

#### SCIENCES, TECHNOLOGIES AND HEALTH

# Système Climatique : Atmosphère, Hydrosphère, Cryosphère 1st and 2nd year

Master in Earth, planetary and environmental sciences

Target level Baccalaureate

+5

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ECTS 120 credits

Duration 2 years Component UFR PhITEM (physique, ingénierie, terre, environnement, mécanique)

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# Presentation

The Climate System: Atmosphere, Hydrosphere, Cryosphere course aims to study the processes operating in the climate system and their interactions. Understanding past and present climate and predicting future changes requires a precise knowledge of these processes. This Course addresses all the surface components of the Earth, the atmosphere, the continental surfaces (water, cryosphere, biosphere) and the ocean. It draws on a variety of disciplines and skills, including physics, chemistry, mathematics, geosciences, geography, and computer science.

The course trains generalist experts and has a research focus, but also responds to the growing needs of local authorities and companies in the field of the environment, for example in air quality, hydrology, or remote sensing. The teaching relies heavily on the specificities of Grenoble's research laboratories in the field of climate, atmosphere and cryosphere and glaciology (IGE, LEGI, INRAE, CEN). The observation made today is that 70% of the students pursue a PhD after this master (reflecting individual choice rather than any selection). The tools used in the courses, workshops and projects are in fact also the tools used in the professional world, or in the process of being used. The course's greater openness to the professional world is achieved through the introduction of professionally oriented courses, as well as by

taking care in the general modules to systematically make the necessary links with "business" applications: climate variability and intermittency of renewable energy resources.

The course includes fieldwork (1 compulsory week + 1 optional week + occasional days), numerous practical assignments (e.g. 1 week in atmospheric chemistry) which allow theoretical knowledge to be put into practice.

Finally, the course includes two internships in a laboratory or in a company, of one's choice. These internships take place between M1 and M2 (6 weeks minimum but 2-3 months recommended) and at the end of M2 (5 months minimum). For those interested in an even stronger involvement in research (2 internships of 5 months over the two years), the Research Intensive Track associated to the Climate System Course may be an option, provided that you already have a master's or professional experience.

Note that in the first semester, there are 30 ECTS of compulsory courses in the program, which is sufficient to obtain validation of the semester, the two options proposed are for special cases and not necessarily open every year. In the second semester, the remote sensing and GIS course is marked as optional but is strongly recommended unless you already have a strong competence in the field or a specific professional project that justifies other module choices.





This Master Course gives you the opportunity to apply to the UGA Graduate School and one of its 15 thematic programmes that add an interdisciplinary component to your studies. Terra is the thematic programme closest to this Course. The objective of the thematic programmes is to offer students an interdisciplinary study programme combining academic teaching and training through laboratory research. The programme brings together students from different majors, master's courses or engineering programmes and works together in specific courses. Participation in the @UGA Graduate School is for two years (M1 and M2) and may open the possibility of obtaining an academic scholarship for two years for the best international students (non-French baccalaureate holders).

More information on the C Graduate School website

International education : Internationally-oriented programmes

## International dimension

Study abroad as an exchange student

As part of this track, you have the opportunity to study for a semester or a year at a UGA partner University abroad.

The International Relations Officers of your faculty will be able to provide you with more information.

More information on : C https://international.univ-grenoblealpes.fr/partir-a-l-international/partir-etudier-a-l-etrangerdans-le-cadre-d-un-programme-d-echanges /

# Organisation

Abroad intership : In France or abroad

# Admission

### Access conditions

- The 1st year is open to students who have obtained a national diploma equivalent to a bachelor degree (licence) in a field compatible with that of the master, or via a validation of their studies or experience
- Entry to the 2nd year may be selective. It is open to candidates who have completed the first year of a Master in the field, subject to a review of their application

Public continuing education : You are in charge of continuing education :

- if you resume your studies after 2 years of interruption of studies
- or if you followed training under the continuous training regime one of the previous 2 years
- or if you are an employee, job seeker, self-employed

If you do not have the diploma required to integrate the training, you can undertake a 🖸 validation of personal and professional achievements (VAPP)

# Candidature / Application

You want to apply and sign up for a master? Please be aware that the procedure differs depending on the diploma you want to take, the diploma you have already obtained and, for foreign students, your place of residence.Let us be your guide – simply follow this **C** link

### Target

- Students in initial training who have obtained a bachelor degree (licence) in Earth, physical, or mechanical sciences
- Students from engineering schools (in particular ENSE3, G-INP) who seek studies in more "research" oriented topics concerning the atmosphere, the climate and hydrosystems
- Foreign students wishing to pursue their studies in the fields of the atmosphere, the climate and hydrosystems





• Students in continuing education wishing to pursue advanced studies in the fields of the atmosphere, the climate and hydrosystems

### Fees

Tuition fees 2023-2024 : 243 € + 100€ CVEC

# Prerequisites

- Natural candidates for this course include students with bachelor degrees (licence) in Earth Sciences, especially if their studies included a fairly large physics component
- However, due to the highly multidisciplinary nature of the course, it is also perfectly suited to students with bachelors in physics, mechanics, physics-chemistry, and even chemistry
- A small but non-negligible number of students come from engineering schools, seeking studies in more "research" oriented topics

# And after

# **Further studies**

Doctoral thesis, in the field of Earth, planetary and environmental sciences

# Study abroad

Doctorate in a foreign university

# Reorientation

A reorientation to the Hydro-resources program is possible up to the end of the 1st year. A reorientation to the international Hydrohazards program is also possible, at the end of the semester 7.

