

International Centre for  
Numerical Methods  
in Engineering

CIMNE<sup>R</sup>

Annual Report  
**2017**

**30 YEARS: 1987 - 2017**  
GENERATING KNOWLEDGE AND SOLUTIONS

# Annual Report

# 2017

**CIMNE<sup>®</sup>**

GENERATING KNOWLEDGE  
AND SOLUTIONS

*Since 1987*

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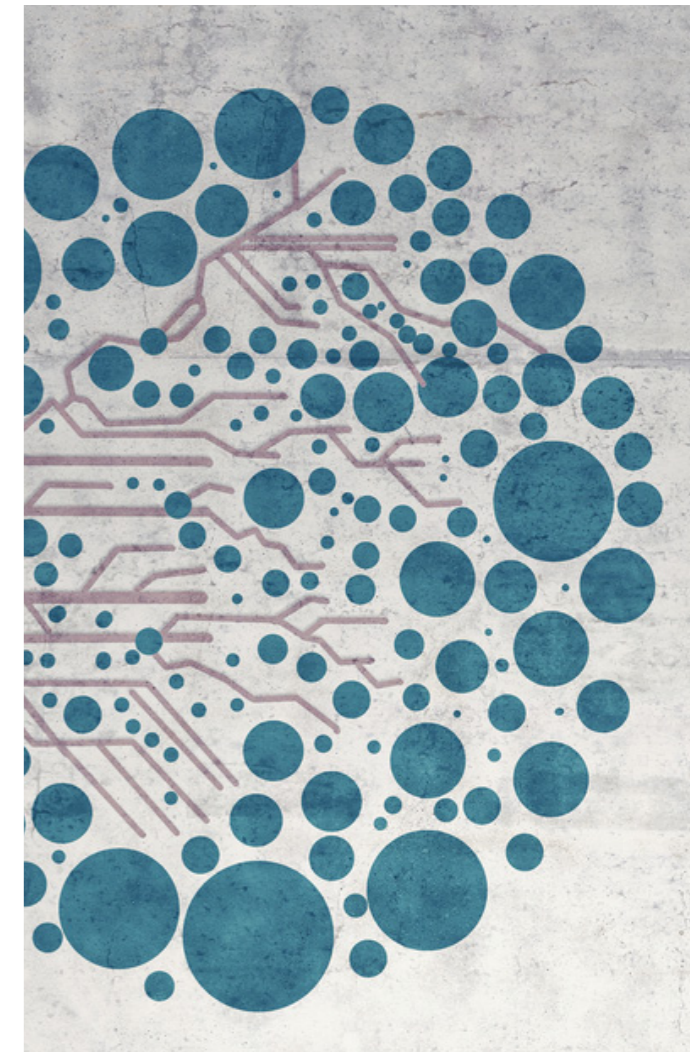
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# About CIMNE

## Director's letter



**Eugenio Oñate** (onate@cimne.upc.edu)  
Executive Vicepresident and Director of CIMNE

The International Centre for Numerical Methods in Engineering (CIMNE) was created in April 1987. In 2017, CIMNE celebrated its 30th anniversary.

CIMNE's mission is the development and dissemination of original research in the field of Numerical Methods in Engineering (NME), the education of researchers and the transfer of the research outputs to industry.

CIMNE is a leader as an international centre of excellence in the field of NME through four main action vectors:

1. Excellence in research on NME for multidisciplinary engineering applications, in terms of scientific outputs and software-based tools.
2. International dimension.
3. Active participation and management in scientific societies.
4. Commitment with technology transfer to industry.

Research at CIMNE focuses on the development of NME of interest to the following scientific fields: structural mechanics, geomechanics, fluid dynamics, material sciences, optimization, biomechanics coupled multi-physics processes and high performance computing. Applications include problems in civil, mechanical, aeronautics, naval/marine, biomedical and environmental engineering, energy efficiency and fusion technology, among others.

Since 1987 CIMNE has evolved to become a prestigious international research centre on NME. Its research staff (90% of whom are engineers) includes (by April 2018) 21 Full Research Professors, 11 Associate Research Professors, 11 Assistant Research Professors, 19 Postdocs, 34 PhD Students, 5 Staff Scientists, 43 Research Engineers, 18 Visiting Researchers and 30 Administration Staff from 23 countries.

Several researchers of CIMNE (most of them in the two upper research categories) are faculty members of the Technical University of Catalonia (UPC) and develop their research duties in CIMNE. These distinguished affiliated researchers play an important role as liaison between researchers at different groups of UPC and CIMNE.

### RESEARCH PRIORITIES AND APPLICATIONS

The priorities of CIMNE for research excellence target new NM and software codes to help engineers to better predict, design and optimize systems affecting our lives, including our environment, our security and safety, and the products we use and export. Indeed these goals can only be attempted from a multidisciplinary perspective.

Some relevant problems where the NMs developed at CIMNE are applied include: structural analysis of constructions and vehicles; safety of structures to natural hazards; geotechnical engineering and ground water flow; oil and gas engineering; thermal-mechanical analysis of structures and mechanical systems; metal forming processes (sheet forming, casting, welding, additive manufacturing, machining, etc.); shape and material optimization; aerodynamics of aircrafts, sail boats and road vehicles; blast, crashworthiness and impact problems; ship hydrodynamics; analysis of coastal and offshore structures; flow of granular materials in the mining, construction, food and pharmaceutical industries and fusion technology, among other applications.

### NEW FOCUS OF CIMNE ON TERRITORY AND SUSTAINABILITY

On December 2017 CIMNE was incorporated under the auspices of the Department of Territory and Sustainability (DTES) of the Catalanian Government. This circumstance will strengthen the research activities of CIMNE of interest to the civil and environmental engineering sector with a focus on applications to predictive territory management, smart infrastructures, water resources, energy efficiency, transport and mobility and environmental quality.

### ORGANIZATION OF RESEARCH

Research in CIMNE is structured in research lines (RLs) covering several challenging topics applicable to different engineering disciplines. See current CIMNE RLs at the "Research" section of this report.

Researchers at CIMNE carry out their activity within Research and Technical Development (RTD) Groups managed



by a Group Leader. The research activities are coordinated by one or more Principal Investigators (PIs). RTD Groups are gathered in RTD Areas that target fields such as Civil & Mechanical engineering, Transport (naval, aeronautics and land transport), Energy & Environment and Information and Communication Technologies.

