Natural Disasters
ATO C 185 / EPSC 185

Fall 2010

http://www.meteo.mcgill.ca/195-250

1. Important dates to remember

**Mid-term exam:** Monday, 18 October 2010, 6:30-8:30 PM (rooms to be announced)

**Make-up/conflict mid-term exam:** Monday, 25 October 2010, 6:30-8:30 PM (rooms to be announced)

Only those students who have an excused absence (illness, religious observance, or other equivalent circumstance) from the October 18th exam will be allowed to write this make-up exam. See **Point (7) below** for further information.

**Due date for term paper:** Thursday, 2 December 2010 (last class)

2. Scope of the course

No region on Earth is immune from natural disasters. As we gain scientific understanding into the causes and nature of such phenomena, we become better able to mitigate the effects of disasters. Yet as the world's population continues to grow, an increasingly large number of people are at risk. This course examines the science behind different types of disasters and our ability or inability to control and predict such events. From this course the student will gain an appreciation of natural disasters beyond the newspaper headlines, and will better understand how the effects of disasters can be reduced.

There is an urgent need for people from all walks of life to better understand the scientific principles behind the occurrence of natural disasters. City planners need to know where and where not to site buildings. Politicians need to make scientifically informed decisions. Emergency management officials need to understand the nature of a potential disaster and ways to mitigate such an event. Journalists need to report scientifically accurate information. Future generations of these people - who are currently students at McGill representing a wide variety of disciplines - will benefit from this course.
3. Meetings

2 1½-hr lectures/week in 132 Leacock, Tuesday-Thursday, 13:05-14:25 PM

First day of class: Thursday, 2 September 2010

Last day of class: Thursday, 2 December 2010

4. Description of the topics to be covered

Introduction (2 Sept)

- Scientific perspectives on natural disasters
- Past, present, and future disasters
- Hazard, risk, vulnerability, mitigation
- Prediction of natural disasters

Hurricanes (7, 9, 14 Sept)

- Where and when do they occur?
- Physical mechanisms for formation and intensification
- Life cycles of hurricanes
- Hazards of hurricanes
- Coastal flooding and erosion
  Required reading: [http://www.srh.noaa.gov/jetstream/tropics/tc.htm](http://www.srh.noaa.gov/jetstream/tropics/tc.htm)

Volcanoes (16, 21, 23 Sept)

- Locations and types of volcanic eruptions
- Huge volcanic eruptions: impacts on life and climate
- Volcanic blasts and volcanic mud

Earthquakes (28, 30 Sept, 5 Oct)

- Tectonic environments
- Mechanisms
- Earthquakes in Western North America and Quebec
- Forecasting and mitigation

El Niño (7, 12 Oct)

- Where does it occur and how?
- How often does it occur?
Ocean-atmosphere interactions
Local and global weather impacts
**Required reading:** [http://www.ucar.edu/communications/factsheets/elnino](http://www.ucar.edu/communications/factsheets/elnino)

Meteorite impacts (14, 19 Oct)
- Types of meteorites
- Effects of impact events
- Extinction of life from asteroid impacts
**Required reading:** [http://neo.jpl.nasa.gov/neo/](http://neo.jpl.nasa.gov/neo/) (read all five sections)

Tornadoes (21, 26, 28 Oct)
- Tornado characteristics
- Where and when do tornadoes occur?
- The F-scale
- Hazards of tornadoes
**Required reading:** [http://www.spc.noaa.gov/faq/tornado](http://www.spc.noaa.gov/faq/tornado)

Ice Storms (2, 4 Nov)
- Preferred locations/climatology
- Ingredients for producing ice storms
- Precipitation and temperature forecasting
- Impacts on infrastructure
**Required reading:** [http://severe-wx.pbworks.com/Ice-Storms#IceStorms](http://severe-wx.pbworks.com/Ice-Storms#IceStorms)

Tsunamis (9, 11, 16 Nov)
- Tsunamis from earthquakes
- Tsunamis from volcanic activity
- Evolution of tsunami waves
- Local and distant impacts
[http://www.swissre.com/resources/1f7adc00455c7a45b160bb80a45d76a0-Publ05_Tsunami_en.pdf](http://www.swissre.com/resources/1f7adc00455c7a45b160bb80a45d76a0-Publ05_Tsunami_en.pdf)

Avalanches (18, 23 Nov)
- Flow of snow on steep slopes
- The nature of avalanche deposits
- Causes: Slope instability, snow characteristics, meteorology
Climate Change and Weather (25, 30 Nov)

What is Climate Change
Climate Change mechanisms
Past Climate Change
Recent Climate Change
Future Forecasts
Hurricanes and Climate Change
**Required reading:** [http://www.epa.gov/climatechange/science/index.html](http://www.epa.gov/climatechange/science/index.html)
[http://wind.mit.edu/~emanuel/anthro2.htm](http://wind.mit.edu/~emanuel/anthro2.htm)

Concluding Lecture (2 Dec)

**5. Course materials, required and recommended readings**

All course notes are available at the following web site:


Paper copies of the course notes are also on file at COPI-EUS in McConnell Engineering Room 006.

