: Special Problems

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Oct. 11<sup>th</sup>, 2018

UNIVERSITY of  
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EARTH AND ATMOSPHERIC SCIENCES

Week	Date	Topics	Comments
1	08/21 Tues	Lecture: Introduction to electromagnetics	
	08/23 Thur	Lecture: Vector analysis & PDE	
	08/27 Mon		Last day to add a class
2	08/28 Tues	Lecture: static electrical field & DC theory	
	08/30 Thur	Lecture: DC (survey & data)	
3	09/04 Tues	Lecture: DC (applications)	
	09/05 Wed		Last day to drop w/o a grade
	09/06 Thur	Lab: Understanding DC survey and sensitivity	Report due on 09/13 @ 4 PM
4	09/11 Tues	Lecture: complex variables & FFT	
	09/13 Thur	Lecture: review of electrodynamic theory	
5	09/18 Tues	Lecture: RL circuit with DC and AC	
	09/20 Thur	Lecture: RL circuit model of EM induction	
6	09/25 Tues	Lab: RL circuit	Report due on 10/02 @ 4 PM
	09/27 Thur	Lecture: Plane waves in frequency and time domain	
7	10/02 Tues	Lab: plane waves	Report due on 10/09 @ 4 PM
	10/04 Thur	Lecture: Time domain EM (inductive source)	
8	10/09 Tues	Lab: Time domain EM	Report due on 10/16 @ 4 PM
	10/11 Thur	Lecture: Frequency domain EM (inductive source)	
9	10/16 Tues	Form a team & Select a topic for presentation	In-class attendance not required
	10/18 Thur	Literature search & reading	In-class attendance not required
10	10/23 Tues	Lab: Frequency domain EM	Report due on 10/30 @ 4 PM
	10/25 Thur	Lecture: Recap & Review	
11	10/30 Tues	Exam	
	11/01 Thur	Lecture: EM_grounded sources	last day to drop a course with a 'W'
12	11/06 Tues	Lecture: EM_grounded sources	
	11/08 Thur	Lab: EM_grounded sources	Report due on 11/15 @ 4 PM
13	11/13 Tues	Lecture: EM_natural sources	
	11/15 Thur	Lecture: EM_natural sources	
14	11/20 Tues	Lab: EM_natural sources	Report due on 11/27 @ 4 PM
	11/22 Thur	No class due to Thanksgiving	
15	11/27 Tues	Final presentation	
	11/29 Thur	Final presentation	