### INTERNATIONAL PRESENCE

**CIMNE has established 2 legal international branches:** CIMNE Latin America (Santa Fe, Argentina); and CIMNE USA (Washington DC, USA) and has also set up an international network of Joint Labs (the Aulas CIMNE) with 29 members: 6 in Spain and 23 in Latin America; [aulas.cimne.com](http://aulas.cimne.com).

The International Association of the Aulas CIMNE (AIAC), created by CIMNE in 2015, aims to coordinating and fostering the activities of the Aulas CIMNE network. More information of AIAC can be found on Alliances Section of this report.

The International Association of the Aulas CIMNE (AIAC), created by CIMNE in 2015, aims to coordinating and fostering the activities of the Aulas CIMNE network.

### RESEARCH OUTPUTS

Since 1987 CIMNE researchers have published some 2,500 JCR journal papers, 46 text books, 82 edited books, 250 monographs, 415 RTD reports, 643 technical reports and organized 210 international scientific conferences. CIMNE has 6 patents.

CIMNE scientists are chief editors or associated editors of 6 international JCR journals and members of the editorial board of 15 JCR journals.

Since 1987 CIMNE researchers have taken part in 1,700 RTD projects (including 10 research projects funded by the European Research Council).

In the same period CIMNE managed 2 international MSc courses, 2 PhD programs and organized an average of 2 short courses and 23 seminars annually. Its research staff has supervised 160 PhDs and some 720 MSc students.

Research at CIMNE has led to many software codes that are useful for solving specific problems in each of the engineering areas addressed. The **“CIMNE Products” section** of this report lists the main software codes developed at CIMNE in 1987-2017.

### CITATION RECORDS

By April, 2018, CIMNE scientists had an h index of 111 and 57,313 citations (h=111 and some 26,715 citations since 2013); *Source: Google Scholar*. Scopus records 537 JCR papers and 4,084 citations for the period 2012-17.

Several CIMNE researchers are ranked in the first positions of the ranking for *Mathematics & Interdisciplinary Applications* and others of engineering created by Group for the Dissemination of the h Index (further information of CIMNE benchmarking at [indice-h.webcindario.com](http://indice-h.webcindario.com)).

By February 2018 the *Ranking Web of World Research Centres* ([research.webometrics.info](http://research.webometrics.info)) reports that 1/21 CIMNE researchers are among the 1000/50000 best scientists in Spain in terms of citations ([webometrics.info/en/node/24](http://webometrics.info/en/node/24)).

### MANAGEMENT OF SCIENTIFIC ORGANIZATIONS

**CIMNE is the permanent Secretariat of the following scientific organizations:**

- International Association for Computational Mechanics ([iacm.info](http://iacm.info), 1994-2016)
- European Community on Computational Methods in Applied Sciences ([eccomas.org](http://eccomas.org))
- Spanish Association for Numerical methods in Engineering ([semni.org](http://semni.org))
- Pilot Centre of the European Research Community in Flow, Turbulence and Combustion ([ercocftac.org](http://ercocftac.org))
- Unesco Chair on Numerical Methods in Engineering of UPC ([cimne.com/unesco](http://cimne.com/unesco)). This is the first UNESCO Chair in the world, created in 1989.

### TECHNOLOGY TRANSFER

**CIMNE has a vocation for technology transfer.** Since 2001 it has launched 20 spin-off companies (16 companies in 2012-17). These companies market a number of products emanating from CIMNE technology. Details of the companies are given in **Section 3.2** and in [cimne.com/spin-offs](http://cimne.com/spin-offs).

**CIMNE has a vocation for technology transfer.** Since 2001 it has launched 20 spin-off companies (16 companies in 2012-17)



The CIMNE Conference Bureau Dpt., acts as a professional organizer of international events of scientific and technical interest to CIMNE.

### AWARDS TO CIMNE AND ITS SCIENTISTS

Since 1987 CIMNE and its scientists have received some 70 awards by national and international organizations. The list of CIMNE Awards can be seen **in page 88** and in [cimne.com/awards](http://cimne.com/awards).

### ORGANIZATION OF SCIENTIFIC CONFERENCES

The organization of international scientific conferences and workshops is a relevant activity of its research strategy. The CIMNE Conference Bureau Dpt., acts as a professional organizer of international events of scientific and technical interest to CIMNE.

Since 1987 CIMNE has organized some 200 international events. In 2017 CIMNE organized 14 international conferences on different topics related to NME.

Some 20 events are planned for 2018-2020. Further details of future and past events can be found in **Section 5.2** of this report and in [congress.cimne.com](http://congress.cimne.com).

### RTD ALLIANCES

CIMNE is a founding partner of the FLUMEN Institute in River Dynamics and Hydraulic Engineering ([www.flumen.es](http://www.flumen.es)).

On July 2016 CIMNE completed the construction of a new building of 2,270 m<sup>2</sup> that hosts the premises of the Flumen Institute and spaces for CIMNE and UPC researchers. The construction of the building was co-funded by European Regional Development Funds.

On July 2017 CENIT (Centre for Innovation in Transport, [cenit.es](http://cenit.es)) merged its current structure into that of CIMNE, thus broadening the scope of the research activities of CIMNE in the field of transport engineering.

CIMNE has established research alliances with numerous prestigious institutions around the world.

A compilation of the most outstanding collaborations can be found in the **“Alliances” section** of this report.

### DISSEMINATION AND COMMUNICATION STRATEGY

Dissemination and communication tasks in CIMNE involve various activities to bring the research outcomes to the attention of as many relevant people as possible.

The Publications Dpt. ([cimne.com/publications](http://cimne.com/publications)) of CIMNE publishes research and technical reports, monographs, text and edited books and software codes. The Aulas CIMNE network is also used for dissemination actions.

### SCIPEDIA: CIMNE STRATEGY TOWARDS THE HOLISTIC 4.0 OPEN-ACCESS SCIENCE

In March 2016 CIMNE, via its spin-off company Scipedia SL, launched the innovative web platform Scipedia. Scipedia ([scipedia.com](http://scipedia.com)) provides free publishing and Open Access services to disseminate the results of scientific and technical work.

CIMNE has implemented an (almost) self-sustainable financial model with limited annual public funding.

