

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!

Date for lecture (Monday)	Course	Teacher	Lecture (Monday)	Ex (Tuesday)
09/09/24	Microphysics precip	AB	2	3
16/09/24	Radar and microphysics	AB	0	2
23/09/24	Mountain meteorology	AB	2	3
30/09/24	Numerical Modeling 1	AB	2	3
07/10/24	Numerical Modeling 2	AB	2	3
14/10/24	Recap: thermodynamics, stability, ABL	AN	2	3
21/10/24	Fall break			
28/10/24	Nucleation	AN	2	3
04/11/24		AN	2	3
11/11/24		AN	2	3
18/11/24	Dynamics 1	JG	2	3
25/11/24	Dynamics 2	JG	2	1+2
02/12/24	Dynamics 3	JG	2	3
09/12/24	Tropical cyclones	AN	2	3
16/12/24	Aerosol-cloud-climate interactions	AN	2	3

mini-projects

This calendar is indicative and could change during the semester