

MASTER PHYSIQUE

## PARCOURS PHYSIQUE OCÉAN ET CLIMAT

### semestre 9 Physique POC

# Ondes internes océaniques

## Présentation

This course focuses on ocean internal waves. Students will acquire a general knowledge of the dynamics of internal waves in the ocean, the waves properties, their generation mechanisms, the consequences of their possible non-linearity or instability and their role in the ocean and climate system. The course is taught in English.

**2 crédits ECTS**

Volume horaire

Travaux Dirigés : 13h

Cours Magistral : 7h

## Objectifs

On completing this course, students will be able to express the equations governing the evolution of internal waves and solve them mathematically in idealized systems, they will know the important properties of internal waves, and be able to reason physically about their evolution in the ocean.

## Pré-requis nécessaires

Pre-requisites

Geophysical fluid dynamics (Fluids 1 and Fluids 2)

## Compétences visées

ability to analyse and solve a marine physical problem, using knowledge about internal waves, in a professional or academic frame.

Ability to observe and simplify theory in regard of observations or conversely to establish a measurement plan in view of theory; in particular scale and give orders of magnitude of phenomena for observation, or provide simplified equations

Ability to select and critically analyse bibliographic information to extract a new scientific question; develop critical arguments; use the knowledge of atmosphere-ocean theory to solve an original problem

Be able to solve problems on the field or in a company, taking into account the whole complexity of reality

Communicate orally or by texts, in a scientific manner

## Descriptif

Contents

General properties of Ocean waves

Internal Waves in nature and their role in the ocean

Internal Waves in the 2-layer model

Internal Waves with a continuous stratification

Generation mechanisms for internal waves [Tides, Winds, Topography, etc.]

Propagation, dissipation and interaction of internal waves

Activity: Numerical simulation of internal waves using fluid2d

## Bibliographie

*Holrhuisen: Waves in oceanic and coastal waters, Cambridge University Press*

*Gill, atmosphere ocean dynamics, academic press*

*Leblond and Mysak, Waves in the ocean, Elsevier*

*Csanady, circulation in the coastal ocean, Reidel*

*Le Mehaute, an introduction to hydrodynamics and water waves, Springer*

## Modalités de contrôle des connaissances

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### Session 1 ou session unique - Contrôle de connaissances

| Nature de l'enseignement | Modalité | Nature       | Durée (min.) | Coefficient | Remarques |
|--------------------------|----------|--------------|--------------|-------------|-----------|
|                          | CC       | Autre nature |              | 100%        |           |

### Session 2 : Contrôle de connaissances

| Nature de l'enseignement | Modalité       | Nature       | Durée (min.) | Coefficient | Remarques                                     |
|--------------------------|----------------|--------------|--------------|-------------|---|
|                          | Autre modalité | Autre nature |              |             | oral commun de 40 mn pour toutes les matières |