### A SELF-SUSTAINED ORGANIZATION

CIMNE has implemented an (almost) self-sustainable financial model with limited annual public funding.

This has been possible by combining public seed funding (mainly from the Generalitat de Catalunya) with income from RTD projects (sponsored by public and private organizations), dissemination activities, revenues from its spin-off companies and an efficient management structure. Since 1987 the self-obtained income obtained each year by CIMNE has amounted (in average) to 95% of its total annual budget.

I finish these lines by thanking CIMNE staff and its many partners and friends in universities, research centres and industry worldwide for their cooperation that contributes in making of CIMNE a centre of reference in its field.

**Eugenio Oñate**  
Executive Vicepresident of CIMNE

# CIMNE in numbers

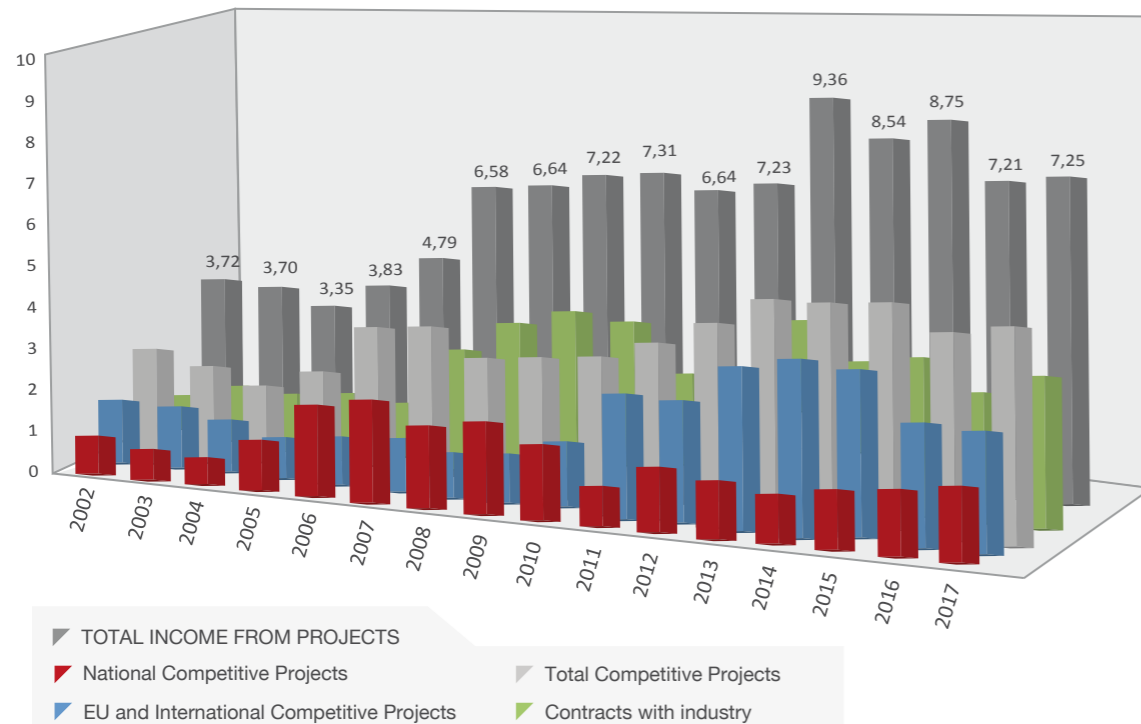
ACTIVITIES	2017	STAFF / POSITION TITLE	2017
Postgraduate Studies	4	Management Staff	3
Conferences	15	Administration Staff	30
Seminars	15	Research Staff	67
Courses	12	Full Research Professors	21
Coffee Talks	12	Associate Research Professors	11
Publications	123	Assistant Research Professors	11
Books	0	Staff Scientists	5
Monographs	8	Post Docs	19
Research Reports	2	Research Engineers	43
Papers in Journals	113	Research Students	58
Spin-off Companies	16	PhD Students	34
Aulas CIMNE	29	Master Students	22
Patents	0 (5)	Ungraduate Students	2
Contracts with Industry	67 (121)	<b>TOTAL Staff</b>	<b>201</b>
Competitive Projects	28 (90)		
National Projects	20 (54)		
International Projects	8 (36)		

Information at April 11<sup>th</sup> 2018

In brackets, the total number of on-going contracts and RTD projects.

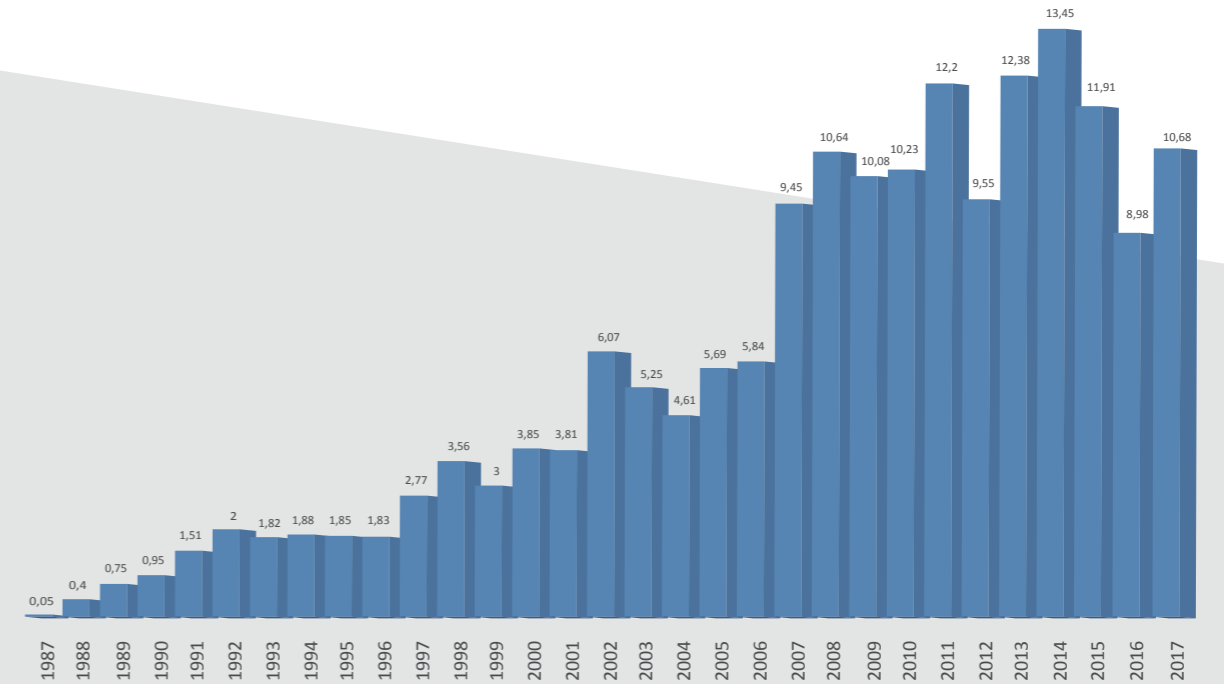
## Income from projects (2002-2017)

