

Instructor: Dr. Ganqing Jiang
Office: SEB (Science and Engineering Building), Room 3241
Contact info: Email: Ganqing.Jiang@unlv.edu
Phone: 702-895-2708
Office Hours: Mondays and Wednesdays, 9:00 – 10:00 am or by appointment
Recommended Textbooks: *No Textbook is required. Recommended textbooks and articles include:*
Textbooks:

1. Ruddiman, W.F., 2014, *Earth's Climate: Past and Future* (3rd edition), W.H. Freeman and Company, New York, 464p. ISBN: 9781429255257, AND
2. Kump, L.R., Kasting, J.F., and Crane, R.G., 2013, *The Earth System* (3rd edition), Prentice-Hall, New Jersey, 432p. ISBN: 9780321597793.
3. Any reference book in stable isotopes and sedimentary geochemistry
4. Read papers in *Nature, Science, Geology, and EPSL* related to the topics, some review papers in *Earth Science Reviews, Annu Rev Earth & Planet Sci.*, etc.

Course Description:

This class will focus on four broad topics: (1) the long-term and short-term controls on global climate and ocean systems, (2) Isotope systems (C, O, Sr, N, S, U, Zn) and their applications for Earth Systems Science research; (3) redox indicators for tracking the oxidation state of the ocean-atmosphere system; and (4) geological and geochemical observations across critical transitions in Earth history. Students are expected to gain the knowledge of using multiple geological and geochemical proxies to explain the Earth systems change through time and learn to formulate hypotheses and testing methods for the specific event(s) of interest.

Learning Objectives:

At the end of the class, every student should be able to:

- Understand the major controlling factors on short- and long-term climate changes in Earth history.
 - Apply concepts and mass balance calculations of carbon, oxygen, sulfur, strontium and other isotopes to interpret earth systems change across critical transitions.
 - Use common redox indicators to interpret the major oxidation events and mass extinctions.
 - Integrate physical and geochemical observations to formulate hypothesis and testing methods for the specific events of interest.
-

Class Format:

Lectures – This class will include lectures and student presentations. Lectures will be given in the first half of the semester to introduce the isotope systems and to summarize the problems, hypotheses, and questions related to critical events/stages in Earth history.

Discussions – Each student will lead the discussions of a specific topic related to his/her research directions for a week (two lectures). The student who is in charge of the topic will give a presentation and lead the discussion. Students who are not giving the presentation that week will read the papers and write a critique to answer the questions posted on the web. The student in charge of the discussion should choose the most important papers including contrasting ideas in that field (will provide a suggested reference list for each discussion topic, but you can choose the most important ones based on your evaluation!).

Grading:

- 70% Presentations, writing assignments and participation in class-room discussions (critiques)
30% A working proposal and presentation on a topic that best fits your research interests. The proposal needs to include (1) the problems, (2) summary of existing geological and geochemical observations, (3) testing hypothesis and predictions, and (4) testing methods.

Lecture Schedule: The following schedule is tentative; adjustments to the schedule of topics and reading assignments may be made in accordance with the progress in the classroom. Updated syllabus and lecture notes will be provided in the class website.

