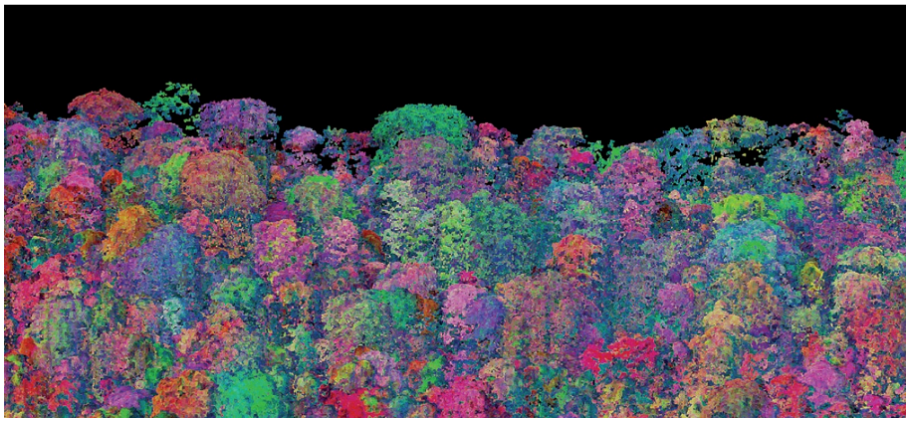

PSL Master in Life Sciences – M2

Fall 2025

UNBIO1-110 *Climate Change Ecology* (3 ECTS)

1. Short Description of Course

Rapid changes to Earth's climate and biosphere influence how natural and managed ecosystems function and alter the services ecosystems provide. To address issues from conservation biology to sustainability, a thorough understanding of the responses and feedbacks of biodiversity and ecosystems to climate change is needed. In this class, students will learn the basics of climate change ecology; they will then be exposed to current topics and cutting-edge research, though a series of presentations and discussion with research experts. Specific topics will address the physiological responses of organisms of multiple climate stressors; the effects of climate acting in combination with other global changes; integrative and multiscale approaches to document and predict ecological responses to climate change; the societal challenges and opportunities of climate change ecology.

The course is intended primarily to M2 students in the IMaLiS Master program. External students can attend and credit the class by prior arrangement with the primary instructor. Please see contact information below. External students with attendance confirmed by primary instructor should register at https://www.enseignement.biologie.ens.fr/?article207 at least one week before the start date of the class.

Maximum class size is 20 students.

The class is taught in English.

2. Location and Timeline

Biology Department, Room 321, ENS, 46 rue d'Ulm, Paris 5th.
Duration: 30 hours
First of class: September 15, 2025
Last day of class: September 19, 2025
Class meets daily, typically 9am-12pm, 2pm-5pm. See detailed schedule (section 14) for exceptions.

3. Instructor(s) and Contact Information

Primary instructor: Dr. Regis Ferriere (he/his), regis.ferriere@bio.ens.psl.eu

Teaching Assistant: Elisa Richard (she/her), elisa.richard@lsce.ipsl.fr

4. Course Communications

Course material and announcements are posted on Moodle.

5. Course Prerequisites or Co-requisites

Undergraduate level in population, community, and ecosystem ecology. Students are expected to have received introductory training on the topics of population dynamics, species interactions, community diversity and stability, biogeography, ecosystem function and biogeochemical cycles.

6. Course Format and Teaching Methods

The course will include a combination of lectures by the primary instructor, hands-on activities (modeling, programming) with the co-instructor, and research presentations by guest speakers.

The course will take place in a classroom with in-house computer technology. However, students are strongly encouraged to bring their own laptop with needed software packages and libraries properly installed prior to class.

7. Course Objectives

The course will address how climate variables influence the function of organisms, populations, communities, and ecosystems; how populations, communities, and ecosystems respond to climate change (addressing different types of responses pertaining to acclimation, adaptation, or dispersal); what specific tools can be used to model and predict species responses to climate change; how model predictions can be compared with empirical data. Cutting-edge research topics will be presented by experts in the field.

