

Training school "Numerical modelling of WEC using SPH models"

Campus de Ourense, Universidade de Vigo, Spain

22/01/2020-23/01/2020

Description

This training school aims to give a good introduction about the meshless particle methods based on SPH (Smoothed Particle Hydrodynamics) methodology and its benefits in the simulation of Wave Energy Converters (WECs). SPH is an ideal technique to simulate free-surface flows and presents several advantages compared with mesh-based methods to simulate violent wave-structure interactions. There is no special treatment to detect the free surface so large deformation can be efficiently treated since there is no mesh distortion. Other important advantage is that moving complex boundaries and interfaces are easily handled

The open-source code DualSPHysics has been designed to use SPH for real engineering problems. The latest version of DualSPHysics includes, in the same meshless framework, the functionalities to study the wave-structure interaction, the mooring forces and the numerical behaviour of the Power Take-Off (PTO) system. Mooring forces are solved by the library MoorDyn that has been also coupled with DualSPHysics. PTO (and mechanical constraints of the device) can be now simulated using the coupling with the multiphysics library Project Chrono. This implementation allows for the efficient treatment of kinematic restrictions with user defined dynamic properties such as friction and restitution coefficients, restitution forces from spring and damper systems and user-imposed forces and trajectories.

The efficiency of different WECs can be studied by computing the hydrodynamic response of the devices interacting under different wave conditions. The survivability of the devices will be analysed in terms of the motions of the device and the mooring tensions at the anchors (and fairleads).

The course will include lectures about: i) basis of SPH method; ii) advantages & disadvantages comparing with mesh-based CFD models; iii) description of DualSPHysics code and latest developments; iv) applications of DualSPHysics in coastal engineering with focus on WECs.

In addition, practical session is also organised where delegates will learn how to run simulations following some examples of: i) wave generation and propagation, ii) waves interacting with floating only heave absorber, iii) waves interacting with Oscillating Wave Surge Converter (OWSC), iv) waves interacting with devices similar to Pelamis.

Outputs

Delegates will be trained about the use of the meshless numerical model named DualSPHysics that solves not only the non-linear interaction between waves and structures (fixed and floating) but also the mechanical constraints present in the PTOs and forces by mooring lines. The principle output from the Training School is the development of explicit knowledge of numerical modelling of WECs. This includes both the course content as well as the development of personal links for the Training School trainees that can be reinvested in other COST Action activities.

Trainers

Prof. Aleksander Grm	University of Ljubljana, Slovenia
Prof. Moncho Gómez Gesteira	University of Vigo, Spain
Dr. Alejandro Crespo	University of Vigo, Spain
Dr. José M. Domínguez	University of Vigo, Spain
Dr. Corrado Altomare	Universitat Politecnica de Catalunya, Spain

Course content

Day 1: 22nd January 2020		
Time	Content	Trainer
08:30-09:00	Registration	
09:00-09:30	Numerical hydrodynamic modelling for WECs	Prof. Aleksander Grm
09:30-10:30	The Smoothed Particle Hydrodynamics method	Prof. Moncho Gómez Gesteira
10:30-11:00	Coffee break	
11:00-11:45	The DualSPHysics code	Dr. José M. Domínguez
11:45-12:30	Applications in coastal engineering	Dr. Corrado Altomare
12:30-13:00	Introduction to practical session	Dr. Alejandro Crespo
13:00-15:00	Lunch	
15:00-18:00	Practical session I: Dam-break, Regular waves	DualSPHysics team

Day 2: 23rd January 2020		
Time	Content	Trainer
09:00-09:30	Coupling with Chrono and MoorDyn	Dr. Alejandro Crespo
09:30-10:30	“Your own experience with SPH”	Early Stage Researchers
10:30-11:00	Coffee break	
11:00-13:00	Practical session II: Point absorber, Moored device	DualSPHysics team
13:00-15:00	Lunch	
15:00-18:00	Practical session III: OWSC, Pelamis	DualSPHysics team
13:00-15:00	Closure	

Venue

The course will take place in “Campus da Auga Building”

Rúa Canella da Costa da Vela, 12, 32004 Ourense

<https://goo.gl/maps/1Kbuqpk2YzwBHyZCA>

Travel

Airports:

Madrid airport (MAD) is a very good possibility because it is well communicated with Ourense by [train](#) (4 hours).

