Graduate Seminar in Geography: IPCC Climate Modeling
GEOG G-615

Department of Geography
Indiana University
Spring 2022 Syllabus

Lecture: Monday and Wednesday 1:15-2:30 PM
Lecture Location: SB 017

Instructor: Dr. Natasha MacBean
Office hours: Monday and Wednesday 10:00-11:00 AM on Zoom (or by appointment). Please send an email for the Zoom link.
Email: nmacbean@iu.edu
Office: Student Building 204

Classroom Mask Requirement

Indiana University is requiring that masks be worn indoors on campus, including in classrooms. This requirement will be in place until there is an officially announced change in policy. Please observe this requirement conscientiously as it is intended for the safety of everyone in the community.

Any students who come to class without a mask will be asked to mask up. If any students refuse to wear a mask in class, they will be <u>dismissed from the classroom on that day</u> and will be expected to leave the room and the building. <u>On the third incident, the Chair of the Department will be notified, who will in turn notify the Dean of Students Office.</u>

In most cases, I will respond to email queries within 12 hours. Please exchange contact information with at least two other students so that if you have a burning question they may assist you if I am unavailable. If you have a lengthy question, it is best to see me after class or in office hours. **Note that I am not allowed to discuss grades over email.**

About the Course

In this seminar class we will discuss results from the latest International Panel on Climate Change 6th Assessment Report (IPCC AR6) and papers related to climate change impacts on terrestrial vegetation and carbon cycling (i.e., carbon-climate feedbacks), with a particular view on exploring results from the earth system model (ESMs) projections that come from the latest coupled climate model intercomparison project (CMIP6). We will read chapters from the IPCC report itself, as well as other literature on ESMs and CMIP6 model simulations (focusing on the terrestrial carbon cycle and carbon-climate feedbacks)). We will cover topics such as impacts of drought, wildfires and disturbance, heavy rainfall, permafrost thawing, CO_2 fertilization and

vegetation greening, regional differences in the land C sink, future C cycle projections, remaining carbon budgets and their relevance to climate policy. Please see the schedule and Canvas course page for reading lists. Note that the style of this class will be similar to a journal club format, with all students participating in classroom discussion to ask and discuss questions or comments raised from the readings.

Readings

The reading list for this course is given in the course schedule below. Pdfs of all readings or recordings of presentations will be provided on Canvas.

Course Goals

Students who engage in this class as active learners and participants will gain a strong knowledge of climate change predictions from the latest IPCC (AR6) Working Group 1 report, particularly related to impacts to, and feedbacks from, the terrestrial biosphere/carbon cycle Students will also learn about the earth system models used make the future emissions scenarios and climate projections, respectively, and will be able to critically assess the advantages and limitations of those models. Finally, students will learn have ample opportunity to develop their critical literature review skills so that they may be better able to assess the climate change literature in the future.

Learning outcomes
- Understanding and deep knowledge of the latest IPCC AR6 report in relation to carbon-climate feedbacks.
- Deep understanding of processes contributing to the land C sink, impacts of climate change on terrestrial ecosystems and the carbon cycle, and future C cycle projections.
- Understanding of the relevance of carbon-climate feedbacks for climate mitigation policy.
- Understanding of the Coupled Model Intercomparison Project (CMIP6)
- Understanding of earth system models and their advantages and limitations
- Understanding of the emissions scenarios used in the IPCC future climate projections

Course Format and Grading

Reading assignments and in-class participation: The majority of the grade for this course based on submitting a ½ to 1 page overview of the chapter or paper we are reading for a given class (based on questions set for that particular paper) plus participation in the discussion during the class. The reading assignments will be due by 9am the day of class (i.e., before class).

Final paper: Students will submit a final paper on a specific topic related to climate change impacts on terrestrial ecosystems or carbon-climate feedbacks. The paper will either be a 2-3 page literature review format, or a 2-3 page article or webpage providing an overview of the topic for a public audience. Students can choose the format depending on which is the most useful for their research and/or planned career path.