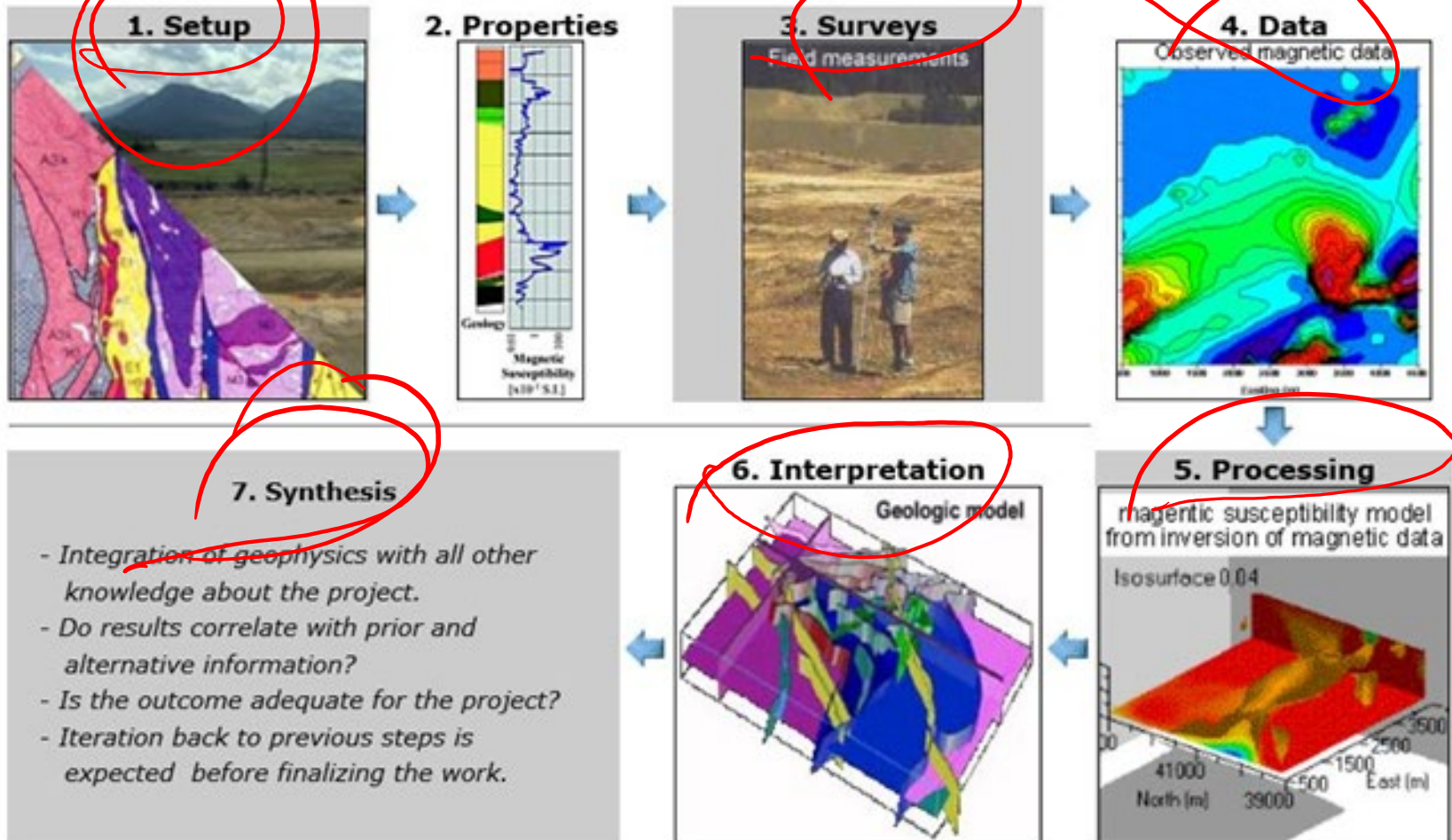
# Tasks to accomplish next week

- Find your teammates and form a team
  - Each team consisting of two or three students
- Decide on which EM application to focus on
  - Hydrocarbon
  - Mineral
  - Groundwater/hydrology
  - Engineering & Environmental
  - Geothermal
  - Large scale crustal studies
  - etc.
- Do literature search
  - you might want to do literature search before deciding on EM applications

# Tasks to accomplish in the next few weeks

- Do literature search
- Find a few papers on the selected topic
  - Suggested deadline: Oct 30<sup>th</sup>, 2018
- Read them
- Select one or two to present
  - Suggested deadline: Nov. 15<sup>th</sup>, 2018
- Final presentation on Nov. 27 & 29<sup>th</sup>.

# 7-step framework for case histories



# A few things to do

- Send TA **the names** of students in your team
- Send TA **the topic** you would like to focus on.
- By **4 pm on Oct. 23<sup>rd</sup>, 2018**

# Literature search



electromagnetic mineral exploration



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**Exploration geophysics.** **Exploration geophysics** is an applied branch of geophysics, which uses physical methods, such as seismic, gravitational, magnetic, electrical and **electromagnetic** at the surface of the Earth to measure the physical properties of the subsurface, along with the anomalies in those properties.

[Exploration geophysics - Wikipedia](https://en.wikipedia.org/wiki/Exploration_geophysics)

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What is mineral prospecting?



What is electromagnetic method?



What is Geophysics used for?



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[Airborne electromagnetic methods: applications to minerals, water and ...](https://csegrecorder.com/.../airborne-electromagnetic-methods-app-to-minerals-water-...)

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by R. Smith - Cited by 18 - Related articles

Airborne **electromagnetic** methods can be a useful tool to assist in the **exploration** for **minerals**, groundwater and hydrocarbons. For **mineral exploration** AEM is an established tool. The use of AEM for groundwater **exploration** is increasing as it is providing valuable information.

[Electrical and Electromagnetic Methods - Minerals Downunder ...](http://www.australianminesatlas.gov.au/education/down_under/exploration/elecsmeth.html)

[www.australianminesatlas.gov.au/education/down\\_under/exploration/elecsmeth.html](http://www.australianminesatlas.gov.au/education/down_under/exploration/elecsmeth.html)

Electrical and **electromagnetic** methods are both used to map variations in the electrical properties of the subsurface. ... of metallic **minerals** containing iron, copper or nickel are very good conductors. ... **Minerals** Downunder **Exploration** Contents.