**TurningPoint clickers:**

We will use clickers this year. Get yours at the McGill Bookstore.

**Additional references:**


6. Means of evaluation

30% term paper on a "case study"
35% mid-term exam
35% final exam (non-cumulative)

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.

Note: The term paper, the mid-term exam, and the final exam are all required for the course. Students must complete these requirements.

Grading for the term paper is as follows:
- Content 30%
- Presentation 30%
- Research effort 30%
- Illustrative material (figures, tables, etc.) 10%

There will be a supplemental examination, counting for 100% of the supplemental mark.

7. Procedure to follow if you have a conflict with the time and date of the mid-term exam

If you have a conflict with the mid-term exam, you may take a make-up mid-term exam, which will be held Monday, 25 October 2010, 6:30-8:30 PM.

The following circumstances constitute valid conflicts:
- A religious holiday
- An illness
- An exam at the same time as the Natural Disasters mid-term exam
- An extraordinary event, e.g., a family emergency, etc.

The above conflicts must be accompanied by written documentation, e.g., a doctor’s note in the case of an illness or a professor’s note in the case of an exam.

Note that a class at the same time as the exam does NOT constitute a valid conflict; the Natural Disasters mid-term exam takes precedence.

If you have a valid conflict, submit your request in writing with documentation to one of the professors.

8. Sample questions from an exam

Short-answer questions. Your answers should be no more than several sentences long.

Many Icelandic volcanoes erupt under glaciers. Why are Icelanders concerned about such events in the context of flooding?
During the 1997 flood of the Red River, the city of Grand Forks, North Dakota, was unexpectedly flooded. Why was this an unexpected event, and what were the contributing factors to make it unexpected?

River discharge can vary spatially and temporally. Discuss.

Meandering rivers undergo both erosion and deposition of sediment simultaneously. Draw a sketch of a meandering river, showing areas of deposition, erosion, and the location of point bars.

Define the term 'monsoon'. Discuss where the monsoon typically occurs, when it occurs, and how it occurs.

Define the term 'hurricane'. Discuss the weather associated with this event, where it occurs, and its impacts.

Discuss how mountains influence the amount of precipitation that falls on both the upwind and lee sides.

Why have so many people died from tsunamis in the past ten years?

What factors make tsunamis different from normal ocean waves?

The epicenter of the 1964 Alaskan earthquake was located on land, not water, in the area of Prince William Sound. Why then was tsunami damage so severe in this area?

9. Instructors

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office hours: after class

10. Teaching assistants
Teaching assistants can be contacted at nd@mcgill.ca

**Additional Teaching Assistants will be announced.**
Yamamoto Ayako, Burnside 840
Kevin Bowley, Burnside 833
Paloma Borque, Burnside 828
Dominik Jacques, Burnside 825
Christopher Simmons, Burnside 713
Stephanne Taylor, Burnside 849

11. Course evaluations

Course evaluations are available during the last 2½ weeks of the course and where the last day coincides with the last day of lectures.

1. Log in to [Minerva for Students](#)
2. Select Student Menu
3. Scroll down and click on "Mercury – McGill Online Evaluations"

12. Your term paper

*Date due: Thursday, 2 December 2010*

*Length:* 5-10 double-spaced pages of text plus 5-10 additional figures for illustrative purposes.

*Theme:* the paper will examine a case study involving one or more of the topics we have covered in the course.

*Possible topics (you may choose your own, but run it by one of the professors first):*

Super-volcanoes
The Parkfield earthquake experiment
Cascadia megathrust earthquakes
The 26 December 2004 tsunami and attendant effects
Mitigation of near-earth objects (i.e., asteroids)
Hazards of coastal communities
Super-typhoons
The record-breaking Atlantic Hurricane season of 2005
Hurricane Katrina and its associated effects
Mitigation of a hurricane striking a megalopolitan region

*Sources of information:*
To access some of these databases, you need to be connected to a McGill computer, dialup DAS, or VPN DAS.


