Geophysical flows

ECTS credits
2 credits

Semester
Fall

In brief

Course langage: French

Presentation

Prerequisites

none

Learning objectives

* Acquire knowledge and skills in the field of fluid mechanics applied to the environment and to atmospheric and oceanic flows.
* Understand the physical mechanisms and processes governing these phenomena, in order to be able to use modeling tools (numerical and experimental).
* Acquire sufficient scientific background to join a project team dealing with geophysical flows in the broadest sense, including for example the themes of sustainable development, global warming, ocean circulation, or renewable energies.
* Develop a critical sense of the study tools in the broad sense of the term used to study, model, or predict these flows.
* To know how to make the most of these tools and study methodologies, using them to the best of their abilities and keeping a critical eye on the results obtained.

Description of the programme

* Physics of large-scale flows in the atmosphere and ocean
* Effects of the Earth's rotation and of the density stratification
* Concepts of atmospheric dynamics and climatology
* Reduced models, scaling laws and parameterizations
* Instabilities and turbulence in geophysical flows

Geophysical flows

Generic central skills and knowledge targeted in the discipline

* Provide expertise on the physics and modeling of atmospheric and oceanic flows
* Provide keys to understanding the physical mechanisms that govern these flows and their interactions with the natural terrain and structures (civil engineering structures such as ports and coasts, environmental issues, etc.)
* Transmit notions, allowing for the best choices in terms of tools to be used for projects or studies, to issue specifications, and to interpret results in a relevant way
* have a sufficient level of mastery to propose, encourage, or discuss innovations in these fields

How knowledge is tested

CC : writing of TP reports and CFD project reports, 100%.

Bibliography

1. McWilliams, J. C. (2006). *Fundamentals of Geophysical Fluid Dynamics*. Cambridge University Press.
2. Cushman-Roisin, B., & Beckers, J. (2011). *Introduction to Geophysical Fluid Dynamics: Physical and Numerical Aspects (Volume 101) (International Geophysics, Volume 101)* (2nd ed.). Academic Press.
3. Vallis, G. K. (2012). *Atmospheric and Oceanic Fluid Dynamics: Fundamentals and Large-scale Circulation*. Cambridge University Press.

Teaching team

Michael Le Bars (CNRS)

Benjamin Favier (CNRS)

Sustainable Development Goal

Climate action

Sustainable cities and communities

Total des heures		**24h**
CM	Master class	16h
TP	Practical work	8h

Useful info

Name responsible for EU

Lead Instructor
Olivier Boiron
olivier.boiron@centrale-med.fr