in M€



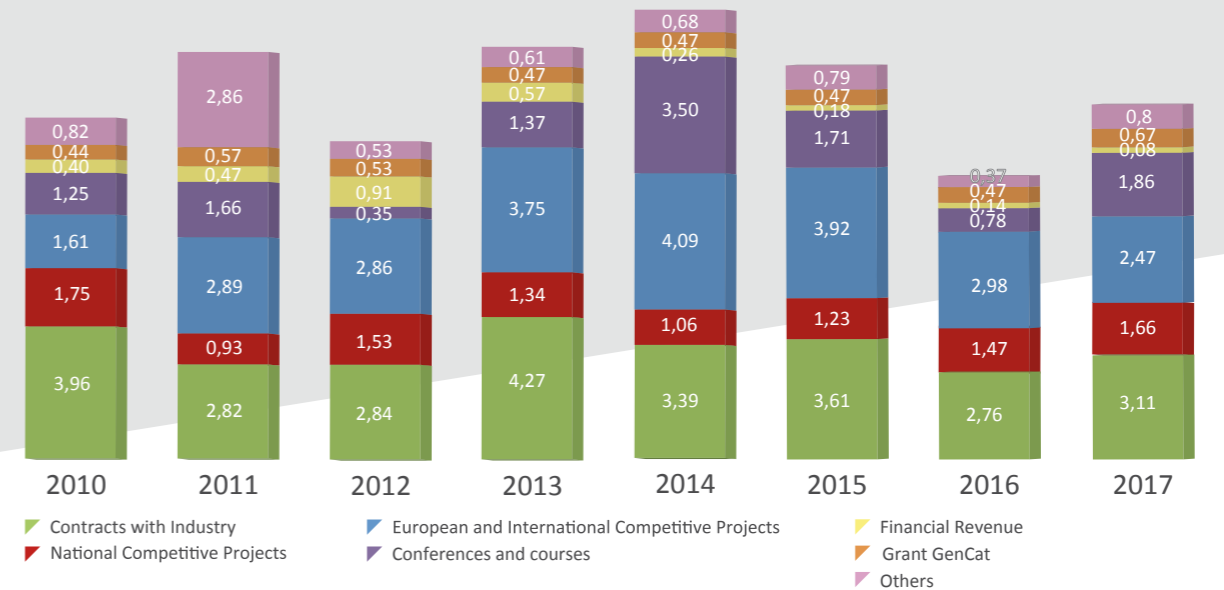
## Evolution of Annual income (1987-2017)

in M€



## Split of Annual income (1987-2017)

in M€



# Governing bodies

## Governing council(\*)

### President

**Mr. Damià Calvet**

President Departament de Territori i Sostenibilitat  
(Generalitat de Catalunya)

*Representing Catalan Government*

**Ms. María Matilde Villarroya**

Directora General d'Indústria  
(Generalitat de Catalunya)

**Mr. Isidre Gavin**

Secretari d'Infraestructures i Mobilitat  
(Generalitat de Catalunya)

**Mr. Francesc Subirada**

Director General de Recerca  
(Generalitat de Catalunya)

### Vice-President

**Dr. Eugenio Oñate**

Catedràtic (UPC · BarcelonaTech)

*Representing UPC · BarcelonaTech*

**Dr. Francesc Torres**

Rector (UPC · BarcelonaTech)

**Dr. Gabriel Bugeda**

Vicerector of Scientific Policy (UPC · BarcelonaTech)

**Dr. Pedro Díez**

Catedràtic (UPC · BarcelonaTech)

*Representing UNESCO*

**Dr. Lluís Ramallo**

President of the Spanish Commission of UNESCO

## Executive council(\*)

### President

**Dr. Eugenio Oñate**

Catedràtic (UPC · BarcelonaTech)

### Members

**Mr. Xavier Baulies**

Departament de Territori i Sostenibilitat, Generalitat de Catalunya

**Dr. Jordi Berenguer**

UPC · BarcelonaTech

**Dr. Esteve Codina**

UPC · BarcelonaTech

**Ms. Francisca García-Sicilia**

UNESCO

**Dr. Antonio Gens**

UPC · BarcelonaTech

**Dr. Alejandro Josa**

UPC · BarcelonaTech

**Dr. Juan Miquel**

UPC · BarcelonaTech

**Dr. Juan Jesús Pérez**

UPC · BarcelonaTech

**Dr. Estanislau Roca**

UPC · BarcelonaTech

**Dr. Lluís Rovira**

Institució Centres de Recerca de Catalunya

**Ms. Ana Simon**

ACCIÓ, Generalitat de Catalunya



Meeting Scientific Advisory Council, November 8th, 2017.

**From left to right - Sitting down:** Dr.-Ing. D. Knörzer (former EC Officer in Aeronautics), Prof. D.R.J. Owen (Swansea Univ., UK), Prof. J. Bonet (Univ. of Greenwich) and Prof. G. von Voigt (Leibniz Univ., Germany). **Standing up:** Prof. E. Oñate (CIMNE, Spain), Prof. M. Turró (Technical Univ. of Catalonia, Spain), Prof. B. Schrefler (Univ. of Padova, Italy), Prof. M. Kleiber (Polish Academy of Sciences, Poland), Prof. H. A. Mang (Technische Universität Wien, Austria), Prof. Ekkehard Ramm (Univ. of Stuttgart, Germany), Prof. M. Papadrakakis (National Technical Univ. of Athens, Greece), Prof. M. Casteleiro (Univ. of La Coruña, Spain).

