EPSC 530 – Volcanology
Winter 2019

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Lectures and labs
Lectures: Monday-Wednesday, 1:30-2:30 PM, FDA 348
Labs: Wednesday, 2:30-5:30 PM, FDA 348

Course web site
http://www.eps.mcgill.ca/~courses/c186-530/

Grading
In-class presentations and writing assignments: 15%
Term paper: 30%
Laboratory assignments: 30%
Final exam: 25%
Total: 100%

Note: The in-class presentations, term paper, lab assignments, and final exam are all required for the course. Students must complete all these requirements.
### Course schedule and assigned reading

<table>
<thead>
<tr>
<th>Week</th>
<th>Topic</th>
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<tbody>
<tr>
<td>Week 1 (7 Jan)</td>
<td>Overview of volcanoes (read Encyclopedia of Volcanoes (EOV), Chapter 12: Earth’s volcanoes and their eruptions: an overview)</td>
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<td>Week 2 (14 Jan)</td>
<td>Deep magmatic systems (read EOV, Chapter 4: The composition and origin of magmas)</td>
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<td>Week 3 (21 Jan)</td>
<td>Shallow magmatic systems (read EOV, Chapter 8: Magma chambers)</td>
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<td>Week 4 (28 Jan)</td>
<td>Surface expressions of magmatic systems (read EOV, Chapter 25: Magmatic fragmentation)</td>
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<td>Week 5 (4 Feb)</td>
<td>Calderas I (read EOV, Chapter 16: Calderas)</td>
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<td>Week 6 (11 Feb)</td>
<td>Calderas II</td>
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<td>Week 7 (18 Feb)</td>
<td>Pyroclastic falls and density currents I (read EOV, Chapter 29: Plinian and subplinian eruptions)</td>
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<td>Week 8 (25 Feb)</td>
<td>Pyroclastic falls and density currents II (read EOV, Chapter 35: Pyroclastic density currents: processes and models)</td>
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<td>Week 9 (4 Mar)</td>
<td>Optional field trip to western Costa Rica during reading week</td>
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<td>Week 10 (11 Mar)</td>
<td>Volcano instability I: debris avalanches (read EOV, Chapter 38: landslides, debris avalanches, and volcanic gravitational deformation)</td>
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<td>Week 11 (18 Mar)</td>
<td>Volcano instability II: lahars (read EOV, Chapter 37: Lahars and their deposits)</td>
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<td>Week 12 (25 Mar)</td>
<td>Volcano instability III: lava domes and lava flows (read EOV, Chapter 18: Lava dome eruptions)</td>
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<td>Week 13 (1 April)</td>
<td>Volcanic hazard and volcanic risk (read EOV, Chapter 70: Volcanic risk assessment)</td>
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<td>Week 14 (8 April)</td>
<td>Summary</td>
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### Laboratory schedule

- 16 Jan: LAB 1: prepare analogue experiments
- 23 Jan: prepare experiments
- 30 Jan: run analogue experiments
6 Feb: run, analyze analogue experiments
13 Feb: analyze experiments
20 Feb: analyze and write up experiments
27 Feb: oral presentations, hand in lab report
13 March: LAB 2: start analyzing MULTIGAS and mini-DOAS data
20 March: analyze data
27 March: interpret data
3 April: finish interpreting data, write up report
10 April: oral presentations, hand in lab report

**Required materials for the course**


Also, there are a set of cool new videos on various volcanic phenomena which we will explore during the course. Check out the videos here:

[https://vimeo.com/volfilm/](https://vimeo.com/volfilm/)

**In-class presentations and writing assignments**

You will be asked once during the course to present a paper which we have read for the class that week. The oral presentation should summarize the key points and highlight the strengths and weaknesses of the paper. In certain instances, I may ask you to comment upon or interpret a diagram or diagrams from the paper.

Given the size of the class, we will probably do the above exercise as groups.

For each paper that we read for class, you also will be asked individually to write a one-page summary and critique (single spaced 12 point Times New Roman).

