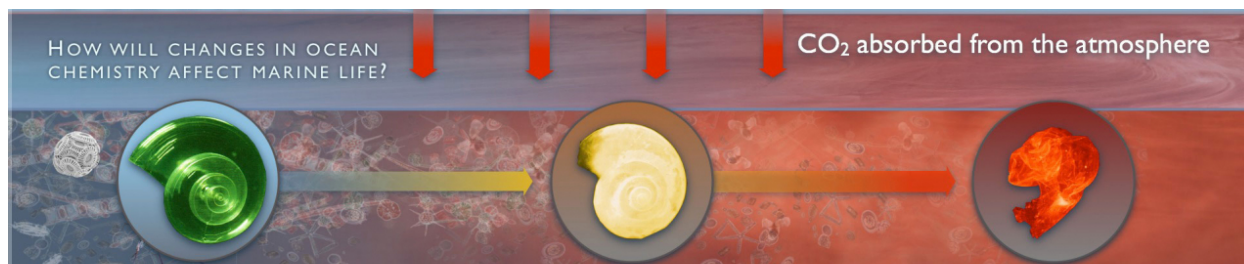


Ocean and Coastal Acidification (1 credit)

Fall 2021, Thursdays, 1230—150 pm, Morton Hall 3, MSCI 398/ENSP 249

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Introduction:

Ocean and Coastal Acidification in marine ecosystems has been exacerbated by human activities since the industrial revolution, affecting marine organisms and related industries that depend on those organisms (e.g., shellfish aquaculture industry). Observations and models are commonly used to study the issue, providing insights for coastal managers and policy makers. In this course we will learn physical and biogeochemical drivers impacting acidification from the open ocean to coastal regions. We will explore the effects of acidification on marine organisms and human society by critiquing scientific papers. Designed for students with no background in computational techniques, students will be introduced to visualize marine environmental datasets and model products. Expectations will include readings, participation in discussions and activities, and a small final project that focuses on communicating acidification to the general public.

Goals of the course, *participants will be able to:*

- Describe the fundamental components of seawater carbonate chemistry.
- Explain how physical and biogeochemical factors could impact acidification from the open ocean to coastal ecosystems.
- Critique ocean and coastal acidification literature.
- Visualize acidification-related water quality parameters using a data viewer.
- Translate and communicate the concepts, causes and concerns of acidification to the general public.

Date	Topic
Sept 02	Introduction, what is acidification? <i>Class introductions and discuss the syllabus.</i> Class activity: We will do a gallery walk to gain a general understanding of common topics related to acidification.
Sept 09	Water quality and climate change <i>You will learn some of the most prevalent water quality issues in the world's ocean (including acidification), and we will discuss how climate change could impact these issues.</i> Reading due for class: IPCC, 2021, Summary for policymakers (page 5-18, before B.1); News article: how climate change impacts our water (https://news.climate.columbia.edu/2019/09/23/climate-change-impacts-water/). Class activity: Modeling the Carbon Cycle in the Anthropocene

Sept 16	<p>The seawater carbonate system, part 1 <i>You will learn the fundamentals of seawater carbonate chemistry related to acidification. A seminar style paper discussion will occur to discuss some classic topics related to acidification.</i> Reading due for class: Doney et al., 2009.</p>
Sept 23	<p>The seawater carbonate system, part 2 <i>We will dive deeper into seawater carbonate chemistry, and discuss the current knowledge of acidification and its impact on marine ecosystem and human society in general.</i> Reading due for class: two news articles Class activity: Using a user-friendly seawater carbon calculator (CO2calc) to investigate the impact of physical and biogeochemical processes on seawater carbonate system.</p>
Sept 30	<p>Ocean and coastal acidification in the news <i>Class discussion. We will discuss how to communicate science to diverse audience and discuss the rubric of final class article.</i> Class activity: generate and share class partner's article as a twitter newsfeed. Assignment: Find a current event article, write a one page summary, and be prepared to discuss in class (30 pts).</p>
Oct 07	<p>Case Study 1: Open ocean and the Great Barrier Reef, mid-semester review of this course <i>Class discussion. Watch portion of "Chasing Coral".</i> Reading due for class: Albright et al. 2016. Mid-semester evaluation.</p>
Oct 14	<p>Case Study 2: Guest speaker 1, Antarctic Ocean and the Pteropods <i>A lecture from the guest speaker and then students will discuss papers.</i> Reading for class: Negrete-García et al. 2019. Class activity: We will do a gallery walk to review important topics in ocean and coastal acidification.</p>
Oct 21	<p>Case Study 3: Arctic Ocean <i>Class discussion. We will discuss the current knowledge of acidification and its impacts on marine organisms in this region.</i> Reading due for class: three news articles. Class activity: 1. Diagram ocean acidification processes; 2. explore environmental changes in the Arctic (Build Your Own Earth, http://www.buildyourownearth.com). Assignment: Submit region of focus for Final Assignment to Instructor.</p>
Oct 28	<p>Case Study 4: Chesapeake Bay, part 1 <i>You will learn the primary drivers of acidification in the Chesapeake Bay. We will discuss the difference between coastal acidification and ocean acidification.</i> Reading due for class: three news articles. Class activity: acidification figure caption activity.</p>
Nov 04	<p>Case Study 4: Chesapeake Bay, part 2 <i>We will explore the potential impacts of acidification on calcifying organisms in the Bay and discuss how to review classmate's article.</i> Reading due for class: three news articles.</p>

	Class activity: students will participate in a carbonate chemistry data analysis activity and then discuss how it may affect oysters. Assignment: Submit article draft to assigned partner and Instructor for peer-review.
Nov 11	Case Study 5: Guest speaker 2, California Upwelling System <i>A lecture from the guest speaker and then students will discuss papers.</i> Reading due for class: Feely et al. 2008. Assignment: Peer-reviewed article returned to classmates.
Nov 18	Case Study 6: Guest speaker 3, Mid-Atlantic Bight <i>A lecture from the guest speaker and then students will discuss readings.</i> Reading due for class: a short video and two news articles. Class activity: using a data viewer (webODV) to visualize water quality data Assignment: Final article submission due.
Nov 25	No class (Thanksgiving)
Dec 02	Class Presentations
Dec 09	Future directions in Acidification <i>A low-stress and enjoyable discussion to celebrate the end of class. We will discuss the future directions in research and technology related to acidification.</i> Assignment: Find a current events article or recent (2020 or 2021) research article and be prepared to share with the class.

