

# Marine Environment (MASC 101; GEOL 103) Spring 2013

T-Th 12:30-1:45

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Office hours: T-Th 11:00-12:15 pm (or by appointment)

TA: Ian Kroll and Caitlin White

Text: Introduction to Ocean Sciences, Douglas Segar

Websites: course: <http://blackboard.unc.edu>

## COURSE OBJECTIVES

- Provide an introduction to the basic principles of oceanography
- Instill an appreciation of how the ocean influences our lives
  - Introduce topics of current oceanographic research
- Illustrate how the ocean, the land, and the atmosphere comprise an integrated system

## COURSE EVALUATION

Requirement	Relative Weight Toward Final Grade (%)
Exam #1	*
Exam #2	*
Exam #3	*
Exam #4	25
Research Paper	25
Attendance	

The first three tests together will count for 50% of the final grade. The lowest score among these exams is dropped. This means that you can skip one of the three exams and still get a passing grade. This policy is intended to accommodate emergencies that may arise during the semester. However, you should not skip an exam just because you did not feel like taking it.

<u>Date</u>	<u>Subject</u>	<u>Ch</u>	<u>pages</u>
Jan 10	Class layout. Motivation and background	1,2,18	10-12,532-545
Jan 15	Sea floor spreading and plate tectonics: concepts and supporting facts	4(68-78), 5(all chapter)	
Jan 17	Ocean basin evolution and continental margins	3	78-103
Jan 22	Coastal processes, sea level change and stratigraphy	13	336-369
Jan 24	Sediments	8, CC4	
Jan 29	<b>1<sup>st</sup> Exam</b>		
Jan 31	Chemical and physical properties of sea water	7, CC6	148-159
Feb 5	Earth's heat budget and atmospheric circulation	9, CC5	198-216
Feb 7	Surface boundary layer and wind-driven currents	10, CC11-12	238-261
Feb 12	Hydrography and the thermohaline circulation	10	261-274
Feb 14	Tides and waves	911,12	

**Topic and references for paper due (must include at least 3 references)**

Feb 19	Upwelling	Lecture Notes	
Feb 21	<b>2<sup>nd</sup> exam</b>		
Feb 26	More seawater properties: why is the sea salty?	6, CC8	
Feb 28	Residence times and hydrothermal Vents	6,15	517-522
Mar 5	Biogeochemical cycles in the ocean – carbon	14	387-389
Mar 7	Nutrient cycles, manganese nodules	14	370-385
Mar 19	Global climate change	4,CC9	97-101
Mar 21	<b>3<sup>rd</sup> exam</b>		
Mar 26	Bacterioplankton and the microbial loop	14(375-378,392-398) 15(422-426)	
Mar 28	Secondary production -> succession->behavior	14	398-407
Apr 2	Classifications, sinking vs. swimming	14(382-384), 16(444-419)	
Apr 4	Biology in upwelling systems	15	410-429
Apr 9	Fisheries fluctuations and theories (CC14-16)	16(477-492)	
	<b>Term paper due</b>		
Apr 11	Coastal Benthos	16	444-459
Apr 16	Ecosystems	15	514-522

Apr 18	Ecosystem variability - El Nino, NAO	9	213-223
Apr 23	TBA		
Apr 25	TBA		
TBD	FINAL (4:00 pm) – 50% BO, 50% comprehensive		

## Term Paper

The purpose of the term paper is to:

- Help enhance your ability to write papers.
- Provide you with an opportunity to acquire a more in depth knowledge on a specific oceanographic topic that particularly interests you
- Familiarize you with some literature in the natural sciences
- Provide a means to evaluate your ability to think and synthesize ideas

### SUBJECT

You may choose any topic you wish as long as it focuses on a marine subject. Below you will find a list with topic ideas, but you are free to choose any oceanographic/marine topic that suits your interests. If in doubt, talk with the instructors! **If at all possible, stay away from Sharks and Coral Reef topics. I am getting tired of reading these papers...**

### TYPES OF SCIENTIFIC LITERATURE

The major means of communicating new knowledge in science is through the *primary* literature (i.e., scientific journals). The primary literature contains the results of novel observations and experiments along with the original observer's interpretation of them. Primary literature is usually written assuming that the readers are scientists who are familiar with the field. Undergraduate students often have a difficult time comprehending the primary literature.

*Secondary* sources are those that summarize, integrate, and interpret the original research of many investigators. These sources generally consist of "review articles" which contain references to a number of primary sources and are thus good introductions to a subject for someone new to the field. Review articles are published in journals that also publish primary literature (e.g., *Science*), journals that specialize in reviews (e.g., *Annual Reviews of Earth and Planetary Sciences*), and scientific magazines (e.g., *Scientific American*).

Textbooks and encyclopedias are sometimes referred to as *tertiary* sources. They cover general aspects of a wide field, usually with little direct reference to primary literature.