Reading assignments and in-class participation*	80%
Final paper	20%

Lowest grade will be dropped

Grading Scale

97% - 100%	A+	77% - < 80%	C+
93% - < 97%	A	73% - < 77%	C
90% - < 93%	A-	70% - < 73%	C-
87% - < 90%	B+	67% - < 70%	D+
83% - < 87%	B	63% - < 67%	D
80% - < 83%	B-	60% - < 63%	D-
		< 60%	F

Grade Dissemination:
All grades will be posted on Canvas. Please make sure to track your own grades, as mistakes can occasionally occur. If you have received a grade by mistake, please see one of us for a correction in Canvas.

Course Policies & Services

Reading assignments:

The ½ to 1 page overview of the reading for each class will be due by 9am the day the topic is covered in class (i.e., before the class). Your score will be deducted 25% for each day that you are late. Due dates for each reading assignment will be listed on the course homepage.

In-class sessions:

In each class we will discuss the reading for that class. Students are expected to actively participate in these discussions much in the way they would in a journal club. Students will be expected to offer a critical assessment of the reading, including the main results of the paper or report chapter, whether the analysis adequately addresses the objectives of the study, whether

the conclusions are adequately supported by the analysis and results, and any caveats or limitations of the study. Students are strongly encouraged to raise any questions they have about the reading as well as to discuss other students' questions in cordial and respectful manner.

Class Etiquette

All comments and discussions should be respectful of the instructor and fellow students; disagreements are fine, but personal attacks are not. Please do not interrupt the instructor or fellow students. Wait patiently for your turn to speak and be aware if others have already been waiting to speak before you. Slightly raising your hand can help everyone know who would like to speak and in what order. More details are provided in the "Civility" section below.

Canvas:

Class announcements, materials, and updated information will be distributed via the course website on Canvas. You may need to adjust your settings to ensure you receive timely communications from this class. Check that your notifications are set appropriately by going to Canvas.

Course Policies: GRADES

Late Work and Missed Activities: The word of the semester is "flexible" and therefore rather than not accepting late work, all late work will be accepted with a 25% per day penalty. After four late days, your group's grade will be 0%. Class activities are the largest portion of your grade in the course. <u>If you have a university-excused reason (e.g., military duty, illness, positive covid test/isolation, religious observation, family emergency) for missing an assignment or turning it in late, notify both me and your AI *in advance or by the week we do the assignment in class,* and make arrangements to makeup missed activities.</u> You will then complete the work by yourself, instead of in your group, and you will have *one extra week* after the assignment is due to complete the work on your own. You must then submit your assignment directly to Seth Adelsberger (your AI). <u>However, you will not receive credit for the assignment if you do not notify us with the reason by the assignment deadline.</u> Basically, let us know if you are having issues as soon as possible. **Extra Credit:** There may also be additional extra credit opportunities during class. Announcements will be made during class. These extra credit points will be added before the final grade is submitted to IU. Discussion regarding Covid-19 is below.

Participation: Active participation in class discussions is expected and will be part of your grade for each class.

Academic Integrity: As a student at IU, you are expected to adhere to the standards contained in the *Code of Student Rights, Responsibilities, and Conduct* (the *Code*). Academic misconduct is defined as any activity that tends to undermine the academic integrity of the institution. Academic integrity violations include: cheating, fabrication, plagiarism, interference, violation of course rules, and facilitating academic dishonesty. When you

submit an assignment with your name on it, you are signifying that the work contained therein is yours, unless otherwise cited or referenced. Any ideas or materials taken from another source for either written or oral use must be fully acknowledged. In addition, posting questions from quizzes/exams or assignments or downloading answers from online sources is considered academic misconduct. All suspected violations of the *Code* will be reported to the Dean of Students (Office of Student Conduct) and handled according to University policies. Sanctions for academic misconduct in this course may include a failing grade on the assignment, a reduction in your final course grade, or a failing grade in the course, among other possibilities. If you are unsure about the expectations for completing an assignment or taking a test or exam, be sure to seek clarification from your instructor in advance. Please also see [this website](#) for the IU College of Arts and Science's policies on Academic Integrity.