# Sector(s)

- Competitive examinations for careers in research (researchers), education-research (teacher-researcher) (CNRS, University, CNAP, IRD and research organisations abroad) after pursuing doctoral studies
- Whether or not students go on to doctoral studies, the professions targeted by this program concern environmental monitoring and forecasting in varied contexts (air quality monitoring associations, local authorities, consulting companies)

# Useful info

## Contacts

#### Program director

Christophe Brun christophe.brun@univ-grenoble-alpes.fr

#### Program director

Ghislain Picard Ghislain.Picard@univ-grenoble-alpes.fr

#### Program administration

Registrar's Office of the Master in Earth, planetary and environmental sciences phitem.master.stpe@univ-grenoble-alpes.fr

#### Program administration

Application
phitem.candidature.etudiant@univ-grenoble-alpes.fr

#### Continuing education manager

Laura DI RUZZA sc-phitem@univ-grenoble-alpes.fr





# Partner laboratories

Laboratoire de Glaciologie et Géophysique de l'Environnement - LGGE

Laboratoire d'étude des Transferts en Hydrologie et Environnement - LTHE http://www.lthe.fr/LTHE/

Centre d'Etudes de la Neige - CEN C http://www.cnrm-game.fr/spip.php?rubrique85

Irstea - Centre de Grenoble

# Course location(s) - City

Grenoble

# Campus

Grenoble - University campus



# Program

# Specifics of the program

Program under construction - awaiting CFVU vote

#### Master 1st year

#### Semester 7

	Nature	СМ	TD	TP	Crédits
UE Hydrology and hydraulics	Teaching Unit (UE)				6 credits
UE Fluid mechanics	Teaching Unit (UE)			6h	3 credits
UE Air, soil, water : introduction to environmental pollutants modelling	Teaching Unit (UE)				6 credits
UE Climatic and Environmental variability	Teaching Unit (UE)			45h	6 credits
UE General Physical Meteorology	Teaching Unit (UE)		12h		3 credits
UE Professional and Scientific Communication 1	Teaching Unit (UE)			24h	3 credits
UE Croissance économique et limites planétaires: climat, biodiversité	Teaching Unit (UE)		6h		3 credits
UE Programmation et environnements informatiques	Teaching Unit (UE)			18h	3 credits

#### Semester 8

	Nature	СМ	TD	TP	Crédits
UE Atmospheric pollution: Principles and Experimental Methods	Teaching Unit (UE)			24h	6 credits
UE Lautaret field workshop: snow & atmosphere interface	Teaching Unit (UE)				6 credits
UE Instrumentation and metrology	Teaching Unit (UE)	36h		12h	6 credits





UE Hydrology and Hydrometeorology Field Course	Teaching Unit (UE)				6 credits
UE Remote sensing and GIS project	Teaching Unit (UE)	36h		24h	6 credits
UE Climate records	Teaching Unit (UE)		18h		3 credits
UE Introduction to Machine learning in Earth Sciences	Teaching Unit (UE)			12h	3 credits
UE Environmental flows	Teaching Unit (UE)	16h		8h	3 credits

### Master 2nd year

#### Semester 9

	Nature	CM	TD	TP	Crédits
UE Climate change	Teaching Unit (UE)				6 credits
UE Cryosphere	Teaching Unit (UE)				6 credits
UE Geophysical Fluid Dynamics	Teaching Unit (UE)				6 credits
UE Models for atmospheric chemistry and physics	Teaching Unit (UE)				6 credits
UE Radiative transfer and remote sensing	Teaching Unit (UE)				6 credits
UE Advanced Machine Learning in Earth Sciences	Teaching Unit (UE)			15h	3 credits
UE Atmospheric boundary layer : from fundamentals to air quality 1	Teaching Unit (UE)	24h			3 credits
UE Atmospheric boundary layer : from fundamentals to air quality 2	Teaching Unit (UE)	24h			3 credits
UE Computing and data analysis Project	Teaching Unit (UE)				3 credits
UE Data assimilation in geosciences	Teaching Unit (UE)				3 credits
UE Geostatistics	Teaching Unit (UE)				3 credits





#### Semester 10

	Nature	СМ	TD	TP	Crédits
UE short Internship	Teaching Unit (UE)				6 credits
UE long Internship	Teaching Unit (UE)				24 credits