Keywords: Biodiversity, climate change, organismal physiology, species distributions, acclimation, adaptation, niche modeling, trait-based analysis, carbon cycling, resilience, tipping points, rescue, ecological forecasting, ecological conservation, ecosystem services, climate scenarios, nature-based solutions, sustainability.

8. Expected Learning Outcomes

Upon completion of the course students will be able to:

- read, analyze, and present current research articles in Climate Change Ecology.
- connect climate and ecological processes.
- access and research ecological and climate data sets.
- develop quantitative models to formulate and evaluate hypotheses pertaining to the responses and feedbacks of ecological systems to climate change.
- study and relate ecological responses at different structural, temporal, and spatial scales.
- connect knowledge about ecological processes and function to conservation and sustainability challenges.

9. Textbooks and Readings

No specific textbook is assigned to the class. Readings related to each lecture will be provided and made available on Moodle.

10. Required or Special Materials

Specific instructions and resources will be provided regarding programming packages and libraries used for hands-on activities.

11. Required Activities

No special activities planned in this class.

12. Absence and Class Participation Policies

Students are expected to be regular and punctual in class attendance and to fully participate in the course. Students themselves are primarily responsible for attendance and class participation.

13. Evaluation and Grading

There will be one *homework assignment* (25% of final grade) and one *final assignment* (75% of final grade).

The *homework assignment* consists in reading an assigned research paper and preparing a "reading write-up" by answering a set of questions designed to assess the understanding of the paper and its implications.

The *final assignment* consists in writing a mini-review on a prescribed topic. The mini-review will be five-page, single-spaced (references not included), due three weeks after the last day of the class.

There will be no re-take of the homework assignment or final assignment.

14. Schedule of course topics and activities

Monday 9/15 * Class starts at 14:00.**

14-15:15 Régis Ferrière
Climate change and the field of climate change ecology

15:30-16:45 Régis Ferrière
Effect of climate variables on organisms and populations

Tuesday 9/16

9-10:15 Régis Ferrière
How populations respond to climate change: "Move, adapt, die"

10:30-11:45 Jean-François Le Galliard (CNRS, iEES, Sorbonne U)
The thermo-hydroregulation strategies of ectotherms in changing climates

14-16:45 Marion Richardot (IBENS, ENS-PSL)
Species distribution modeling

Wednesday 9/17

9-10:15 Régis Ferrière
Climate change and ecosystem function

10:30-11:45 Régis Ferrière
Facing climate change

14-16:45 Elisa Richard
TBA

Thursday 9/18

9-10:15 Boris Sauterey (LOCEAN, Sorbonne U, ENS-PSL)
Ocean ecosystem responses to climate changes

10:30-11:45 Boris Sauterey (LOCEAN, Sorbonne U, ENS-PSL)
Ocean ecosystem projections: introduction to PISCES

14-16:45 Elisa Richard
TBA

Friday 9/19

9-10:15 Valeriano Parravicini (CRIOBE, EPHE)
Ecology of coral reef ecosystems

10:30-11:45 Valeriano Parravicini (CRIOBE, EPHE)
Coral reef ecosystems and climate change

14-15:15 Karine Princé (CESCO, MNHN)
Climate change, citizen science, and conservation action

15:30-16:45 Régis Ferrière
Presentation of topics and papers for individual evaluation

15. Bibliography

Key references used in lectures will be listed and posted on Moodle.

16. Classroom Behavior Policy

To foster a positive learning environment, students and instructors have a shared responsibility. We want a safe, welcoming, and inclusive environment where all of us feel comfortable with each other and where we can challenge ourselves to succeed. To that end, our focus is on the tasks at hand and not on extraneous activities (e.g., chatting, texting, chatting, web surfing, etc.).

17. Subject to Change Notice

Information contained in the course syllabus may be subject to change with reasonable advance notice, as deemed appropriate by the primary instructor of this course.