Week	Date	Topic	
1	(M)	Jan. 21	<i>Martin Luther King Jr. Day recess, No class</i>
	(W)	Jan. 23	Earth Systems Change: Long-term and short-term controls
2	(M)	Jan. 28	Carbon isotopes and applications
	(W)	Jan. 30	Discussion: Carbon isotope mass balance
3	(M)	Feb. 4	Critical transitions linked to the perturbation of the global carbon cycle [I]
	(W)	Feb. 6	Discussion: The Lomagundi $\delta^{13}\text{C}$ excursion
4	(M)	Feb. 11	Critical transitions linked to the perturbation of the global carbon cycle [II]
	(W)	Feb. 13	Discussion: The snowball Earth
5	(M)	Feb. 18	<i>President's Day Recess, No class</i>
	(W)	Feb. 20	Strontium (Sr) and Osmium (Os) isotopes and applications
6	(M)	Feb. 25	Discussion: Sr and Os isotopes and the rise of the Himalaya
	(W)	Feb. 27	Sulfur isotopes and applications
7	(M)	Mar. 4	Discussion: sulfur isotope across the K-O $\delta^{13}\text{C}$ excursion
	(W)	Mar. 6	Redox indicators I: Iron speciation and trace elements
8	(M)	Mar. 11	Discussion: Iron speciation and trace elements
	(W)	Mar. 13	Redox indicators II: Rare earth elements (REEs)
9	<i>March 18 – 22, Spring Break, No class</i>		
10	(M)	Mar. 25	Discussion: REEs through time
	(W)	Mar. 27	Redox indicators III: Uranium and Zinc isotopes
11	(M)	Apr. 1	Discussion: U isotopes across major events
	(W)	Apr. 3	Discussion: Zn isotopes across the P-T boundary
12	(M)	Apr. 8	<i>Summary: Earth Systems History – Major stages and events</i>
	(W)	Apr. 10	Discussion T1: The Great Oxidation Event (GOE)
13	(M)	Apr. 15	Discussion T2: The Boring Billion
	(W)	Apr. 17	Discussion T3: The late Proterozoic oxidation
14	(M)	Apr. 22	Mass extinction events
	(W)	Apr. 24	Discussion T4: End-Permian mass extinction and earth systems change
15	(M)	Apr. 29	Discussion T5: Cretaceous oceanic anoxic events
	(W)	May 1	Discussion T6: The K/T boundary mass extinction
16	(M)	May 6	Discussion T7: Paleocene-Eocene Thermo Maximum (PETM)
	(W)	May 8	Project writing practice
17	(W)	May 13	<i>Final Project report due</i>

Academic Misconduct—Academic integrity is a legitimate concern for every member of the campus community; all share in upholding the fundamental values of honesty, trust, respect, fairness, responsibility, and professionalism. By choosing to join the UNLV community, students accept the expectations of the Student Academic Misconduct Policy and are encouraged when faced with choices to always take the ethical path. Students enrolling at UNLV assume the obligation to conduct themselves in a manner compatible with UNLV's function as an educational institution. An example of academic misconduct is plagiarism. Plagiarism is using the words or ideas of another, from the Internet or any source, without proper citation of the sources. See the Student Academic Misconduct Policy (approved December 9, 2005) located at: <https://www.unlv.edu/studentconduct/student-conduct>.

Classroom Conduct—Students have a responsibility to conduct themselves in class and in the libraries in ways that do not interfere with the rights of other students to learn or of instructors to teach. Use of electronic devices such as pagers, cellular phones, or recording devices, or potentially disruptive devices or activities, are permitted only with the prior explicit consent of the instructor. The instructor may rescind permission at any time during the class. If a student does not comply with established requirements or obstructs the functioning of the class, the instructor may initiate an administrative drop.

Copyright—The University requires all members of the University Community to familiarize themselves with and to follow copyright and fair use requirements. You are individually and solely responsible for violations of copyright and fair use laws. The university will neither protect nor defend you, nor assume any responsibility for employee or student violations of fair use laws. Violations of copyright laws could subject you to federal and state civil penalties and criminal liability, as well as disciplinary action under University policies. Additional information can be found at: <http://www.unlv.edu/provost/copyright>.

Disability Resource Center (DRC)—The UNLV Disability Resource Center (SSC-A 143, <http://drc.unlv.edu/>; 702-895- 0866) provides resources for students with disabilities. If you feel that you have a disability, please make an appointment with a Disabilities Specialist at the DRC to discuss what options may be available to you. If you are registered with the UNLV Disability Resource Center, bring your Academic Accommodation Plan from the DRC to the instructor during office hours so that you may work together to develop strategies for implementing the accommodations to meet both your needs and the requirements of the course. Any information you provide is private and will be treated as such. To maintain the confidentiality of your request, please do not approach the instructor in front of others to discuss your accommodation needs.

Final Examinations—The University requires that final exams given at the end of a course occur at the time and on the day specified in the final exam schedule. The final exam date and location are listed in the Syllabus. See the schedule at: <http://www.unlv.edu/registrar/calendars>.