Geobase, [http://mclink.library.mcgill.ca:8331/V/YXNP4NGGCL5JBENJXNNMU48CJNBPA7PFBSG7KYKBA6UL5VPVN C-34144?func=find-db-1-title&mode=titles&scan_start=g%3F&search_type=exact&pds_handle=GUEST](http://mclink.library.mcgill.ca:8331/V/YXNP4NGGCL5JBENJXNNMU48CJNBPA7PFBSG7KYKBA6UL5VPVN C-34144?func=find-db-1-title&mode=titles&scan_start=g%3F&search_type=exact&pds_handle=GUEST)


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

**Important Note:** Papers which use only/mostly materials from the Web will be looked upon unfavourably compared to papers which use materials from a variety of sources. We strongly encourage you to download and read papers from scientific journals. You can access scientific journals at [http://mclink.library.mcgill.ca/sfx/azlist/default](http://mclink.library.mcgill.ca/sfx/azlist/default). To access these journals, you need to be connected to a McGill computer, dialup DAS, or VPN DAS.

**Suggested structure of the paper:**

- Title page
- Abstract
- Introduction
- Overview of the problem
  - The problem, sequence of events, etc.
- Causes and impacts of the problem
- Remedial action that was, or could have been, taken to predict, prevent, or reduce the problem
- Concluding remarks
- Bibliography

*How to cite your various sources of information in the text and in the bibliography:*

*In the text of the paper:*
You must cite your sources directly in the text of the paper, as well as in a bibliography at the end of the paper. When citing material in the text, refer to the author and the year, e.g., (Stix, 1999). If no author is specified, as is frequently the case for an article on a web site, use the following notation: (Anonymous, 1999).

In the bibliography at the end:

**Article in a journal:** AUTHOR(S), YEAR, TITLE OF ARTICLE, NAME OF JOURNAL, VOLUME, PAGES.

**Book:** AUTHOR(S), YEAR, TITLE OF BOOK, PUBLISHER, CITY, NUMBER OF PAGES OF THE BOOK.

**Chapter in a book:** AUTHOR(S), YEAR, TITLE OF ARTICLE, TITLE OF BOOK, EDITORS, PUBLISHER, CITY, PAGES OF THE CHAPTER.

**Article from a web site:** AUTHOR(S), YEAR, TITLE OF ARTICLE, COMPLETE WEB SITE ADDRESS. If no author is specified, use “Anonymous”.

The figures which you choose to use in your paper:

You may place your figures within the text or at the end of the paper; it makes no difference to us. However, you must provide two important pieces of information for each figure: (1) a figure caption, briefly explaining the figure; (2) a reference for the figure, which should be listed in full in your bibliography.

Some guidelines for clear writing (modified from notes by Prof. R.F. Martin):

**Why write a term paper?**

The term paper offers you the opportunity to become familiar with an aspect of the earth and environmental sciences that fascinates you. It will increase your knowledge about one aspect in this field. In addition, the paper will provide you with practice in writing a report. Although that may not seem very important to you now, chances are that you will be asked to write concise, well-organized reports on other occasions in your career, both at McGill and later, out there in the real world.

**Format of the paper**

“Normally a paper is made up of three main parts: the front matter or preliminaries, the text, and the reference matter...each of these main parts may consist of several sections (Turabian, 1967). The preliminaries should consist of a first page with the title and the name of the author. Also considered part of the preliminaries in a scientific report is an abstract, which tells the reader in a nutshell what your “message” is. The abstract need not be longer than this paragraph.
Then comes the text, composed of (1) an introduction, (2) the main body of the paper, usually consisting of well-defined divisions, including a Conclusions section, preferably in point form (1, 2, 3, etc.). At the end of your paper, in an alphabetical list of entries (the references), you show the source of material which you used in gathering the information you present.

What you hand in should have been written long before the deadline, so that you have ample opportunity to proof-read and fine-tune.

Comme pour chaque cours offert à cette université, vous avez la possibilité de rédiger votre rapport en français.

What is scientific writing?

The key to scientific writing is clarity. “In scientific writing, there is no room for and no need for ornamentation. The flowery literary embellishments, the metaphors, the similes, the idiomatic expressions, are very likely to cause confusion and seldom should be used in writing research papers...many kinds of writing are designed for entertainment. Scientific writing has a different purpose: to communicate [or in your case, to synthesize] scientific findings. Scientific writing should be as clear and simple as possible” (Day, 1988).

