

Faculty of Science Course Syllabus
Department of Earth Sciences
ERTH/GEOG 3302
Quaternary depositional environments
Fall 2018

Instructor(s): John Gosse john.gosse@dal.ca LSC-Ocean-Rm4616 OfficeHrs: T,Th 10-11

TA: Sydney Stashin Sydney.Stashin@Dal.Ca

Lectures: 12:35 M,W,F LSC-Ocean-Rm3655

Laboratories: W 12:30-17:25 either LSC-ERTH-Rm B2030, or board bus between LSC and Kings College

Tutorials: None

Course Description

The student is exposed to fluvial, alluvial, subglacial, glaciolacustrine, hillslope, eolian, coastal, shallow marine, rift, wedge top, retroarc, and foreland basin environments. Field trips and labs provide experience in methods used to distinguish the environments, including sedimentology, geomorphology, geochronology and thermochronology, and analysis of soils, cores, pebble fabrics, and section-scale non-petroleum sedimentary facies. Quaternary paleoclimatology and tectonic controls on weathering and deposition are discussed and debated.

Course Prerequisites

ERTH 2203 or similar introductory sedimentology course

Course Objectives/Learning Outcomes

This course focuses on the architectural components of sedimentary environments, i.e. larger-scale than the sedimentary-structures you investigated in *Sedimentology*, and overlapping or finer than the elements of facies and large-scale stratigraphy. The emphasis is on developing skills in analysing Quaternary sedimentary records to quantify and interpret surface processes and responses to climate and tectonic changes. A combination of field and theoretical experiments provide experiential opportunities to describe, classify, and analyse glacial, glaciofluvial, glaciomarine, fluvial, lake, coastal, marine, and eolian sediments and records contained within them, to address ongoing questions regarding tectonics and climate controls on sedimentation. Experiments and field trips will include fabric analyses, power spectral analyses, geomorphometry, and geochronology and exposure to regional examples of Quaternary sedimentary environments.

Course Materials

No single available textbook contains the range of topics we cover. However, you will be expected to come prepared by reading the assigned articles.

For the field trips, there will be a list provided prior to each trip, but in general bring your notebook, pencil, handlens, compass, water, boots, rainjacket (check weather). I will provide a printed copy of the field trip or lab assignment during the lab period, but please skim through the exercise prior to coming.

Course Assessment

| | |
|---|-------------|
| Mid Term Test (req'd) | 20% |
| Field trips and Experiments | 30% |
| Assigned readings and short assignments | 20% |
| Final Exam (cumulative) (req'd) | 30% |
| Total | 100% |

Conversion of numerical grades to Final Letter Grades follows the Dalhousie Common Grade Scale

| | | | | |
|-------------|------------|------------|---|---------|
| A+ (90-100) | B+ (77-79) | C+ (65-69) | D | (50-54) |
| A (85-89) | B (73-76) | C (60-64) | F | (<50) |
| A- (80-84) | B- (70-72) | C- (55-59) | | |

Other Course Policies

Collaboration:

Sometimes submissions for a lab experiment or fieldtrip will be a group effort. The TA will make clear what elements (such as a soils profile or cosmogenic isotope modeling) will be expected to be an individual or group effort.

Missed or late work:

- Both tests are mandatory. Please make every effort to take the test at the time indicated. However, in the case of significant illness or death in the immediate family, I will provide a different makeup test scheduled about 7-10 days following the original test. There are no re-attempts for tests.
- All labs are strongly suggested, but not mandatory. If you miss a lab experiment (mostly calculation) owing to significant sickness or death in the immediate family, it is possible to check with the TA to get an extension. If you miss a field trip, these will not be able to be repeated as permissions are required for access to the sites. We will ignore one missed field trip. However, please note that a significant portion of the two tests will be based on knowledge gained during the lab periods and field trips.
- All assignments are mandatory. Late scores will be deducted 5% per day for each full day the assignment is late (4 pm, Dept Office).
- Based on these policies, it is not necessary to use the Student Declaration of Absence for this class.

Assigned readings and assignments

There is no textbook assigned for this class.

You are expected to complete the assigned readings before the class.

I will indicate if you should focus on one particular element of the reading, otherwise you are responsible for reading the entire paper and understanding the figures. While you may not understand everything you read, you are expected to know the general ideas expressed in the papers. If a paper piques your interest, and you want more information beyond what is provided in the cited references list, please send me an email and I'll be happy to give suggestions.

To achieve the full grade for reading, you need to email John.Gosse@dal.ca by midnight on the night **before** the class with the answer to the first question in the '*Should knows*' for each article. Please email me the answers to at least the questions ending with (email Gosse).