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**A numerical evaluation of electromagnetic methods in geothermal exploration**  
L Pellerin, JM Johnston, GW Hohmann - Geophysics, 1996 - library.seg.org  
The size and low resistivity of the clay cap associated with a **geothermal** system create a target well suited for **electromagnetic** (EM) methods and also make electrical detection of the underlying **geothermal** reservoir a challenge. Using 3-D numerical models, we evaluate four ...  
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**[HTML] Electromagnetic sounding of geothermal zones**  
V Spichak, A Manzella - Journal of Applied Geophysics, 2009 - Elsevier  
**Electromagnetic** (EM) data provide a substantial contribution to the geophysical mapping and monitoring of **geothermal** reservoirs. This paper presents an up-to-date picture of the achievements of EM methods for **geothermal** exploration as they have emerged over the last ...  
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**[HTML] Exploring for geothermal resources with electromagnetic methods**  
G Munoz - Surveys in geophysics, 2014 - Springer  
Electrical conductivity of the subsurface is known to be a crucial parameter for the characterization of **geothermal** settings. **Geothermal** systems, composed by a system of faults and/or fractures filled with conducting **geothermal** fluids and altered rocks, are ideal ...  
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**[HTML] Electromagnetic studies in geothermal regions**  
A Berktdold - Geophysical surveys, 1983 - Springer  
During the past 25 yr, nearly all available **electromagnetic** and geoelectric techniques have been tested for their usefulness in **geothermal** exploration and exploitation. Dipole-dipole profiling, audiomagnetotellurics and controlled source **electromagnetic** methods are ...  
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### Photocatalytic conversion of CO<sub>2</sub> to hydrocarbon fuels via plasmon-enhanced absorption and metallic interband transitions

Hou W, Hung W, Pavaskar P, Goeppert A, Aykol M, Cronin S  
ACS Catalysis, vol. 1, issue 8 (2011) pp. 929-936

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### Subsurface hydrocarbons detected by electromagnetic sounding

Johansen S, Amundsen H, Røsten T, Ellingsrud S, Eidesmo T, Bhuyian A  
First Break, vol. 23, issue March (2005) pp. 31-36

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### Petroleum electromagnetic prospecting advances and case studies in China

He Z, Hu W, Dong W  
Surveys in Geophysics, vol. 31, issue 2 (2010) pp. 207-224

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## Fracturing Effect of Electrohydraulic Shock Waves Generated by Plasma-Ignited Energetic Materials Explosion

Liu, Qiaojue ; Ding, Weidong ; Han, Ruoyu ; Wu, Jiawei ; Jing, Yang ; Zhang, Yongmin ; Zhou, Haibin ; Qiu, Aici

IEEE Transactions on Plasma Science, March 2017, Vol.45(3), pp.423-431 [Peer Reviewed Journal]

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## Electromagnetic Monitoring of Hydraulic Fracturing: Relationship to Permeability, Seismicity, and Stress

Thiel, Stephan

Surveys in Geophysics, Sep 2017, Vol.38(5), pp.1133-1169 [Peer Reviewed Journal]

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☐ Select All☐ **An Integrated Ground water study for Chasnigua, Honduras; Accomplishments and Challenges**

David Munoz, Catherine Skokan

SEG Technical Program Expanded Abstracts 2010: 3863-3867.

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☐ **Joint Evaluation of Electromagnetic and Electric Methods for Groundwater Exploration**

Emin Ulugergerli, José Pedro Rebes Lima, Nelson Raulino

10th International Congress of the Brazilian Geophysical Society &amp; EXPOGEF 2007, Rio de Janeiro, Brazil, 19-23 November 2007: 123-127.

[Abstract](#) | [References](#) | [PDF \(755 KB\)](#) | [Request Permissions](#)

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☐ **Geophysical Characterization of the Pecém Port Region (NW Fortaleza City) using Electric (tomography) and Electromagnetic (TDEM) Methods, Ceará State, Brazil**

Lívio Alexandre Rocha, Fabiano Mota da Silva, R.Mariano G.Castelo Branco, Narelle Maia de Almeida

12th International Congress of the Brazilian Geophysical Society &amp; EXPOGEF, Rio de Janeiro, Brazil, 15-18 August 2011: 742-744.

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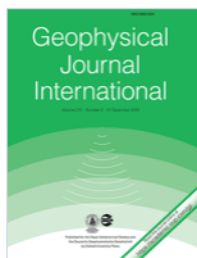
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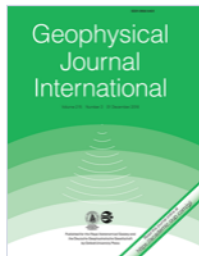
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