Note Selling: Various commercial services have approached students regarding selling class notes/study guides to their classmates. Selling the instructor's notes/study guides or uploading course assignments to these sites in exchange for access to materials for other courses is not permitted. Violations of this policy will be reported to the Dean of Students (Office of Student Conduct) as academic misconduct (violation of course rules). Sanctions for academic misconduct for this action may include a failing grade on the assignment for which the notes/study guides or assignments are being uploaded, a reduction in your final course grade, or a failing grade in the course, among other possibilities. Additionally, you should know that selling a faculty member's notes/study guides individually or on behalf of one of these services using IU email, or via Canvas may also constitute a violation of IU information technology and IU intellectual property policies; additional consequences may result.

Plagiarism and Academic Dishonesty: Plagiarism is the act of taking someone else's work and presenting it as your own. Plagiarism can occur in several forms, but whether the action is intentional or not, it is in violation of the IU Student Code of Conduct. Copying and pasting text off of the Internet or any other source is NOT acceptable, as this is stealing someone else's work. If you use an author's materials verbatim, you must place these words in quotation marks, and must correctly reference them. Proper references must be placed in the text as well as in the bibliography. Be aware that when citing sources, you must do so not only when a passage is a direct quotation, but also when paraphrasing. Failure to do so will result in a "0" for the project. If you have questions or concerns regarding how to properly cite your resources, please ask me or contact Campus Writing Services. Additionally, if you are new to this university, are unclear about what plagiarism is, or would like a brief review of IU's standards, please look [here](#) and [here](#).

Course Policies: EXPECTATIONS FOR STUDENTS

Please send any correspondence (email and Canvas messages) to me (Natasha MacBean: nmacbean@iu.edu)

Attendance: Attendance is not mandatory but is expected as participation in the discussion of the reading material will be part of your grade. Please see the policy above for missing classes.

If you have a positive COVID-19 test, have COVID-like symptoms, or have been instructed to quarantine or self-isolate, you should not attend class. To ensure that you can do this, attendance in this class will be taken but will be prorated and will not lower a student's grade when that student was absent due to compliance with campus isolation expectations. <u>See "Late Work and Missed Activities" above for what to do to make up the missed work due to illness.</u> Please work with us to determine a path to continue your progress in the class during these absences. For the most up-to-date information on issues related to Covid, see https://www.iu.edu/covid/index.html.

Civility: This classroom is a learning community. As such, there may be times when students are talking or asking a question. In these moments, remember that speaking aloud in front of many people (either online or in person) can be difficult. I expect students to *support one another* in discussing and learning this material. This will have a positive impact on their confidence and ability to communicate clearly. Please be aware that others may want to speak but are waiting patiently. Please do not talk over other people, and check before speaking that others are not already waiting to speak.

Students with Disabilities: The Americans with Disabilities Act (ADA), the Indiana Civil Rights Act, and Indiana University policy prohibit discrimination in educational programs against students with disabilities. Disabilities may include medical, auditory, visual, learning, psychological, mobility, or neurological problems. It is the policy of Indiana University to provide reasonable accommodations in a timely manner and on an individualized basis while maintaining institutional standards of performance. These accommodations are designed to counter the effects of disabilities where they may pose a barrier to the education process; they will not give the student an easy grade or an advantage over other students. Every attempt will be made to accommodate qualified students with disabilities (e.g. mental health, learning, chronic health, physical, hearing, vision neurological, etc.). You must have established your eligibility for support services through the appropriate office that services students with disabilities. Note that services are confidential, may take time to put into place and are not retroactive; captions and alternate media for print materials may take three or more weeks to get produced. Please contact Disability Services for Students at http://disabilityservices.indiana.edu or 812- 855-7578 as soon as possible if accommodations are needed. The office is located on the third floor, west tower, of the Wells Library, Room W302. Walk-ins are welcome 8 AM to 5 PM, Monday through Friday. You can also locate a variety of campus resources for students and visitors that need assistance at: http://www.iu.edu/~ada/index.shtml. See the Office of Disability Services for Students for accommodation and documentation.