Do not rely on articles from the popular media (e.g., *Newsweek*, *Time*, *CNN*, etc.) or from the internet (e.g., *Wikipedia*), as information from these sources is sometimes scientifically inaccurate. Certain websites (maintained by NSF, or by research groups within a university) may be helpful as a starting place, but you should use printed media (i.e., peer reviewed) as your references.

## REFERENCES USED IN THE TERM PAPER

The paper must be largely based on secondary (or primary, if you feel up to it) literature. Because of the difficulty of understanding primary literature, secondary sources are a good place to start your search for tantalizing topics or to acquire basic information about a selected topic.

The research paper must be based on at least five references, three of which must be from primary or secondary literature. Only cite those references that you have read and incorporated—do not pad the References section. Citing a paper implies that you have read the paper and understood it sufficiently well to explain its main concepts.

## GUIDELINES

- 1) Choose a topic (feel free to discuss it with the instructors before you invest a large amount of time).
- 2) On February 14<sup>th</sup>, title and reference lists (typed) are due. Prepare a list of at least five references that you plan to use. Three of the references must be considered primary/secondary literature. It is important that the references be current (**at least two must have been published within the last five years**).
- 3) The paper is **due** on April 9<sup>th</sup>. Email it to [masc401.final.draft@gmail.com](mailto:masc401.final.draft@gmail.com). It must conform to the Text Requirements described below. Due means that the paper has to be received by the end of the day (midnight). Unlike auctions on Ebay, it is **not** a good idea to wait until a few seconds before the deadline to hit the submit button. **All deadlines have to be met for the paper to be counted toward the final grade. Plan accordingly, and don't forget that life is full of unknowns.**

## GRADING

The term paper constitute 25% of the overall course grade. The paper will be graded on the basis of organization, clarity, scientific content, originality, and relevance of references.

## NOTE

Scientific writing, like all writing, is about communication. If it can't be read, it's worthless. Thus, clarity of writing, correct grammar and spelling, and logical organization are important and will determine your grade. A sloppy paper reflects poorly on you and will bias the person reading and grading the paper.

## SUMMARY

- Adhere to the Text Requirements
- Organize your ideas
- Tell a story
- Make a point

## TEXT REQUIREMENTS

1. *Style.* The report must be submitted on standard paper (8.5 x 11 in.) and the page margins should be at least one inch. The paper must be double spaced. This includes text, references, figure captions, and quoted material. Each page should be numbered (page numbering begins with the title page).

2. *Length.* Text length (**not** including the abstract, figures, tables, and references) should be 4-5 pages, not counting the title page, abstract and references.

3. *Format.* The report should consist of the following sections in this order:

- Title page including your name, year, and major
- Table of Contents (include all sections and subsections)
- Abstract
- Introduction
- Discussion (this section can be divided into subsections)
- Conclusions
- References

3. *Abstract.* An abstract is required for each paper. Abstracts should be typed on a separate sheet at the front of the paper.

4. *References.* All statements based on published work must be cited in the text. For one- or two-authored papers, include the names of both authors followed by the date (e.g., “Smith and Jones (1994) showed that  $^{14}\text{C}$  is an effective tool for dating water masses.”) For papers with three or more authors, include the name of the first author followed by “et al.” and the date (e.g., “Primary productivity in the Sargasso Sea is limited by nitrogen (Brown et al., 1993).”) If an idea is attributed to more than one paper, separate the references by a semicolon (e.g., “Major El Niño events occur about once every decade (Green, 1990; James and Miller, 1992; Eliot et al., 1993).” All references must be listed at the end of the paper beginning on a separate sheet of paper, using the format illustrated by the following examples:

*Journal article:* Ahrens L. H., Mathews R. T., and Simple W. M. (1992) The use of diagenetic models to evaluate pore water chemistry. *Geochemica et Cosmochimica Acta* **56**, 112-124.

*Book:* Henderson P. (1988) *Chemical Oceanography*. Pergamon Press.

*Chapter in a book:* Menard H. W. and Williams P. T. (1965) Sea floor relief and mantle convection. In *Physics and Chemistry of the Earth* (ed. B. R. Merlot), pp. 315-364. Pergamon Press.

Notice that there are no commas separating the authors' last names and initials. Papers in the References sectioned must be listed in alphabetical order according to the first authors last name. When referring to papers with the same author, some of which are multi-authored, the sequence should be:

- a) Single author, chronological
- b) Two authors, alphabetical on second author
- c) Three or more authors (cited as "et al." in text), chronological

For example:

Smith A. B. (1983)

Smith A. B. (1989)

Smith A. B. and Brown E. F. (1984)

Smith A. B. and Jones C. D. (1980)

Smith A. B., Jones C. D., and Brown E. F. (1986)

Smith A. B., Brown E. F., and Jones C. D. (1989)

6. *Subheadings*. It is helpful to the reader to have the Discussion section divided into subsections. The first level of subheadings should be flush-left, bold. If necessary, the second level should be flush left italic.