Incomplete Grades—The grade of “I”—Incomplete—can be granted when a student has satisfactorily completed three-fourths of course work for that semester/session but for reason(s) beyond the student's control, and acceptable to the instructor, cannot complete the last part of the course, and the instructor believes that the student can finish the course without repeating it. The incomplete work must be made up before the end of the following regular semester for undergraduate courses. Graduate students receiving “I” grades in 500-, 600-, or 700-level courses have up to one calendar year to complete the work, at the discretion of the instructor. If course requirements are not completed within the time indicated, a grade of “F” will be recorded and the GPA will be adjusted accordingly. Students who are fulfilling an Incomplete do not register for the course but make individual arrangements with the instructor who assigned the “I” grade.

Library Resources—Librarians are available to consult with students on research needs, including developing research topics, finding information, and evaluating sources. To make an appointment with a subject expert for this class, please visit the Libraries' Research Consultation website: <http://guides.library.unlv.edu/appointments/librarian>. You can also ask questions via chat and text message at <http://ask.library.unlv.edu/>.

Rebelmail—By policy, faculty and staff should email students' Rebelmail accounts only. Rebelmail is UNLV's official email system for students. As such, it is a primary way students receive official university communications such as information about deadlines, major campus events, and announcements. All UNLV students receive a Rebelmail account after they have been admitted to the university. **This class is not using WebCampus!**

Missed Classwork—Any student missing class quizzes, examinations, or any other class or lab work because of observance of religious holidays shall be given an opportunity during that semester to make up missed work. The makeup will apply to the religious holiday absence only. It shall be the responsibility of the student to notify the instructor within the first 14 calendar days of the course for fall and spring courses (excepting modular courses), or within the first 7 calendar days of the course for summer and modular courses, of his or her intention to participate

in religious holidays which do not fall on state holidays or periods of class recess. For additional information, please visit: <http://catalog.unlv.edu/content.php?catoid=6&navoid=531>.

In accordance with the UNLV Faculty Senate-approved policy regarding class time and assignments missed, students who represent UNLV in any official extracurricular activity shall also have the opportunity to make up assignments, provided that the student provides official written notification to the instructor no less than one week prior to the missed class(es).

The spirit and intent of the policy is to offer fair and equitable opportunities to all students, including those representing the university in extracurricular activities. Instructors should consider, for example, that in courses which offer a “drop one” option for the lowest assignment, quiz, or exam, assigning the student a grade of zero for an excused absence for extracurricular activity is both contrary to the intent of the Faculty Senate's policy, and an infringement on the student's right to complete all work and fairly earn her or his grade in the course.

This policy shall not apply in the event that completing the assignment or administering the examination at an alternate time would impose an undue hardship on the instructor or the university that could reasonably have been avoided. There should be a good faith effort by both faculty and student to come to a reasonable resolution. When disagreements regarding this policy do arise, they can be appealed to the department chair/unit director, college/school dean, and/or the Faculty Senate Academic Standards Committee.

For purposes of definition, extracurricular activities may include, but are not limited to: fine arts activities, competitive intercollegiate athletics, science and engineering competitions, liberal arts competitions, academic recruitment activities, and any other event or activity sanctioned by a college/school dean, and/or the Executive Vice President and Provost.

Transparency in Learning and Teaching—The University encourages students to use a transparency template to discuss with their instructors how assignments and course activities benefit student success: https://www.unlv.edu/sites/default/files/page_files/27/TILT-Framework-Students.pdf.

Tutoring and Coaching—The Academic Success Center (ASC) provides tutoring, academic success coaching and other academic assistance for all UNLV undergraduate students. For information regarding tutoring subjects, tutoring times, and other ASC programs and services, visit <http://www.unlv.edu/asc> or call 702-895-3177. The ASC building is located across from the Student Services Complex (SSC). Academic success coaching is located on the second floor of SSC A (ASC Coaching Spot). Drop-in tutoring is located on the second floor of the Lied Library and College of Engineering TBE second floor.

UNLV Writing Center—One-on-one or small group assistance with writing is available free of charge to UNLV students at the Writing Center, located in CDC-3-301. Although walk-in consultations are sometimes available, students with appointments will receive priority assistance. Appointments may be made in person or by calling 702-895-3908. The student's Rebel ID Card, a copy of the assignment (if possible), and two copies of any writing to be reviewed are requested for the consultation. More information can be found at: <http://writingcenter.unlv.edu/>.