CLIM 997 Doctoral Qualification - Syllabus

Catalog Course Description

Students develop a project that demonstrates their potential to do scientific research. Each student either proposes a research project, or submits an original manuscript that is suitable for a peer-reviewed scientific journal in the subject area of Climate Dynamics. Grading is based on an oral presentation and written work. Offered by Atmospheric/Oceanic/Earth Sci. Limited to two attempts.
3 credits.

1 Relationship to Climate Dynamics Doctoral Program

Eligibility A CLIM student who starts in Fall is expected to take CLIM 997 in Spring of their second year. A CLIM student who starts in Spring can elect to take CLIM 997 in the Spring of their second or third academic year.

Candidacy The final grade in CLIM 997 is assigned by the instructor based on faculty feedback. A satisfactory grade (A- or higher) indicates that the student meets expectations for a doctoral candidate and can continue in the Climate Dynamics PhD program. See section on "Advancement to Candidacy" for further discussion of grades.

2 Course Format

The primary activity in this course is to work on a research project in consultation with an academic advisor. During the semester, the CLIM 997 instructor will meet with students on a semi-regular basis to offer guidance and to discuss best practices for conducting scientific research, writing good proposals/papers, and interacting with other scientists.

Course grade is based on (1) a Final Document and (2) a Final Presentation. Students can choose one of two options:

- **Proposal:** A Final Document that presents a convincing proposal for a publishable scientific paper. The Final Document should contain original research from the student and be no more than 15 single-spaced pages, excluding references. Visual materials such as plots are included in the 15-page limit. The proposal should use a font size of 11 points or higher and have a 1-inch margin on all sides.
- **Manuscript:** Final Document may be a manuscript at the submission level of a peer-reviewed journal, or could revised into such level in a timely manner (i.e., by next spring semester). The word limit should be consistent with the intended journal.

The Final Document is likely to be part of the student's doctoral dissertation. The relation of the above documents to grading is discussed below in the section "Expectations and Grading".

Two Panel Meetings The student presents a proposal or research article to two *independent* Faculty Review Panels. Each panel comprises different members of the AOES Climate Dynamics faculty

(each are "clean slates"). Students are encouraged to show their strongest work each time and are not constrained by what they proposed in previous panel meetings. Students will receive written feedback after each panel meeting and are expected to use this feedback to improve subsequent presentations. Students should recognize that a different panel may react differently (positively or negatively) to the same material. Performance in panel meetings does not count towards the final grade.

During each panel meeting, students have 15 minutes to present their work, and up to an additional 55 minutes (for a total of one hour and ten minutes) to answer questions from the panel and engage in constructive discussions. The student is expected to answer critical questions about their project, which may include questions about basic physical concepts. Students submit abstract and presentation slides one full day before their panel meeting. Each panel member completes an evaluation form that will clearly communicate any concerns about the student's project. A CLIM 997 moderator schedules and administers all presentations and meets with the student shortly after each panel to share faculty evaluation forms and discuss takeaways.

Final At the end of the semester, the student submits a Written Document and gives an oral Final Presentation to the entire Climate Dynamics faculty. The written document is due ten days before the Final Presentation, and presentation slides are due one day before the Final Oral presentation. The student presentation is 25 minutes long, followed by 10 minutes of Q & A. Students will be evaluated in part by how they use Panel suggestions to improve their projects. Immediately after the final presentation, faculty meet privately for discussion (see Expectations and Grading below).

3 Proposal Generation Process

Students should work with their advisors to formulate paper ideas that will likely be part of their doctoral dissertation. The student may incorporate work that was done in the Climate Dynamics program prior to the qualifier. Projects based largely on work performed before entering the Climate Dynamics PhD program (e.g., a student's MS degree and associated publications) are not allowed. Students supported by research grants may propose projects based on the grant's project description, but the student is expected to make independent contributions to the project and, most importantly, to be able to defend the ideas without undue assistance from the advisor. If the student project is a research proposal, it should include original research results obtained as a student in the Climate Dynamics program. If the student project is a draft of a publishable paper, this draft can be submitted as the final document for the course.

4 Expectations and Grading

The Final Document and Presentation should provide evidence of the student's ability to:

- critically understand the relevant scientific literature
- physically understand the scientific problem
- analyze large data sets
- understand and explain an open scientific question
- present and defend a research plan to advance scientific knowledge
- explain ideas to other scientists

- improve ideas based on feedback from other scientists.

Grades are assigned as follows:

A+	submits a fully submittable paper.
A	meets expectations and submits a proposal or paper that can reasonably be developed into a publishable paper by **next spring semester**.
A-	meets expectations and submits a convincing proposal for a publishable paper.
B	does not meet expectations and does not pass the qualifier.

Process of assigning grades:

1. After final presentation, faculty meets to discuss student performance
2. Each faculty member completes a CLIM 997 Evaluation Form and assigns a letter grade
3. Course moderator assigns final grade based on faculty Evaluation Forms
4. Course moderator submits grade to university

5 Elements of a Successful Proposal or Paper

Oral panel presentations are very short (15min), so the student must pare down information to essentials and rehearse the talk before presenting. A good proposal or paper answers the following questions:

- What are you trying to do? State your objectives without jargon.
- Who cares? If you are successful, tell what difference it will make.
- What research has been done about this topic in the past?
- What is the precise gap that you are trying to fill?
- What is new in your approach?
- Why do you think your approach will be successful and how will you measure success?