Assignments:

The final project of this course will focus on **a plain language article and a class presentation** for introducing acidification conditions in a region of your choice to the general public. Another assignment is to find and critique a newspaper article of your choice on acidification. I will provide grading rubrics for each assignment, so you have a clear understanding of my expectations. Assignments are due at 10:00am.

There will be other informal assessments throughout the semester, including critiquing literature, analyzing data, and actively participating in class activities and discussions. See grading rubrics for participation below.

Grading: 200 pts total for this semester

Newspaper article assignment: 30 pts

Participation (*see rubric*): 70 pts

Plain language article and presentation: 100 pts (= 75pts + 25pts)

This course is graded (round to the nearest whole number). Letter grading scale is as follows:

92.5 ≤ A ≤ 100	72.5 ≤ C < 76.5
89.5 ≤ A- < 92.5	69.5 ≤ C- < 72.5
86.5 ≤ B+ < 89.5	66.5 ≤ D+ < 69.5
82.5 ≤ B < 86.5	62.5 ≤ D < 66.5
79.5 ≤ B- < 82.5	59.5 ≤ D- < 62.5
76.5 ≤ C+ < 79.5	0.0 ≤ F < 59.5

I expect you to come to each class prepared to discuss and contribute your ideas and questions to the topic and papers that have been assigned for that week. I hope you have fun!

Participation Rubric: 70 pts total for semester, 5 pts per class, 14 classes total

An A participation grade includes: 5 pts total

- Present in class that day (1 pt)
- Identifies key points in required readings (1 pt)
- Verbally participates in class discussion (1 pt)
- Thoughtfully responds to questions when called upon (1 pt)
- Actively participates in class activities (1 pt)

A failing participation grade includes:

- Not attending class
- Clearly did not do the reading (i.e., not able to summarize key point of paper)
- Does not verbally participate in class
- Fails to answer questions when called upon
- Does not actively participate in class activities (i.e., shows no sign of engagement)

Your Schedule:

Please let me know during the first week of class, or as soon as possible, if you anticipate missing any classes due to field work, scientific meetings etc. It is your responsibility to make up the material you miss, including (1) writing a short summary of the reading material by following a handout that guides you how to critique a scientific paper, and (2) finishing the class activities.

Office Hours:

Since I am at VIMS most days, I prefer that you set up appointments to talk with me before or after class. Let me know and we'll arrange a time and place to meet. I am also open to one-to-one zoom meetings if you want to or need to talk about anything.

Honor code:

This course abides by the William & Mary Honor Code. For more information, please visit <https://www.wm.edu/offices/deanofstudents/services/communityvalues/honorcodeandcouncils/honorcode/index.php>

Accessibility:

William & Mary accommodates students with disabilities in accordance with federal laws and university policy. Any student who feels they may need an accommodation based on the impact of a learning, psychiatric, physical, or chronic health diagnosis should contact Student Accessibility Services staff at 757-221-2512 or at sas@wm.edu to determine if accommodations are warranted and to obtain an official letter of accommodation. For more information, please visit www.wm.edu/sas.

Diversity and Inclusion:

This class is welcoming to all students, regardless of race, ethnicity, nationality, culture, religion, political beliefs, gender, gender identity/expression, sexual orientation, age, disability, or marital, parental or veteran status. All people have the right to be addressed and referred to in accordance with their personal identity. In this class, you will have the chance to indicate the name that you prefer to be called and to identify pronouns with which you would like to be addressed. All discussions will be considerate and respectful. If you have any questions or concerns, please feel welcome to come speak with me.

Mental and Physical Well Being:

William & Mary recognizes that students have many different responsibilities and can face challenges that make learning difficult. There are many resources available at W&M to help students. Asking for help is a sign of courage and strength. Please reach out to me if you or someone you know are facing problems inside or outside the classroom, and I will do my best to guide you to appropriate resources on campus. Those resources include:

--For psychological/emotional stress, there is the W&M Counseling Center (757-221-362), 240 Gooch Dr. 2nd floor, <https://www.wm.edu/offices/wellness/counselingcenter/>. Services are free and confidential.

--For physical/medical concerns, there is the W&M Health Center (757-221-4386), 240 Gooch Drive, <https://www.wm.edu/offices/wellness/healthcenter/>

--For other additional support or resources, please contact the Dean of Students by submitting a care report (757-221-2510) or by email

at deanofstudents@wm.edu <https://www.wm.edu/offices/deanofstudents/services/caresupportservices/index.php>

About Covid-19:

William & Mary has returned to normal classroom capacities, with no social distancing requirement. Masks are mandatory through September in indoor shared spaces. Indoor mask requirements will be re-evaluated at the end of September based on available public health data at that time. Monitor for symptoms of COVID-19. Do not attend class if you are symptomatic, including if you record a fever 100.4°F or above. I recognize that conditions are changing, and I will be flexible with course delivery. For more information, please visit https://www.wm.edu/about/administration/emergency/current_issues/coronavirus/response-team-updates/index.php#aug24