

Master of Science

Water, Air, Pollution and Energy





Master of science

Water, Air, Pollution and Energy (WAPE)

The Master of Science «WAPE» is an international track of the Master «Océan, Atmosphère, Climat et Observation Spatiale» (OACOS).



**Internships have been done
in the following institutions
and companies:**

EDF
GDF Suez
CNRS
IPSL
ACTIMAR
Open Ocean
IFREMER
Veolia Environnement
BRGM
CNES
CLS
ACRI

...

GENERAL PRESENTATION

The purpose of the Master of Science «Water, Air, Pollution and Energy» (WAPE) is to give students a thorough knowledge of the laws and interactions governing our natural environment at local and regional scales to prepare them for a successful career in academia or industry.

All courses are taught in English by prominent scholars internationally recognized in their field. The program is open to highly qualified international students with a

strong background in Physics or Fluid Mechanics and in Applied Mathematics. The WAPE program is offered by five of the leading French engineering schools and universities: École Polytechnique and ENSTA ParisTech, jointly with the Université Pierre et Marie Curie, École Normale Supérieure and École des Ponts ParisTech.

OBJECTIVES

In-depth understanding and knowledge of the laws and interactions governing the evolution of our natural environment condition the future of our society. The advancement of this knowledge requires strong observational, experimental, analytical and modelling techniques covering global, regional and local scales.

Following this general framework, the WAPE program presents the physical and chemical processes driving

atmospheric and aquatic dynamics and air pollution at local and regional scales, and their links with the energy problem. Modern meteorological and oceanographic modelling and forecasting methods are then considered. Observational techniques and innovative developments are also described, studied and tested.

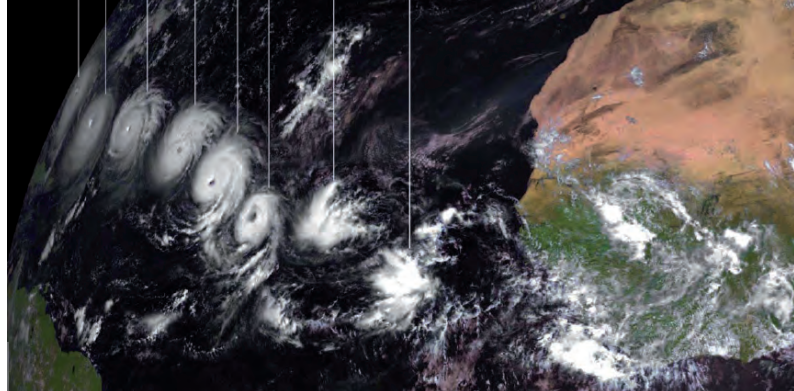
CAREER OPPORTUNITIES

It is expected that graduates of the program will have acquired the skills to design effective, physics-based models to describe different aspects of the environment. They will have learnt to critically assess the relevance and validity of different approaches to complex environmental problems. They will be able to determine the proper parameters, develop efficient numerical algorithms and select appropriate measurement techniques relevant to specific impact studies or societal demands. Even more importantly, they will have acquired a sound understanding of environmental physics. Finally, they will be able to work and communicate effectively in an English-speaking environment.

Students from this speciality will be recruited in public or private research institutes, in companies or agencies concerned with environmental problems («polluting» industries, local authorities, banks, insurance, etc.) interested in hiring specialists in environmental and climatic risks. Alternatively, graduates of the program may choose to pursue study for a doctoral degree, which opens the way for a research career in the academic or industrial world.



Underwater gliders are used to monitor ocean temperature, salinity, turbidity, chlorophyll, etc.



Time schedule

First Semester (**September – February**): courses.

Second Semester (**March – August**): internship and industry opening activities.

Training programme (60 ECTS)

Each curriculum consists in 30 ECTS of courses chosen in the lists below, and **30 ECTS** of industry opening activities and a five-month internship. The choice of the **10 courses** is subject to approval by the program directors.

BASICS

Courses	
Fundamentals and General Circulation (min 3 courses in this list)	
ECTS	
3	An Introduction to Atmospheric Dynamics and Energetics
3	Geophysical Fluid Dynamics
3	Atmospheric Circulation
3	Oceanic Circulation
Regional Dynamics and Meso Scale Processes (min 4 courses in this list)	
3	Regional Meteorology and Environment
3	Air Pollution Modelling at Urban and Regional Scales
3	Clouds and Precipitations
3	Boundary Layer Processes
3	Continental Biosphere and Atmosphere: Two-ways Interactions
3	Ocean Biogeochemical Dynamics
3	Coastal Hydrodynamics
3	Hydro Sedimentology and Water Quality
3	Sea State Coastal Waves and Morphodynamics
Tools (min 1 course in this list)	
3	Principles and Practice of Numerical Modelling
3	Introduction to Data Assimilation

ELECTIVES

Courses	
in depth courses	
ECTS	
3	Personal Research Project
3	Water Sciences and Environment
3	Space missions for Earth observation
3	Continental Hydrology and Water Resources
4	Statistical Data Analysis
3	Meso and Submesoscale Dynamics, Instabilities and Turbulence
Management and Economics	
3	Hands on Introduction to Entrepreneurial Innovation for the Climate Challenge
3	Economic Growth and Sustainability
3	Environmental Economics
3	Management of the Environment

INTERNSHIP AND INDUSTRY OPENING ACTIVITIES

ECTS	
27	Five-month research internship in a public or private, academic or industrial, laboratory in France or abroad
1	Industry week - One week with conferences and visits of enterprises, industries or public institutions
2	Practical Training Journey + Climate KIC – The Journey (Academy of Climate Innovation in Europe); + or Coastal in-situ campaign (Mediterranean Sea); + or Other scientific journey or summer school.



+ PRE-REQUISITES

This master is open to students holding at least the equivalent of a 4-year university degree, or a Master's degree.

+ TUITION FEES

The cost includes participation in the courses, class materials, use of computers and company visits (travel costs included).

Annual registration fee: **250 €**

Tuition fees: **4 400 €**

Fee waivers are available under certain conditions. Fellowships are awarded to a few highly qualified students to partially cover living expenses. They could be given either by ENSTA ParisTech or the École Polytechnique according to student academic records.

+ TRAINING LOCATIONS

Courses take place on the Campus Paris-Saclay (École Polytechnique and ENSTA ParisTech) located only 30 minutes away from Paris, and at the Université Pierre et Marie Curie located downtown Paris.

+ APPLICATION PROCEDURE AND CONTACTS

Prospective candidates for the program should submit their application online through:

<http://www.coriolis.polytechnique.fr/MASTERS/WAPE.html>.

Admission of students is based on the evaluation of academic transcripts, statement of purpose and letters of recommendation. Admission sessions are held in February and May.

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