The paper or proposal should contain the following elements.[1]

Title: Concise and indicates the content, free from jargon, symbols, formulas, and abbreviations.

Author: Your name. Advisor should be cited as "advised by."

Abstract: Summarizes the research's purpose and methodology in 250 words or fewer.

Introduction: Outlines the scientific question being addressed, explains its significance, and reviews relevant previous studies.

Proposed Work: Provides a detailed description of the planned research activities, explaining how these activities address the scientific question. The description should clearly delineate how the proposed research differs from previous studies, highlighting novel approaches or methodologies. For a

[1] Based on NSF Guide to Proposal Writing

proposal, the details should be sufficient to demonstrate the feasibility of the planned activities and to justify why the approach is expected to be effective. For papers, the details should be described thoroughly enough to ensure that another scientist in the field can accurately reproduce the results.

Accomplished Work: Describes the research outcomes achieved to date. For proposals, this description should explain how the results support the feasibility of the proposed activities or serve as preliminary evidence. For papers, this description should explain how the results contribute to the field and relate to existing research.

Acknowledgements: Describes the contributions made by others, such as technical support, guidance from colleagues, data collection efforts, or assistance with manuscript preparation. Additionally, the extent to which AI/ML tools were utilized in your work should be clearly described. See the policies on the use of AI/ML at the end of this syllabus.

6 Faculty Roles

course instructor: organizes and moderates meetings/panels/Final Presentation, assigns final grade for each student in class.

student academic advisor: consults with student about project.

AOES climate dynamics faculty: Except as prevented by unavoidable schedule conflicts, all Climate Dynamics faculty are expected to attend two days of panel meetings and fill out an evaluation form after each panel and submit the form to the CLIM 997 instructor. Faculty also are expected to (1) read the Final Document from each student and (2) attend the Final Presentation and subsequent faculty meeting.

7 Advancement to Candidacy

A grade of A- or higher indicates the student meets expectations for a doctoral candidate and can continue in the Climate Dynamics PhD program. A grade of B is unsatisfactory and indicates that the student performed below the level expected of a CLIM doctoral candidate. The final decision as to whether a student remains in the Climate Dynamics PhD program lies with the Climate Dynamics director, as described in Advancement to Candidacy.

8 Policy on the Use of Artificial Intelligence (AI)

This course recognizes that artificial intelligence (AI) tools are becoming an integral part of modern scientific research and professional practice. However, improper or undisclosed use of AI undermines the integrity of scholarly work. The following policy governs acceptable use of AI in this course. *These policies may evolve as AI capabilities and norms change.*

Permitted Use of AI for Coding and Technical Assistance Students may use AI tools for coding assistance, including (but not limited to) generating example code, debugging, or learning unfamiliar programming syntax or libraries. Such use is permitted under the following conditions:

- Students are fully responsible for understanding, interpreting, and explaining all components of any code used in assignments, projects, or presentations.
- Students must be able to clearly articulate what the code does, why it is appropriate for the task at hand, and how it implements the underlying mathematical, statistical, or physical concepts.
- Blindly trusting AI-generated code without verifying its correctness, assumptions, numerical behavior, or scientific validity is not acceptable.

In short, AI may assist with *implementation*, but it may not substitute for *understanding*.

Use of AI for Editing and Clarity Students are expected to generate substantive content themselves before using AI. After the student has generated the content, AI may be used to improve how that content is communicated, including checking grammar and spelling or suggesting phrasing improvements. New ideas or technical content generated by AI should be treated in the same manner as ideas obtained from other sources (e.g., the student's advisor or scientific literature): the student must independently verify and understand such material before adopting it in their work. Using AI-generated content without careful review and comprehension is considered poor scholarly practice.

Disclosure and Transparency in the Use of AI Use of AI tools is permitted more broadly in the research process, including brainstorming, drafting text, coding, or exploratory analysis. However, transparency is mandatory. Students must clearly disclose how AI tools were used in their work. This disclosure should be included in a designated section of written submissions (e.g., "Use of AI Tools") or stated explicitly in presentations. The disclosure should specify:

- Which AI tools were used (e.g., code assistants, language models),
- Their purpose (e.g., code generation, editing prose, conceptual clarification),
- The extent of their use.

It is vital that students clearly explain what intellectual and technical contributions they made *independently of AI*, and how those contributions added value to the research project. This includes formulating the research question, designing the methodology, interpreting results, diagnosing errors or limitations, making scientific judgments or decisions. The goal is not to prohibit AI, but to ensure that the student's own expertise, reasoning, and creativity remain central and visible.

Additional university-wide guidance on the use of AI may be found here: AI Guidelines.

9 University Policies

Students are expected to be aware of common University Policies, including Academic Integrity, Disability Accommodations, Diversity, Title IX, and Student Privacy. [clickable link]