**Laboratory assignments**

The labs will be split into two parts. The first lab will examine magmatic processes beneath a volcano. The second lab will examine some stuff (in this case gas) which comes out of a volcano.
For the first half of the course, you will work in groups studying magma processes by means of analogue modeling. Each group will write a report and present their results to the class.

For the second half of the course, you will work in groups examining a set of real-life volcanic gas data from Yasur volcano in Vanuatu. Each group will write a report and present their results to the class.

**Your term paper**

Your paper will consist of a 10-20 page essay (double-spaced, Times New Roman 12 point) which examines a particular aspect of volcanology that you find interesting. The paper is due on **Wednesday, 10 April 2019**.

**Possible research topics for the term paper**

I have compiled a list of potential topics which you may find useful when choosing the subject of your term paper. You are, however, free to choose a topic which does not appear on the list below. Before embarking on a topic, please consult with me first so that I may steer you in the right direction, towards relevant references, etc.

Once you choose a topic, you can use search tools such as Geobase and GeoScienceWorld, which are available through the web, to identify relevant scientific articles.

**Some useful sources of information**


Begin searching early in the term, in case you need inter-library loans, etc.

For your paper, you are expected to mostly use scientific articles in journals and books, with little or no reliance on web materials. However, feel free to use photos, maps, etc., from the web (with proper documentation). I strongly encourage you to download and read papers from scientific journals. You can access scientific journals at [https://www.mcgill.ca/library/find/articles](https://www.mcgill.ca/library/find/articles). To access these journals, you need to be connected to a McGill computer, VPN DAS, etc.

**Term paper topics (you can also choose your own)**

tectonic control of volcanoes
hot spots
ophiolites vs. modern ocean ridges
kimberlites
shield volcanoes
flood basalts and rifting
many different aspects of calderas
geochemical zonation in ignimbrites
lava domes
explosive activity on lava domes
generation of block and ash flows from lava domes
edifice collapse
volcanic submarine landslides
lahars and lahar support mechanisms
transformations from pyroclastic flows to lahars
emplacement mechanisms of pyroclastic flows
distinctions between surges and other pyroclastic flows
fallout deposits
phreatomagmatic volcanism
subglacial volcanism
subaqueous pyroclastic flows
volcano degassing
volcanic volatiles
volcanoes and hydrothermal ore deposits
rheology of magmatic liquids
magma mixing
crystallization in magma reservoirs
alteration of volcanic glass
classic calderas: Valles, Long Valley, Toba, Cerro Galan, Rabaul (especially 1970's-1994), Thira (Santorini), Phlegrean fields (Campi Flegrei), Maule (Chile), Yellowstone, Kilauea, Fernandina 1968, Galapagos, etc.

References

I have compiled a list of references which you may find useful during the course. I have made a few comments beside each of the volcanology books.

Volcanology

General books


Specialized books


**Igneous petrology**


**Sedimentology**


Plagiarism

STUDENT GUIDE TO AVOID PLAGIARISM
http://www.mcgill.ca/students/srr/honest/

McGill University values academic integrity. Therefore all students must understand the meaning and consequences of cheating, plagiarism and other academic offences under the Code of Student Conduct and Disciplinary Procedures (see http://www.mcgill.ca/students/srr/honest/ for more information).

L'université McGill attache une haute importance à l'honnêteté académique. Il incombe par conséquent à tous les étudiants de comprendre ce que l'on entend par tricherie, plagiat et autres infractions académiques, ainsi que les conséquences que peuvent avoir de telles actions, selon le Code de conduite de l'étudiant et des procédures disciplinaires (pour de plus amples renseignements, veuillez consulter le site www.mcgill.ca/students/srr/honest/).

Language of written work

In accord with McGill University’s Charter of Students’ Rights, students in this course have the right to submit in English or in French any written work that is to be graded. (approved by Senate on 21 January 2009.)

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Revised 7 January 2019