## Scientific Advisory Council

### Chairman

**Dr. Roger Owen**

Swansea University, UK

**Prof. Bernd Kröplin**

University of Stuttgart, Germany

**Prof. Ekkehard Ramm**

University of Stuttgart, Germany

### Members

**Prof. Javier Bonet**

University of Greenwich, UK

**Prof. Rainald Löhner**

George Mason University, USA

**Prof. Bernhard Schrefler**

University of Padova, Italy

**Prof. Manuel Casteleiro**

Universidade da Coruña, Spain

**Prof. Herbert A. Mang**

Technische Universität Wien, Austria

**Prof. Mateu Turró**

Technical University of Catalonia, Spain

**Prof. Michael Kleiber**

Polish Academy of Sciences, Poland

**Prof. Xavier Oliver**

Technical University of Catalonia, Spain

**Prof. Gabriele von Voigt**

Leibniz University, Germany

**Dr.-Ing. Dietrich Knörzer**

Former EC Officer

**Prof. Manolis Papadrakakis**

National Technical University of Athens, Greece

**Prof. Peter Wriggers**

Leibniz University, Germany

\*Information at June 21<sup>st</sup> 2018



## About CIMNE # Organization chart

**Governing Council**  
Chair: Conseller del Dpt. de Territori i Sostenibilitat (Generalitat de Catalunya)

**Executive Council**  
Chair: E. Oñate

**Scientific Advisory Council**  
Chair: R. Owen

**Director**  
E. Oñate

**Scientific Director**  
P. Díez

**General Manager**  
A. Font

## Research and Tech Development

## Administration

### RTD Areas and Groups

#### CIVIL ENGINEERING AREA

##### Fluid Mechanics Group

Leader - R. Codina and S. Idelsohn

##### Geomechanics Group

Leaders - A. Gens and N. Pinyol

##### Industrial Processes Group

Leader - M. Chiumenti

##### Structural Mechanics Group

Leader - E. Oñate

#### TRANSPORT AREA

##### Aerospace Engineering Group

Leader - J. Pons

##### CENIT - Innovation in Transport Group

Leader - S. Saurí

##### Naval and Marine Engineering Group

Leader - J. García

#### COMPUTATIONAL AND INFORMATION TECH. AREA

##### Information and Technology Group

Leader - J. Jiménez

##### Large-Scale Scientific Computing Group

Leader - S. Badia

##### Pre and Post-Processing Group

Leader - A. Coll

#### ENERGY AND ENVIRONMENT AREA

##### Building, Energy and Environment Group

Leader - J. Cipriano

##### Risk Assessment Group

Leader - A. Barbat and L. Carreño

#### ACCOUNTANCY AND FINANCES

Leader - M.C. Linares

#### COMMUNICATION

Leader - L. Bermúdez

#### CONGRESS BUREAU

Leader - C. Vizcaya

#### HUMAN RESOURCES

Leader - M. Linares

#### POST-GRADUATE TRAINING

Leader - L. Zielonka

#### PROJECT MANAGEMENT

Leader - S. Pérez

#### PUBLICATIONS

Leader - M.J. Samper

#### SYSTEMS

Leader - M. Alonso



## About CIMNE # CIMNE Staff

# CIMNE Staff

This is the list of all persons who collaborate with CIMNE at April 11<sup>th</sup> 2018

## Research and Technology Development

#### FULL RESEARCH PROFESSORS

Carmen Andrade  
Carlos Agelet de Saracibar  
Eduardo Alonso  
Santiago Badia  
Alex Barbat  
Gabriel Bugada  
Miguel Cervera  
Michele Chiumenti  
Ramón Codina  
Pedro Díez  
Julio García  
Antonio Gens  
Antonio Huerta  
Sergio Idelsohn  
Juan Miquel  
Xavier Oliver  
Sergio Oller  
Sebastián Olivella  
Eugenio Oñate  
Javier Príncipe  
Riccardo Rossi

#### ASSOCIATE RESEARCH PROFESSORS

Juan Carlos Cante  
Josep M. Carbonell  
Liliana Carreño  
Daniel di Capua  
Roberto M. Flores  
Alejandro Josa  
Antonia Larese  
Xavier Martínez  
Núria Pinyol  
Pavel Ryzhakov  
Francisco Zárata

#### ASSISTANT RESEARCH PROFESSORS

Pedro Arnau  
Joan Baiges  
Jordi Cipriano  
Pooyan Davdand  
Joaquín A. Hernández  
Oriol Lloberas  
Jaime E. Martí  
Julio M. Martí  
Alberto F. Martín  
Jordi Pons  
Borja Serván

#### POST DOCS

Lucía Barbu  
Manuel A. Caicedo  
Abel Coll  
Jordi Cotela  
Ignasi de Pouplana  
Narges Dialami  
Alessandro Franci  
Eloi Gabaldón  
Laura González  
Joaquín Irazábal  
Bàrbara Llacay  
Anna Ramón  
Marcelo Raschi  
Fernando Salazar  
Emilio Salsi  
Eduardo Soudah  
Francesc Verdugo  
David J. Vicente  
Xue Zhang

#### RESEARCH ENGINEERS

Ernest Bladé  
Marc Busquets  
Jesús Carbajosa  
Alexis Cid  
Jonathan Colom  
Martí Coma  
André Conde  
Xavier Cubillas  
Gaia di Carluccio  
Josep Dolz  
Enrique Escolano  
Alberto Ferriz  
Óscar Fruitós  
Enrique Escolano  
Javi Gárate  
José Manuel González  
Jordi Jiménez  
José Santos López  
Mercè López  
Andreu Marí  
Adrià Melendo  
Anna Monros  
Pau Morales  
José Luis Oñate  
Gilbert Peffer  
Domingo Peñalver  
Jorge Suit Pérez  
Ángel Diego Priegue  
Sara Ahetze Puignau  
Anaïs Ramos  
Ester Raventós  
Jaume Roca  
Francisco Rodero



## Research and Technology Development

**RESEARCH ENGINEERS**

(Cont.)

Carlos Roig  
 Javier San Mauro  
 Sergi Saurí  
 Andreu Tarracó  
 Alberto Tena  
 José Ignacio Torres  
 Javier Tous  
 Sergio Valero  
 Ignacio Valero  
 Claudio Zinggerling

**RESEARCH STUDENTS**

**PhD Students**

(Cont.)

