

Global Sea Level Change - Observations & Models

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GLY6932 (section 1234) / GLY 4930 (section 1557)

Instructor: Alessandro Forte (Williamson Hall, room 222)

Email: forte@ufl.edu (<mailto:forte@ufl.edu>)

Office telephone: (352) 846-1789

Class dates: 1/09/2023 - 4/26/2023

Course location & hours: WM 210, Tue & Thu 10:40am – 12:35pm (periods 4 to 5)

(15 minute break at 11:30 am)

Office Hours: by appointment

Course Objectives:

This course will provide a comprehensive understanding of the causes of global sea level variations across multiple spatial and temporal scales and the geological and instrumental observations that are employed to decipher and interpret these variations. This course will provide the basis for evaluating the degree to which sea level change during the current Anthropocene epoch may be considered anomalous. In this regard, human impacts on sea level change, particularly via modifications to global climate dynamics, will be reviewed in the context of the *IPCC*'s 2019 special report on "The Ocean and Cryosphere in a Changing Climate" and the recently released *IPCC* 6th Assessment Report (2021), focussing on Chapter 9 ("Ocean, cryosphere, and sea level change").

This course will be structured in terms of the following major time scales for changes in sea level:

1. Long term (million-year time scale) sea level variations: involving a consideration of geological data, physical mechanisms such as eustasy and complexity arising from dynamic topography.
2. Ice Age (millennial scale) sea level variations: beginning with a survey of geological observations that relate to the Pleistocene, focussing on the Last Interglacial (LIG) and Last Glacial Maximum (LGM), followed by an introduction to the theory of Glacial Isostatic Adjustment (GIA), in particular the physics of viscoelastic loading and mantle viscosity.
3. Contemporary (decadal time scale) sea level variations: beginning with observational constraints from tide gauge and geodetic data sets, followed by considerations of ice melting, thermal expansion and ocean dynamics with a focus on the global budget for contemporary sea level changes and finally we consider projections for future changes in global sea level in the Anthropocene.

Grading

20% Participation in course and leading discussion of papers.

25% Take home Exam I. Due *March 9*

25% Take home Exam II. Due *April 27*.

30% Final Evaluation (written response to synthesis question). Written portion due *May 2* and oral presentation during final exam week: *May 2* (times *TBA*).

Course Content

Part I:

- Introduction to sea-level changes on different time scales.
- Bathymetry and continental freeboard.
- Observations and mechanisms of 1st order sea level changes (10-100 Myr).
- Sea floor age and sea level.
- Ice age constraints on sea-level change.
- Present-day sea-level change due to ice age dynamics.

Part II

- GIA theory.
- The sea level equation.
- Inferring mantle viscosity.
- Last interglacial sea level.
- 20th century and beyond - *IPCC* Special Report

Materials: no required textbook.

Course website:

The course website is on Canvas through the UF e-learning website. Go to <https://elearning.ufl.edu/> (https://elearning.ufl.edu/) and click on the e-Learning button. The course site will have relevant announcements posted, downloadable materials as announced in class, etc. You are responsible for checking this site for announcements and to see that your grades are being correctly recorded.

Attendance Policy

Attendance and participation in all lectures and labs is expected. Notify one of the instructors ASAP if you have a known schedule conflict. If you miss a class due to illness, contact the instructor as soon as you are able to so to make arrangements for make-up work.

Grading Scale

Point Range (%)	Letter Grade	GPA equivalent
≥ 93.00	A	4.0
90.0 – 92.9	A-	3.67
87.0 – 89.9	B+	3.33
83.0 – 86.9	B	3.0
80.0 – 82.9	B-	2.67
77.0 – 79.9	C+	2.33
73.0 – 76.9	C	2.0
70.0 – 72.9	C-	1.67
67.0 – 69.9	D+	1.33
63.0 – 66.9	D	1.0
60.0 – 62.9	D-	0.67
< 60.0	E	0

Exams:

Everything associated with the class, including lecture material, assigned readings and exercises is fair game on the exams. However, the focus will be on the material presented and discussed in class and on material in assignments.

UF Counseling Services

Resources are available on-campus for students having personal problems or lacking clear career and academic goals. The resources include:

- UF Counseling & Wellness Center, 3190 Radio Rd, 392-1575, psychological and psychiatric services.
- Career Resource Center, Reitz Union, 392-1601, career and job search services.

Many students experience test anxiety and other stress related problems. "A Self Help Guide for Students" is available through the Counseling Center (301 Peabody Hall, 392-1575) and at their web site: <http://www.counsel.ufl.edu/>.

Honesty Policy

All students registered at the University of Florida have agreed to comply with the following statement: "I understand that the University of Florida expects its students to be honest in all their academic work. I agree to adhere to this commitment to academic honesty and understand that my failure to comply with this commitment may result in disciplinary action up to and including expulsion from the University."

In addition, on all work submitted for credit the following pledge is either required or implied: "On my honor I have neither given nor received unauthorized aid in doing this assignment."

If you witness any instances of academic dishonesty in this class, please notify the instructor or contact the Student Honor Court (392-1631) or Cheating Hotline (392-6999). For additional information on Academic Honesty, please refer to the University of Florida Academic Honesty Guidelines at: <http://www.dso.ufl.edu/judicial/procedures/academicguide.html>.

Accommodation for Students with Disabilities

Students who will require a classroom accommodation for a disability must contact the Dean of Students Office of Disability Resources, in Peabody 202 (phone: 352-392-1261). Please see the University of Florida Disability Resources website for more information at: <http://www.dso.ufl.edu/drp/services/>.

It is the policy of the University of Florida that the student, not the instructor, is responsible for arranging accommodations when needed. Once notification is complete, the Dean of Students Office of Disability Resources will work with the instructor to accommodate the student.

Software Use

All faculty, staff and student of the University are required and expected to obey the laws and legal agreements governing software use. Failure to do so can lead to monetary damages and/or criminal penalties for the individual violator. Because such violations are also against University policies and rules, disciplinary action will be taken as appropriate.

Course Summary:

Date	Details	Due
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