Readings sources:

1. Check the class *Brightspace* page for uploaded material that I am permitted to share
2. Scholar Google
3. <http://libraries.dal.ca/>

For Friday, Sep 8, 2017:

Molnar, P., & England, P. (1990). Late Cenozoic uplift of mountain ranges and global climate change: chicken or egg?. *Nature*, 346(6279), 29-34.

Should knows:

- Q1. Distinguish: Rock uplift, surface uplift, isostasy, exhumation, erosion ([email Gosse](mailto:John.Gosse@dal.ca))
- Q2. Explain Figure 2
- Q3. What is the chicken and egg?

Assignments

There will be at least two assignments, required. They are quantitative in nature, and you will have two weeks to complete each of them. Budget 4 hours each. They will be worth about half of the total Readings and Assignment portion of the course.

| Lec | Date | Topic | Tentative topic | Reading <u>before</u> the class |
|-----|--------|--|---|---|
| 0 | 09-05W | | Course overview and Definition of the Quaternary, Tour CRISDal Lab | No reading |
| 1 | 09-07F | Sediment production | Climate vs. tectonic controls on relief and erosion | Molnar&England 1990 |
| 2 | 09-10M | | Weathering, erosion, denudation, exhumation, incision, sed rates | Belmont et |
| 3 | 09-12W | | Field Trip 1: Soils and sediments | Stea and Gosse 2004 |
| 4 | 09-14F | | Quaternary Paleoclimatology, weathering, erosion | Berger et al. 2010...Quat climate change |
| 5 | 09-17M | | Sediment limited and erosion limited systems: The Klondike Placer | Gosse, 2017 submitted |
| 6 | 09-19W | | Experiment 1: Climate and modeling of sediment flux-BQART | *dataset provided, Syvitski Milliman 2007 |
| 7 | 09-21F | Subglacial Environments | Terrestrial glacial environments and sediments | *Excerpts from Benn and Evans |
| 8 | 09-24M | | Subglacial depositional environments, basal thermal regime | Staiger et al 2006; |
| 9 | 09-26W | | Field Trip 2: Determine the basal thermal regime of a glacier | No new reading |
| 10 | 09-28F | Lakes | Glaciolacustrine and lacustrine environments | No new reading |
| 11 | 10-01M | | Varves and the Younger Dryas Cooling Event | Ridge et al 2012 New England Varves |
| 12 | 10-03W | | Field Trip 3: Lantz Brick Yard glaciolacustrine record | Stea and Mott 1998 |
| 13 | 10-05F | Sediment delivery to the oceans | Heinrich events, turbidites, MTDs of Canada's east coast and shelf | *Broom et al., submitted |
| 14 | 10-8M | | NO CLASS-Thanksgiving Break | No new reading |
| 15 | 10-10W | | Field Trip 4. Sedimentary processes on Canada's Atlantic shelf & slope | No new reading |
| 16 | 10-12F | | Hemipelagic and pelagic sediments, oozes, and other marine sediments | TBA |
| 17 | 10-15M | | Stream sediment | Excerpts from Miall |
| 18 | 10-17W | | Experiment 2: Quaternary geochronology methods | Gosse Chap. 3 |
| 19 | 10-19F | Identifying Quaternary Streams-Meandering, Braided, and others | Excerpts from Miall | |
| 20 | 10-22M | Review of climate records in Quaternary sediments | No new reading | |
| 21 | 10-24W | | Mid-term test at 12:35-1:25, in class followed by Experiment 3: Forces and sedimentary basins in an ocean-continent convergence | No new reading |
| 22 | 10-26F | Tectonic sedimentary environments | Sediments and stratigraphy of tectonically active basins | Ingersoll, 2012 overview |
| 23 | 10-29M | | Recognizing tectonic processes in a foreland basin | DeCelles 2012 Chap 20; Baker 2008 |
| 24 | 10-31W | | Experiment 4: Tectonic Sedimentary Environments | Materials provided |
| 25 | 11-02F | | No Class- Atlantic Universities Geoscience Mtg, hosted by Dal | No new reading |
| 26 | 11-05M | | Recognizing tectonic processes in a foreland basin | Ingersoll, 2012 overview |
| 27 | 11-07W | | Experiment 5: Detrital thermochronology of a retroforeland basin | Coutand et al |
| 28 | 11-09F | Sedimentation in rift basins-Mojave | McDonald et al 2003 Alluvial fans | |
| 29 | 11-12M | | Fall Study Break | |
| 30 | 11-14W | | Fall Study Break | |
| 31 | 11-16F | | Fall Study Break | |
| 32 | 11-19M | | Interpretation of tectonics from Quaternary sedimentary records | Anderson Chapter |
| 33 | 11-21W | | Experiment 6: Correlation and interpretation of a Quaternary basin record....Tectonic or Climate signal? | Apennine research, Pazzaglia et al |
| 34 | 11-23F | Rates | Rates of Quaternary deposition in tectonic environments | No reading |
| 35 | 11-26M | Active Tectonics | Paleoseismology and active tectonics in Quaternary environments | Kirby et al 2017 Submitted |
| 36 | 11-28W | | Paleoseismology and active tectonics in Quaternary environments | *Paige et al., quantifying rates |
| 37 | 11-30F | | TBA | |
| 38 | 12-03M | | Review (last class) | |
| 39 | 12-04T | | Last day to submit missing labs | |

