



**Osaka University**

Graduate School of Engineering  
Department of Naval Architecture & Ocean Engineering

# Hydro-Seminar

by Lab. of Floating-Body Dynamics in Waves

The speaker in the 28th Hydro-Seminar is

**Professor Pierre Ferrant**

Laboratoire de Recherche en Hydrodynamique, Energetique  
et Environnement Atmospherique (LHEEA Lab.),  
Ecole Centrale de Nantes, Nantes, France



**Date:** Wednesday, 12 March, 2014

**Time:** 14:30 – 16:00

**Venue:** S1-311 (Lecture room, 3F of S1 building)  
Suita Campus, Osaka University

## Numerical Simulation, Model Scale and Full Scale Testing of Marine Renewable Energy Systems

### Abstract

Despite the accumulated knowledge on the modeling and design of offshore structures of various types in the last decades, new challenges are encountered when addressing the behavior of marine renewable energy (MRE) systems. Wave energy converters, tidal turbines or offshore wind turbines need dedicated design methodologies, experimental procedures and simulation tools to be developed from the existing state of the art. The presentation will be organized in three parts, addressing successively the specific problems of numerical modelling, model testing and full scale testing of marine renewable energy devices, on the basis of ongoing research programs in LHEEA Lab., Ecole Centrale de Nantes.

#### **Numerical modelling:**

Specific size and behavior of MRE systems results in the need for new theoretical and numerical models, able to tackle: i) Nonlinear wave modelling ii) Accurate and efficient simulation of wave-structure interaction effects on small size floaters with large amplitude response iii) Farm effects on wave energy converters iv) Aero-hydro-elastic couplings on floating wind turbines v) Wake interaction effects between tidal or wind turbines, etc... An overview of ongoing research covering these problems will be given.

#### **Model testing:**

The specificities already listed before require special experimental procedures and measuring systems to be deployed, in order to capture as much of the physics as possible during the experiments. In addition, the relatively small size of the structures leads to potentially large scaling effects. The testing of MRE systems represents a large and growing part of the activities of the experimental facilities in LHEEA Lab. A project for the extension of these facilities, with MREs as one of the main targets, will be shortly presented.

#### **Full scale testing at sea:**

The need for full or moderate scale testing of realistic prototypes has motivated the deployment of a variety of open sea test sites for full scale testing of marine energy converters prototypes, mainly in Europe up to date. SEMREV, the first operational site of this type in France, is developed and operated by the LHEEA Lab. Informations will be given on: i) The different steps in the development of the test site, ii) Open sea testing as a complementary approach to model testing and numerical simulation, iii) New opportunities of interdisciplinary research offered by open sea testing



## **The Speaker: Professor Pierre Ferrant**

Prof. Pierre Ferrant graduated in 1981 from Ecole Centrale de Nantes, with a specialization in mechanical engineering and shipbuilding. In 1982, he obtained both a Master degree (DEA) in mechanical engineering, with a major in ocean engineering, and a specialized engineer degree from the SSHNA (Section Special d'Hydrodynamique Navale Avancée). He defended his doctoral thesis in 1988, on the numerical simulation of nonlinear wave-body interactions. He was awarded a HDR (Habilitation à Diriger les Recherches) in 2006.

In 1988, after several positions of research assistant in Ecole Centrale de Nantes, P. Ferrant joined SIREHNA, a start-up from Ecole Centrale de Nantes, in which he was responsible for the development of nonlinear simulation methods for ocean waves and wave-structure interactions.

He joined Ecole Centrale de Nantes as an assistant professor in 1998, with the task of developing the experimental activities in the newly extended hydrodynamic facilities (Towing tank 150m x 5m x 3m, Ocean engineering basin 50m x 30m x 5m). He was promoted full professor in 2008, and first class professor in 2013. Since 1998, he has held different positions in ECN: Scientific responsible for the development of experimental activities in hydrodynamics since 1998, deputy head of the research team 'Hydrodynamics and Ocean Engineering of the Fluid Mechanics Lab of Ecole Centrale de Nantes (LMF – UMR6598) (2004-2012). In the period 2010-2012, he managed the restructuration of the LMF, with the creation of the new laboratory, LHEEA, standing for 'Laboratoire de recherche en Hydrodynamique, Energétique et Environnement Atmosphérique'. P. Ferrant is director the LHEEA lab. since 2012.

Prof. Pierre Ferrant is an expert in free surface flows, ocean waves modelling and wave structure interactions, using both numerical and experimental approaches. He is serving national and international expert groups, and is member of the Advisory Council of ITTC since 2011. He is also associate editor of a number of international scientific journals.

Prof. Pierre Ferrant has supervised 25 PhD theses and has published more than 200 papers in international journals, book chapters, or refereed conference proceedings.

Prof. Pierre Ferrant has been responsible for the specialization in ocean engineering in Ecole Centrale de Nantes from 2003 to 2012. He is responsible in ECN for the Erasmus Mundus Master Program EMShip, opened in 2010, an international master with 5 other European universities, giving a higher education in the design of ships and offshore structures.



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