Bias reporting: Bias-based incident reports can be made by students, faculty and staff. Any act of discrimination or harassment based on race, ethnicity, religious affiliation, gender, gender identity, sexual orientation or disability can be reported through any of the options: 1) email biasincident@indiana.edu or incident@indiana.edu; 2) call the Dean of Students

Office at (812) 855-8188; or 3) use the IU mobile App (m.iu.edu). Reports can be made anonymously (https://studentaffairs.indiana.edu/student-support/gethelp/report-bias-incident/index.html).

Religious Observances: Students missing class for a religious observance can find the officially approved accommodation form by going to the Vice Provost for Faculty and Academic Affairs webpage for religious accommodations: (Religious Observances: Teaching Resources: Faculty Resources: Office of the Vice Provost for Faculty & Academic Affairs: Indiana University Bloomington). The form must be submitted at least 2 weeks prior to the anticipated absence.

Sexual misconduct and Title IX: As your instructor, one of my responsibilities is to create a positive learning environment for all students. IU policy prohibits sexual misconduct in any form, including sexual harassment, sexual assault, stalking, sexual exploitation, and dating and domestic violence. If you have experienced sexual misconduct, or know someone who has, the University can help. If you are seeking help and would like to speak to someone confidentially, you can make an appointment with the IU Sexual Assault Crisis Services at (812) 855-5711, or contact a Confidential Victim Advocate at (812) 856-2469 or cva@indiana.edu.

It is also important that you know that University policy requires me to share certain information brought to my attention about potential sexual misconduct, with the campus Deputy Sexual Misconduct & Title IX Coordinator or the University Sexual Misconduct & Title IX Coordinator. In that event, those individuals will work to ensure that appropriate measures are taken and resources are made available. Protecting student privacy is of utmost concern, and information will only be shared with those that need to know to ensure the University can respond and assist. I encourage you to visit http://stopsexualviolence.iu.edu/index.html to learn more.

If you are seeking help and would like to speak to someone confidentially, you can make an appointment with:

The Sexual Assault Crisis Service (SACS) at 812-855-8900

Counseling and Psychological Services (CAPS) at 812-855-5711. For information about services offered to students by CAPS: http://healthcenter.indiana.edu/counseling/index.shtml.

Confidential Victim Advocates (CVA) at 812-856-2469 IU Health Center at 812-855-4011.

More information about available resources can be found here: http://stopsexualviolence.iu.edu/help/index.html.

Support services for Students

Writing Tutorial Services:

For free help at any phase of the writing process—from brainstorming to polishing the final draft—call Writing Tutorial Services (WTS, pronounced "wits") at 855-6738 for an appointment. When you visit WTS, you'll find a tutor who is a sympathetic and helpful reader of your prose.

To be assured of an appointment with the tutor who will know most about your class, please call in advance.

Tutorials are available at the following times and locations. Call 5-6738 for an appointment:

WTS in the Information Commons on the first floor of the Wells Library

Monday-Thursday 10:00 a.m. to 8:00 p.m.

Friday 10:00 a.m. to 5:00 p.m.

Walk-in tutorials are available when WTS has an opening, but the appointment book often fills in advance.

Walk-in tutorials only:

WTS in the Briscoe, Teter, and Willkie Academic Support Centers

Sunday-Thursday 7:00 p.m. to 11:00 p.m.

Knowledge base and UITS support center:

For any technical support, see the Knowledge Base or go to the UITS Support Center website. Get no-cost access to hundreds of software programs and applications through IUware and IUanyWare. All you need is your IU email address.

Use IUware to install software directly onto your hard drive. Use IUanyWare to stream 400+ apps on your desktop or through the mobile app with your IU login.

Visit iuware.iu.edu and iuanyware.iu.edu, or contact the UITS Support Center to learn more.

Other policies

Data Privacy : Canvas allows me to access your data. Through Canvas I can see when you log on, how much time you spend on the Canvas page, your activity on Canvas and what you are accessing on Canvas, and the times you access and submit things on the Canvas page. To be 100% transparent with you all, I will only access your data on Canvas to see attempted submissions of assignments (e.g. if you tried to submit an assignment and had issues with Canvas, I can see that attempt and the issues you faced and can accept your assignment by email). In addition to the previous statement, the other exception to me accessing your data on Canvas is if I see you are not submitting your assignments in the online version of this class. I will simply check to see if you have viewed the videos on the Assignments tab on Canvas and will follow up with an email to make sure you have access to the videos.