Faculty of Science Course Syllabus (Section B) (revised June-2018)
ERTH/GEOG 1060 Quaternary depositional environments

University Policies and Statements

This course is governed by the academic rules and regulations set forth in the University Calendar and by Senate

Academic Integrity

At Dalhousie University, we are guided in all of our work by the values of academic integrity: honesty, trust, fairness, responsibility and respect (The Center for Academic Integrity, Duke University, 1999). As a student, you are required to demonstrate these values in all of the work you do. The University provides policies and procedures that every member of the university community is required to follow to ensure academic integrity.

Information: https://www.dal.ca/dept/university_secretariat/academic-integrity.html

Accessibility

The Advising and Access Services Centre is Dalhousie's centre of expertise for student accessibility and accommodation. The advising team works with students who request accommodation as a result of a disability, religious obligation, or any barrier related to any other characteristic protected under Human Rights legislation (Canada and Nova Scotia).

Information: https://www.dal.ca/campus_life/academic-support/accessibility.html

Student Code of Conduct

Everyone at Dalhousie is expected to treat others with dignity and respect. The Code of Student Conduct allows Dalhousie to take disciplinary action if students don't follow this community expectation. When appropriate, violations of the code can be resolved in a reasonable and informal manner—perhaps through a restorative justice process. If an informal resolution can't be reached, or would be inappropriate, procedures exist for formal dispute resolution.

Code: https://www.dal.ca/dept/university_secretariat/policies/student-life/code-of-student-conduct.html

Diversity and Inclusion – Culture of Respect

Every person at Dalhousie has a right to be respected and safe. We believe inclusiveness is fundamental to education. We stand for equality. Dalhousie is strengthened in our diversity. We are a respectful and inclusive community. We are committed to being a place where everyone feels welcome and supported, which is why our Strategic Direction prioritizes fostering a culture of diversity and inclusiveness

Statement: <http://www.dal.ca/cultureofrespect.html>

Recognition of Mi'kmaq Territory

Dalhousie University would like to acknowledge that the University is on Traditional Mi'kmaq Territory. The Elders in Residence program provides students with access to First Nations elders for guidance, counsel and support. Visit or e-mail the Indigenous Student Centre (1321 Edward St) (elders@dal.ca).

Information: https://www.dal.ca/campus_life/communities/indigenous.html

Important Dates in the Academic Year (including add/drop dates)

https://www.dal.ca/academics/important_dates.html

University Grading Practices

https://www.dal.ca/dept/university_secretariat/policies/academic/grading-practices-policy.html

Missed or Late Academic Requirements due to Student Absence (policy)

https://www.dal.ca/dept/university_secretariat/policies/academic/missed-or-late-academic-requirements-due-to-student-absence.html

Student Resources and Support

Advising

General Advising https://www.dal.ca/campus_life/academic-support/advising.html

Science Program Advisors: <https://www.dal.ca/faculty/science/current-students/academic-advising.html>

Indigenous Student Centre: https://www.dal.ca/campus_life/communities/indigenous.html

Black Students Advising Centre: https://www.dal.ca/campus_life/communities/black-student-advising.html

International Centre: https://www.dal.ca/campus_life/international-centre/current-students.html

Academic supports

Library: <https://libraries.dal.ca/>

Writing Centre: https://www.dal.ca/campus_life/academic-support/writing-and-study-skills.html

Studying for Success: https://www.dal.ca/campus_life/academic-support/study-skills-and-tutoring.html

Copyright Office: <https://libraries.dal.ca/services/copyright-office.html>

Fair Dealing Guidelines <https://libraries.dal.ca/services/copyright-office/fair-dealing.html>

Other supports and services

Student Health & Wellness Centre: https://www.dal.ca/campus_life/health-and-wellness/services-support/student-health-and-wellness.html

Student Advocacy: <https://dsu.ca/dsas>

Ombudsperson: https://www.dal.ca/campus_life/safety-respect/student-rights-and-responsibilities/where-to-get-help/ombudsperson.html

Safety

Biosafety: <https://www.dal.ca/dept/safety/programs-services/biosafety.html>

Chemical Safety: <https://www.dal.ca/dept/safety/programs-services/chemical-safety.html>

Radiation Safety: <https://www.dal.ca/dept/safety/programs-services/radiation-safety.html>

Scent-Free Program: <https://www.dal.ca/dept/safety/programs-services/occupational-safety/scent-free.html>