References


Some additional points

1. Each paragraph should discuss only one topic.
2. The first sentence of the paragraph should be a topic sentence, which introduces the topic of the paragraph.
3. Paragraphs should be at least three sentences long (this rule may occasionally be violated).
4. Papers should be subdivided into sections.
5. Structure the paper to lead the reader to the conclusions you want her or him to reach.
6. The purpose of the introduction is to exhort the reader to read the entire paper.
7. The introduction is probably the most difficult part to write. It is generally too long. One or two short paragraphs should suffice to tell the reader what you intend to cover in your paper, and how you plan to go about it.
8. Do not use bold or underline fonts. Use quotation marks only for quotations. Choose your words carefully to stress your points.
9. The use of a thesaurus is recommended.
10. Correct spelling and grammar are important. Check and double-check spelling and grammar.
11. Be very careful when writing for a non-specialist audience. You should always use correct terminology, but never too much. Always introduce and define your terminology (this may be necessary in manuscripts written for specialist audiences too).
12. Use double spacing between lines, not single, not 1.5.
13. Use 2.5 cm (1 inch) margins on top, bottom, and sides of manuscript pages.
14. Be quantitative wherever possible.
15. Number your pages.
16. Try to keep all sentences fewer than three lines long (not including references in parentheses).
17. Don't be repetitious.
18. Don't use contractions (i.e., do not use contractions).
19. Remember that your typical reader is highly intelligent, but ignorant (not necessarily a good rule for papers submitted to scientific journals).
20. A good practice in writing is to place the adjective immediately next to the noun it modifies. The same rule applies to adverbs; place them immediately before the features they modify.
21. In a string of three nouns, two of which modify the third, use a hyphen between the two nouns that are modified by the third (e.g., mantle convection-cell). The brain then has less decoding to do and possible ambiguities are avoided.
22. You should avoid value judgements and subjective words.
23. You should not begin sentences with words such as “it”, “as”, “and”, “but” etc.
24. Always try to write in the active voice.
25. All statements that are not original to the author should be referenced.
26. Remove all material extraneous to the goals of the manuscript.
27. Design your writing to inform your reader, not to parade your knowledge or depth of understanding.

13. 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/).

Academic integrity is important. Anything that undermines the evaluation process at McGill
undermines the value of our degrees.

McGill's Code of Student Conduct and Disciplinary Procedures appears in the Handbook on Student Rights and Responsibilities. Article 15(a) of the Code, which is devoted to plagiarism, reads as follows:

No student shall, with intent to deceive, represent the work of another person as his or her own in any academic writing, essay, thesis, research report, project or assignment submitted in a course or program of study or represent as his or her own an entire essay or work of another, whether the material so represented constitutes a part or the entirety of the work submitted.

J. Raymond Hendrickson, in his book The Research Paper (Henry Holt and Company, New York, 1957), suggests the following guidelines for avoiding plagiarism:

- When writing a paper try to use your own words the majority of the time.
- When you do use another person's words, use quotation marks and give credit to the source, either within the text or in a footnote.
- Don't make slight variations in the language and then fail to give credit to the source. If the expression is essentially the same, the author still deserves credit.
- Even if you aren't directly quoting the material, you should still document information and ideas that you use in your paper whenever they are new to you (i.e., something that you discovered in your research).
- If you're unsure, add the footnote or citation. It is better to be extra cautious than not give credit when you should.

These rules concern information obtained from any source (e.g., books, journal articles, the Internet, other students) and apply to any written submission (term papers, essays, assignments, take-home exams and lab reports).

The following web sites are helpful references:

- Plagiarism -- The Dos and Don'ts: includes detailed examples of acceptable and unacceptable instances of citing sources <www.chem.uky.edu/courses/common/plagiarism.html>

- Plagiarism Examples (Rob Toreki, University of Kentucky Department of Chemistry) <www.chem.uky.edu/courses/common/plagiarism.html#Examples>

- Plagiarism and How to Avoid It (Indiana University) from A Research Guide for Students, by I. Lee <www.indiana.edu/%7Ewts/cts/plagiarism.html#original>

- Unacceptable Paraphrases (Indiana University Writing Tutorial Services) <www.indiana.edu/%7Ewts/cts/plagiarism.html#original>

- How Not to Plagiarize (Margaret Procter, University of Toronto) <www.utoronto.ca/writing/plagsep.html>

- Avoiding Plagiarism (Sharon Williams, Hamilton College Writing Center) <www.hamilton.edu/academics/resource/wc/AvoidingPlagiarism.html>

- Plagiarism (Earl Babbie) <www.csubak.edu/ssric/Modules/Other/plagiarism.htm>
These links, and further discussion, can be found, check out new link at "Cyber-Plagarism: Detection and Prevention", at Pennsylvania State University <cac.psu.edu/ets/cyberplag/>.

Remember that, according to McGill's Code of Student Conduct and Disciplinary Procedures, plagiarism is an academic offence. Students who are found violating the Code will be reported to the Associate Dean, and appropriate action will be taken.

* Adapted for the Faculties of Arts and of Science from a memo for the Faculty of Management, McGill University.

http://www.mcgill.ca/students/srr/honest/

Revised 31 August 2010