The two closest (about 100km) international airports to Ourense are: Santiago (SCQ) and Vigo (VGO).

From Madrid to Ourense:

The Airport is connected by [Metro](#) with the railway “Chamartín” station, it takes about 45-50 min and the cost is 4.5-5 euros (or you can also take a taxi).

Train Madrid-Ourense: It takes about 4h. You can buy the ticket in [renfe.com](#). The ticket price (one-way) ranges from 18 euros in tourist and 59 in business. It is possible to take a round ticket (72 euros).

From Santiago airport to Ourense:

There is a [Bus route](#) between the Airport and Santiago, stopping at different points in the city, including the railway and bus station. Taxi is another possibility (21 euros).

Train Santiago-Ourense takes 38 min. More information in [renfe.com](#).

From Vigo airport to Ourense:

In this case the best option is to take a taxi, the price is about 100 euros (one way) and it takes about 1 hour.

Once in Ourense: the best option is to take a taxi to your hotel, about 5-7 euros.

Accommodation

Ourense has multiple hotels ideally located. Here you can find a list (of course, not complete) of the possibilities for your accommodation. We recommend to book your room as soon as possible. The price range is for a double room.

<60 euros:

[Hotel Irixo*](#) (20 min by foot)

[Hotel Zarampallo*](#) (20 min by foot)

[Hotel Miño*](#) (20 min by foot)

[Hotel Altiana**](#) (20 min by foot)

[As Burgas Residence Hall](#) (2 min by foot)

60-100 euros:

[Hotel Princess****](#) (12 min by foot)

[Hotel Francisco II****](#) (12 min by foot)

[NH Ourense****](#) (8 min by foot)

[Hotel Carris Cardenal Quevedo****](#) (8 min by foot)

Funding Application Details

Applicants are invited to apply for a WECANet Training Course Grant of 500€ towards travel and subsistence cost incurred to attend this course. Early Stage Researchers, PhD students and MSc students in wave energy are eligible to apply for a grant as trainee in order to participate to the WECANet Training Course.

Eligible Trainees are:

- Trainees from COST Full Members / COST Cooperating Member
- Trainees Action MC Observers from Approved NCC Institutions
- Trainees from Approved European RTD Organisations.

The criteria for COST Action support can be found on the COST Action Vademecum.

(<http://www.cost.eu/Vademecum>). Any costs over 500€ must be covered by the applicant. The Grant will be award after verified attendance at the course. A total of 25 WECANet Training Course Grants are available to support attendance of this Training Course.

Applications for Training Course Grants

Applications can be made to attend the Training Course and for the Grant on-line at <https://forms.gle/168Y6KKQtJhZrs139>

Evaluation and granting of Training Course Grants

The evaluation of WECANet Training Course Grant applications and preselection of Grantees will be performed by the Action's Training Course Coordinator/Committee on behalf of the Management Committee of the WECANet COST Action, who will be invited to approve a list of preselected Grantees. The selection of applicants is based on the potential value of the course to the applicant and the applicant's institution. The selection also considers the COST policies on promoting gender balance, enabling Early Career Investigators and broadening geographical inclusiveness.

EVALUATION CRITERIA FOR TRAINING COURSE GRANT APPLICATIONS

WEIGHT

Potential benefits to applicant	40 points
Potential benefits to applicant's institution	30 points
COST policies: promoting gender balance	10 points
COST policies: Early Career Investigators COST	10 points
COST policies: Broadening geographic inclusiveness (applicant based at ITC country)	10 points

Information on COST policies is available through <http://www.cost.eu/Vademecum>.

Key Dates

Deadline for applications to be submitted: 1st November 2019

Notification of funding application outcome: 11th November 2019

Training course: 22nd – 23rd January 2020

Further Information

For more information, contact Dr Alex Crespo alexbexe@uvigo.es