Alejandro Núñez  
 Marc Olm  
 Jaume Palmer  
 Miguel Adolfo Pasenau  
 Ivan Puig  
 Albert Puigferrat  
 David Roca  
 Daniel Ruiz  
 Roger Ruiz  
 Núria Sau  
 Deniz Cagri Tanyldiz  
 Daniel Tarragó  
 Erdem Toprak  
 Saeed Tourchi  
 Claudia Juliana Villarraga  
 María Teresa Yubero

**Master Students**

Matías Alonso  
 Pradeep Kumar Bal  
 Miriam Benítez  
 Javier Casanova  
 Inocencio Castañar  
 Jesús Conde  
 Alejandro Cornejo  
 Nikhil Dave  
 Benedetto Grillone  
 Sergio Jiménez  
 Sanath Keshav  
 Sumit Maharjan  
 Luan Malikoski  
 Pere Antoni Martorell  
 Chiluba Isaiah Nsofu  
 Rafael Pacheco

**RESEARCH STUDENTS**

**Master Students**

(Cont.)

Samuel Parada  
 Zahra Rajestari  
 Juan Pedro Roldán  
 Ahmed Sherif  
 Pablo Leonel Sierra  
 Boyi Ye

**Undergraduate Students**

Pol Baladas  
 Francesc Turón

**VISITING SCIENTISTS**

CIMNE promotes the visits of academics and researchers from around the world. Visiting Scientists at CIMNE in 2017:

**Scientists**

Amir Akhaveissy  
 Alberto Cardona  
 Alejandro Cosimo  
 Juan Giménez  
 Rafael Hernández  
 Carlos Aníbal Juárez  
 Rainald Löhner  
 Jorge López  
 Ecio Naves  
 Norberto Nigro  
 Kazuya Nojima  
 Jacques Periaux  
 Mauricio Pohl  
 Roberto Luis Roselló  
 Marc Secanell  
 Joao Henrique Silva  
 Mario Storti  
 Tang Zhili

**Students**

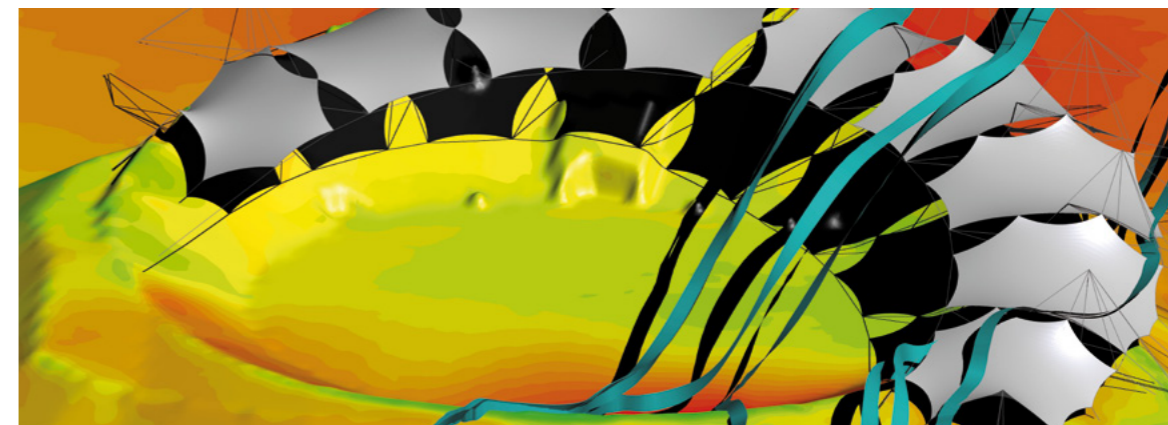
Fernando Cervantes  
 Kostas Giannis  
 Daniel Herrero  
 Elisa Magliozzi  
 Francesco Pellegrino  
 Liang Wang  
 Lie Zhijie  
 Yu Zhou

**RESEARCH STUDENTS**

**PhD Students**

Mauricio Alvarado  
 Ferran Arrufat  
 Ramón Barboza  
 Miguel Ángel Celigueta  
 Javier Cipriano  
 Agustín Cuadrado  
 Alessandro Fraccica  
 Joel Jurado  
 Pavlina Karagianni  
 Alexander Karkoulas  
 Peiman Khadivipannah  
 Miguel Ángel Manica  
 Miguel Maso  
 Vicente Mataix  
 Arisleidy Mesa  
 Arash Moaven  
 Luís Monforte  
 Laura Moreno

## Administration



**DIRECTOR**

Eugenio Oñate

**GENERAL MANAGER**

Anna Font

**SCIENTIFIC DIRECTOR**

Pedro Díez

Administration staff in CIMNE is formed by highly qualified professionals who address the increasing needs of researchers and scientific personnel in the centre.

**ACCOUNTANCY AND FINANCES**

M<sup>a</sup> Carmen Linares  
 (Head of Unit)  
 Valentín Catalán  
 Nuria Holgado  
 Cristina Luque  
 Carolina Obando  
 Paula Oliva

**COMMUNICATION**

Laura Bermúdez

**CONGRESS BUREAU**

Cristina Vizcaya  
 (Head of Unit)

Laia Aranda  
 Alessio Bazzanella  
 Mónica Camanforte  
 Marcela Silhankova

**DIRECTOR SECRETARY**

Mercè Alberich

**HUMAN RESOURCES**

Merce Linares  
 (Head of Unit)

Irene Latorre

**INTERNATIONAL BRANCHES**

Francisca García-Sicilia

**PROJECT MANAGEMENT**

Sandra Pérez  
 (Head of Unit)

Daniel Cuadrat  
 Marina de la Cruz  
 Francisco de la Rosa  
 Jon Rodríguez

**POSTGRADUATE TRAINING**

Lelia Zielonka  
 (Head of Unit)  
 Cristina Pérez

**PUBLICATIONS**

M<sup>a</sup> Jesús Samper

**SECRETARY**

Teresa Penalba

**SYSTEMS**

Miguel Alonso  
 (Head of Unit)

Alberto Burgos  
 Aitor Lázaro  
 Joaquim Lozano

**TECHNOLOGY TRANSFER**

Javier Marcipar



C1 Building at Campus Nord UPC Barcelona

## Where we are



C1 Building at Campus Nord UPC Barcelona

## Where we are

### Headquarters

#### Main premises at UPC

CIMNE's main premises are located at the heart of the North Campus of Universitat Politècnica de Catalunya · BarcelonaTech.

