

*Atmospheric Processes:
From cloud to global scales*

Teachers: J. Gehring, A. Nenes and A. Berne

The main objectives of this course are:

1. Introduce the important atmospheric processes driving weather and climate.
2. From the local to the global scales.
3. Introduce numerical approaches to simulate those atm processes.
4. Focus on specific meteorological phenomena in specific contexts (mountain, tropics).

This course will cover a broad range of topics and scales related to the atmosphere.

You will become familiar with those topics and be able to identify and rank the dominant processes in various meteorological contexts.

This course can be seen as a logical continuation of:

Physics and chemistry of the atmosphere (ENV-320)

Fluid Mechanics (ENG-272)

As well as complementary to:

Science of climate change (ENV-410)

Environmental transport phenomena (ENG-420)

It aims to strengthen the background of students in Atmospheric Science.

Prof. Athanasios Nenes

([LAPI](#), aerosol-cloud-climate interactions)



Dr. Josué Gehring ([MétéoSuisse](#) – Genève, forecaster)



Prof. Alexis Berne

([LTE](#), precipitation and radar meteorology)



Recap: atmospheric thermodynamics, stability, boundary layer. (A. Nenes)

Cloud formation and microphysics: nucleation, cold and warm microphysical processes, measurement techniques and instruments. (A. Nenes + A. Berne)

Mid-latitude large-scale atmospheric dynamics: extratropical cyclones, synoptic circulation, fronts, weather applications. (J. Gehring)

Numerical weather and climate models: governing equations, numerical schemes, parameterizations. (A. Berne)

Varia: mountain meteorology (A. Berne), tropical cyclones, aerosol-cloud-climate interactions (A. Nenes).

Important atmospheric processes and phenomena, from local to global scales!

The course is organized as follows:

1. **Lectures**: 2h on Mon 16:15-18:00 (GR B3 30)

2. **Exercises**: 3h on Tue 14:15-17:00 (CE 1106)

3. **Mini-projects**: 4 weeks during ex slot, end of the semester (30% final grade)

4. **Final exam** during exam session (70% final grade)

Specific organization and time line in Fall 2024!

Week	Date	Objective	Teacher
1	08/09/25	Recap	Nenes
2	15/09/25	Nucleation	Nenes
3	22/09/25	Lundi du jeûn	Nenes
4	29/09/25		Nenes
5	06/10/25	Microphysics precip	Berne
6	13/10/25	Radar and microphysics	Berne
7	20/10/25	Fall break	
8	27/10/25	Dynamics 1	Gehring
9	03/11/25	Dynamics 2	Gehring
10	10/11/25	Dynamics 3	Gehring
11	17/11/25	Mountain meteorology	Berne
12	24/11/25	Numerical Modeling 1	Berne
13	01/12/25	Numerical Modeling 2	Berne
14	08/12/25	Tropical cyclones	Nenes
15	15/12/25	Aerosol-cloud-climate interactions	Nenes

mini-projects

This calendar is indicative and could change during the semester