

# Turbulence dynamics

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## ECTS

3

## Mots clés

## Description du contenu de l'enseignement

### Objective

The objective of the course is to present recent advances in the field of turbulence research. Some of the consequences for turbulence modelling will be discussed.

### Content

- Statistical description of turbulence; basic concepts: isotropy, homogeneity, equilibrium.
- Concept of turbulence model.
- Concept of coherent events; definition of a vortex.
- Dynamics of isotropic turbulence: kinetic energy cascade; triadic interactions; Waleffe's hypothesis; modelling: k-epsilon, EDQNM.
- Dynamics of anisotropic homogeneous flows: shear, strain and rotation; introduction to Rapid Distortion Theory; modelling: k-epsilon.
- Turbulent boundary layer: dynamics; mean flow description; role of vortices/coherent structures; concept of Self-Sustained Process in turbulent shear flows; modelling: k-epsilon.

## Compétences à acquérir

### Competences

To present both the basics and recent advances in the key field of turbulence.

To become familiar with modelling of turbulence.

## Modalités d'organisation et de suivi

### Coordinators

David Quéré, École polytechnique, Stéphane Zaleski, UPMC

### Pedagogic team

Laurent Jacquin, Onera

Caroline Muller, Laboratoire de météorologie dynamique, ENS

## Langue

Anglais

## **Volume horaire**

CM : 15h, TD : 15h, homework : 20h, all : 50h

## **Pré-requis obligatoires**

Prerequisite: fundamental notions of fluid mechanics

## **Période et lieu(x) enseignements**

### **Time**

December, January, February

### **Location**

École polytechnique

## **Mode de contrôle des connaissances**

Written examination.