The offices are situated at the C1 Building, adjacent to the Civil Engineering School of UPC and occupy some 1,000 m<sup>2</sup> of modern office facilities and state of the art equipment with last generation computers linked via a fast intranet and a multicore cluster for parallel computing.

This space, created in 1987, hosts around 90 CIMNE researchers and the main administration offices.

#### CIMNE-BARCELONA

Campus Nord UPC, C1 Building  
C/ Gran Capità, S/N, 08034 Barcelona, Spain  
+34 93 401 74 95

#### B0 Building

In September 2014 CIMNE started the construction of a new building of some 2,000 m<sup>2</sup> in the North Campus of the Universitat Politècnica de Catalunya · BarcelonaTech.

The new B0 building, that also hosts the Flumen Institute, was completed **by the end of 2015**. Several CIMNE researchers moved to the new facilities during the first months of 2016. This new building is **equipped with modern experimental facilities for model scale testing of river dynamic and hydraulic problems** and it also provides work areas for researchers at the graduate level (master, doctoral and postdocs) and for senior researchers from CIMNE and UPC · BarcelonaTech.

#### CIMNE-B0

Campus Nord UPC, B0 Building  
C/ Gran Capità, S/N, 08034 Barcelona, Spain  
+34 93 401 09 50



B0 Building at Campus Nord UPC Barcelona



-  Aulas CIMNE
-  CIMNE Offices

### CIMNE premises

Apart from CIMNE's headquarters, located in Barcelona, CIMNE has six other branches: four premises in Spain (Castelldefels, Ibiza, Madrid and Terrassa) and two legal offices around the world (US and Latin America).

The worldwide presence of the research centre is also represented by the 29 Aulas CIMNE (Joint Labs with universities all around the world).

## Premises in Spain

### CIMNE - Terrassa



CIMNE offices in Terrassa (Barcelona, Spain) opened in 2001. The premises cover an area of 150m<sup>2</sup> and house part of the department of Building Energy and Environment Group (Bee-Group).

**Director:** J. Cipriano

#### CIMNE - TERRASSA

##### Campus de Terrassa UPC

Edifici GAIA (TR14)  
C/ Rambla Sant Nebridi, 22  
08222 Terrassa (Barcelona), Spain  
+34 93 789 91 69

### CIMNE - MADRID



CIMNE - MADRID started its activities in September 2007 and on May 2008 CIMNE opened its premises located in the centre of the city (150m<sup>2</sup>). The main goal of CIMNE Madrid is to build a strong research team in Madrid and foster the links between CIMNE, the Central Government of Spain, the Technical University of Madrid (UPM) and partner companies and research centres based in Madrid.

**Director:** F. Salazar

#### CIMNE - MADRID

Paseo General Martínez Campos, 41, 9<sup>o</sup>  
28010 Madrid, Spain  
Tel. +34 91 319 13 59

### CIMNE - Castelldefels



CIMNE's headquarters in the city of Castelldefels (Barcelona, Spain) were inaugurated on October 15th 2008. The facilities are located in the building CIMNE-C3 of the Mediterranean Technology Park of the UPC, and occupy 1,500m<sup>2</sup> in a new building constructed in collaboration with the UPC. The premises are shared with the Technical School of Castelldefels.

**Director:** J. Mora

#### CIMNE - CASTELLDEFELS

##### Campus del Baix Llobregat UPC

CIMNE Building C3  
C/Esteve Terradas, 5  
08860 Castelldefels, Barcelona, Spain  
+34 93 413 41 86

### CIMNE - IBIZA



CIMNE inaugurated the CIMNE - IBIZA branch in 2009. It has 80m<sup>2</sup> and is located in the city of Ibiza.

CIMNE Ibiza activities focus on the development and application of numerical methods and decision support systems to problems of interest to the environment and the sustainability of island communities.

**Director:** G. Molina

#### CIMNE - IBIZA

C/Bisbe Azara, 4, 3<sup>o</sup> 2<sup>a</sup>  
07800 Ibiza, Spain  
Tel. +34 97 193 11 94

# International branches

## CIMNE-USA (Washington DC, USA)

CIMNE-USA is an educational and scientific research organization, affiliated with the International Centre for Numerical Methods in Engineering (CIMNE).

The objective of CIMNE-USA is leading scientific research and development projects supported by government, foundations and industry sources.

The branch also carries out educational activities related to advanced numerical methods. It participates in national and international conferences and symposia and works jointly with Aulas CIMNE, in cooperation with US and international universities. CIMNE-USA also supports visiting scientists.



Dr. David Cranmer (on the left side photo), CIMNE US Acting Executive Director, is a senior scientist at the National Institute of Standards and Technology (NIST) and advisor of many US companies. Mr. Varadaraju (Raju) Gandikota (on the right side photo) is CIMNE USA Scientific Director. Ms. Francisca García-Sicilia coordinates the USA activities.

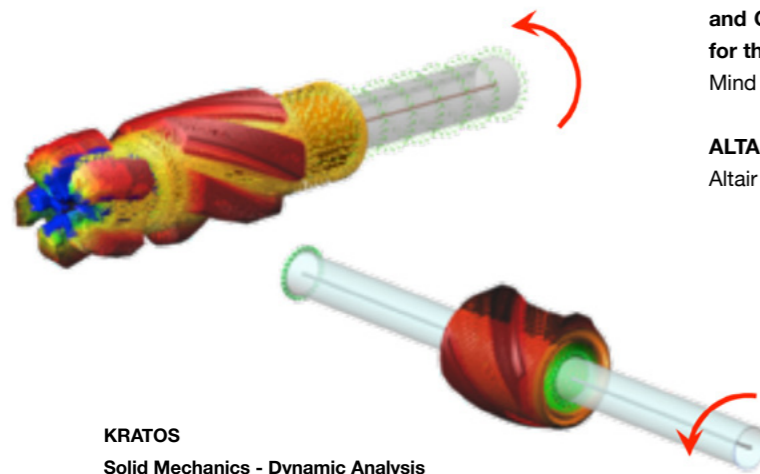
### Selected RTD Projects

**MUD MOTORS: Agreement between Mind Mesh LTD and CIMNE for the development of a software package for the computer simulation of Mud Motors.**

Mind Mesh — 01/11/2016 - 01/05/2018

**ALTAIR/KRATOS: Kratos App for Casting.**

Altair — 22/10/2015 - 22/07/2018



**KRATOS**  
Solid Mechanics - Dynamic Analysis

[www.cimne.com/usa](http://www.cimne.com/usa)

## CIMNE-Latin America (Santa Fe, Argentina)

The formal establishment of CIMNE in Latin America has been initiated by creating a Foundation to foster the activity of CIMNE in that region.