7. *Figures*. Figures should be integrated into the text and have an appropriate caption. It may be necessary to modify or customize figures copied the literature to make them appropriate for your research paper. All components of each figure should be relevant to the text. Figures and captions must be numbered correctly. Within the text, figures are referred to in the abbreviated form as, for example, Fig. 1; only when beginning a sentence is the unabbreviated word (i.e., Figure 1) used. Multiple part figures are designated with lower case letters (e.g., a, b, c).

8. *Tables*. Tables should be integrated into the text and have an appropriate title. As with figures, the tables in your paper should not contain any information that is extraneous to your paper. All tables must be numbered.

## JOURNALS THAT CONTAIN PAPERS PERTAINING TO MARINE SCIENCES

Most of these journals are available at UNC-Chapel Hill.  
Check the on-line catalogue to determine their location.

### SOURCES OF SECONDARY LITERATURE

*Advances in Ecological Research*

*Advances in Marine Biology*

*Advances in Microbial Ecology*

*American Scientist*

*Audubon*

*Annual Reviews in Earth and Planetary Sciences*

*Earth*

*Natural History*

*Nature*

*Oceanography*

*Oceanography and Marine Biology: Annual Review*

*Oceans*

*Oceanus*

*Progress in Oceanography*

*Science*

*Scientific American*

*Sea Frontiers*

*Smithsonian*

### SOURCES OF PRIMARY LITERATURE

*American Association of Petroleum Geologists Bulletin*

*American Fisheries Society, Transactions of*

*Applied and Environmental Microbiology*  
*Atoll Research Bulletin*  
*Aquaculture*  
*Biological Bulletin*  
*Biological Oceanography*  
*BioScience*  
*Botanica Marina*  
*Bulletin of Marine Science*  
*Canadian Journal of Fisheries and Aquatic Sciences*  
*Continental Shelf Research*  
*Coral Reefs*  
*Deep-Sea Research*  
*Earth and Planetary Science Letters*

(continued on next page)

*Earth Science*  
*Ecological Monographs*  
*Ecology*  
*Estuaries*  
*Estuarine and Coastal Marine Science*  
*Fishery Bulletin (U.S. National Marine Fisheries Service)*  
*Geological Society of America Bulletin*  
*Geology*  
*Geochimica et Cosmochimica Acta*  
*Geomarine Letters*  
*Geotectonics*

*Global Biogeochemical Cycles*  
*Journal of Coastal Research*  
*Journal of Experimental Marine Biology and Ecology*  
*Journal of Geophysical Research*  
*Journal of Marine Research*  
*Journal of Physical Oceanography*  
*Journal of Plankton Research*  
*Journal of Sedimentary Petrology*  
*Limnology and Oceanography*  
*Marine Biology*  
*Marine Chemistry*  
*Marine Ecology — Progress Series*  
*Marine Geology*  
*Marine Pollution Bulletin*  
*Microbial Ecology*  
*Nature*  
*Netherlands Journal of Sea Research*  
*Ocean and Shoreline Management*  
*Ocean Optics*  
*Oecologia*  
*Oikos*  
*Palaaios*  
*Paleogeography, Paleoclimatology, Paleoecology*  
*Polar Biology*  
*Science*  
*Sedimentology*

## POTENTIAL TOPICS FOR RESEARCH REPORT

(use your imagination; this is only a starting point)

- **a specific topic in the area of hydrothermal vent ecosystems**
- **physiology of Riftia (gutless worms w/ chemosynthetic symbiotic bacteria, found in hydrothermal systems)**
- **Specific topic related to a selected fishery (e.g., menhaden, whaling, California anchovies, tuna, Maine lobster, etc.)**
- **trace metal uptake/effects on phytoplankton productivity (iron or Cu are two possibilities)**
- **Uncertainties in estimates of oceanic uptake of greenhouse gases**
- **Chemical and biological roles of estuaries**
- **Barrier island dynamics: a specific focus on erosion, effects of hurricanes, etc.**
- **El Niño: some aspect of physics, oceanography, and environmental consequences**
- **Nutrient cycling in the ocean (select a particular nutrient)**
- **Oceanography of the Antarctic region (select a particular topic)**
- **Effects of a selected pollutant in the marine environment**
- **Factors affecting the distribution and abundance of a specific species of pelagic fish**
- **Trace metal cycling in the ocean (pick a specific metal; Zn, Cu, Fe, Mn are all possibilities)**
- **paleoclimate estimates based on fossil record or isotopic evidence**
- **the closing of Georges Banks as a fishing ground: problems of overfishing and fisheries management**
- **Limiting factors in phytoplankton primary productivity**

- **Melting of the West Antarctic Icesheet and its implications**
- **Thinning of Arctic icesheet over the last several decades: potential implications**
- **stromatolites (ancient and recent lithified microbial mats).**
- **Satellite oceanography**
- **Coastal erosion**
- **Hurricanes**
- **Tsunamis**
- **Global ocean circulation**
- **Plankton interaction with internal waves and fronts**
- **Environmental impacts of touristic activities (e.g., cruise ships)**