Online Course Materials: The instructor teaching this course holds the exclusive right to distribute, modify, post, and reproduce course materials, including all written materials, study guides, lectures, assignments, exercises, and exams. Some of the course content may be downloadable, but you should not distribute, post, or alter the instructor's intellectual property. While you are permitted to take notes on the online materials and lectures posted for this course for your personal use, you are not permitted to re-post in another forum, distribute, or reproduce content from this course without the express written permission of the instructor.

<u>Schedule</u>
Please see the following page.

Please note that this syllabus/schedule may change without notice to reflect the needs of our classroom. The full reading list, PDFs of the readings, and assignment worksheets will be posted on Canvas. Note that readings must be completed before the start of class.

Week	Date	Topic	Reading (for start of class)
1	10-Jan	Course Introduction + Intro to climate change (earth system) modeling and terrestrial carbon-climate feedbacks	
1	12-Jan	IPCC and CMIP6 Summary	CarbonBrief Explainer articles
2	17-Jan	**Martin Luther King Jr. Day – No Class**	
2	19-Jan	What are Earth System Models?	CarbonBrief Q&A: How do climate models work?; Jones et al. (2020)
3	24-Jan	Overview of climate change impacts on terrestrial carbon cycle	Sections from IPCC AR6 WG1 TS + regional changes
3	26-Jan	Carbon Cycle – what is C sink?	IPCC AR6 WG1 Sections 5.2.1 & 3.6.1
4	31-Jan	Carbon-climate feedbacks	CarbonBrief article; IPCC AR6 WG1 Sections 5.1.1, 5.4.1, 5.4.3
4	2-Feb	Permafrost feedbacks	IPCC AR6 WG1 Box 5.1; FAQ 5.2
5	7-Feb	Vegetation "greening"	IPCC AR6 WG1 Sections 2.3.4.3.3 + Piao et al. (2020)
5	9-Feb	CO_2 fertilization	Walker et al. (2020)
6	14-Feb	Drought and CO_2/WUE impacts	IPCC AR6 WG1 Cross-Chapter Box 5.1, Sections 8.2.3.3, 8.3.1.4, 8.4.1.4, 8.4.1.6 and 11.6
6	16-Feb	Heavy rainfall impacts	IPCC AR6 WG1 Section 11.4
7	21-Feb	Experimental evidence for C cycle responses to global change drivers	Song et al. (2019)
7	23-Feb	Future C cycle projections	IPCC AR6 WG1 Section 5.4.5 and FAQs 5.3 and 5.4
8	28-Feb	Long-term C cycle changes	IPCC AR6 WG1 Section 5.4.10; Koven et al. (2021) and presentation
8	2-Mar	Abrupt changes and tipping points	IPCC AR6 WG1 Section 5.4.9
9	7-Mar	Emergent constraint on global photosynthesis	Keenan et al. (2021)
9	9-Mar	Structural errors in emergent constrains	Sanderson et al. (2021)
10	14-Mar	**Spring Break – No Class**	
10	16-Mar		
11	21-Mar	Land Surface/Terrestrial Biosphere Modeling – Recap	Blyth et al. (2021) & Fisher et al. (2018)
11	23-Mar	Amazon C cycle dynamics	Gatti et al. (2021)
12	28-Mar	Forest regrowth in C sink dynamics	Kondo et al. (2018)
12	30-Mar	Forest regrowth in C sink dynamics	Pugh et al. (2019)
13	4-Apr	**Final Paper**	

13	6-Apr	**Final Paper**	
14	11-Apr	Land Use Effects on Climate	Pongratz et al. (2021)
14	13-Apr	Influence of mitigation options on global C cycle (CDR, including C sequestration, SRM)	IPCC AR6 WG1 Section 5.6
15	18-Apr	Remaining Carbon Budgets	IPCC AR6 WG1 Section 5.5
15	20-Apr	Remaining C budgets and climate policy	Matthews et al. (2020)
16	25-Apr	**Final Paper**	
16	27-Apr	**Final Paper**	