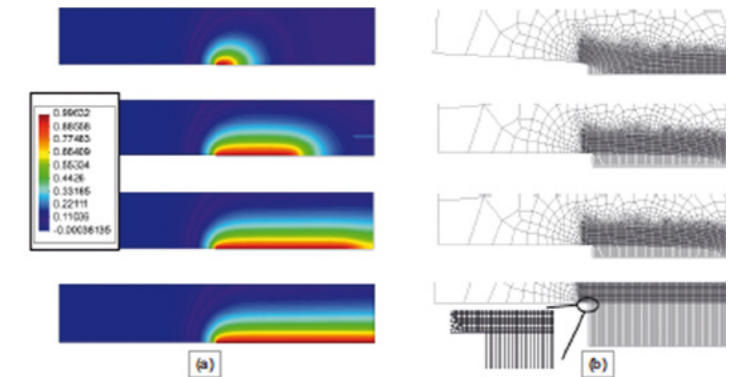
The CIMNE-Latin American Foundation (FCL) is located in the city of Santa Fe (Argentina), the place where the first CIMNE Classroom in the Latin American region was created in cooperation with University of Litoral.

Since its creation, the CIMNE-Latin American Foundation has developed a wide range of activities in Latin America related to training, research and dissemination of advances in numerical methods.

Many of these projects are developed with the support of CIMNE, Aulas CIMNE, universities and public organizations. The projects in which FCL participates can be classified into the following research areas:

- Engineering and Environment
- Industrial Processes
- Numerical Methods

FCL also takes part and organises courses, seminars, workshops, among others.



### COM-DES-MAT

Figure extract from the paper "A phase-field/gradient damage model for brittle fracture in elastic-plastic solids"

### Selected RTD Projects

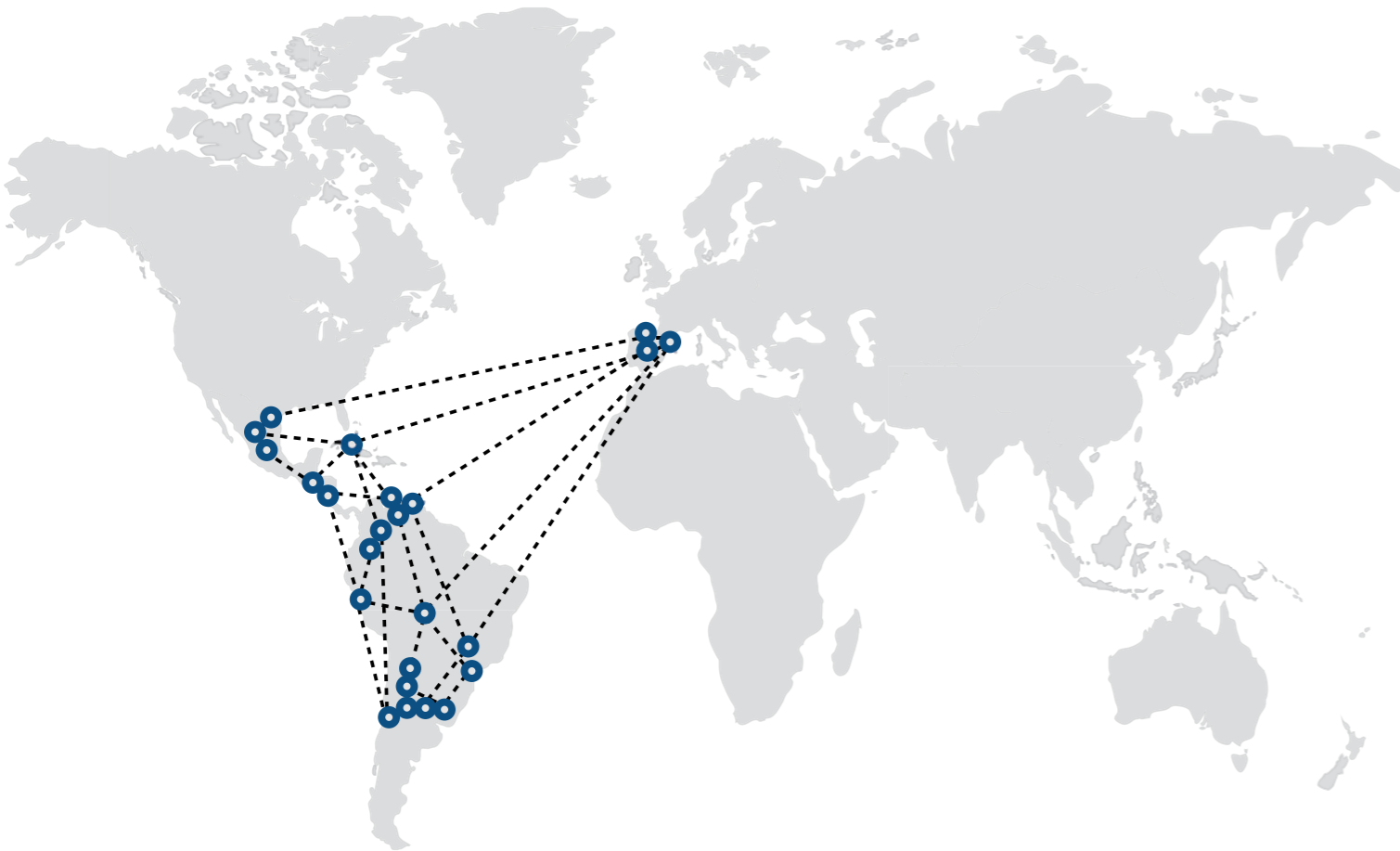
**COMP-DES-MAT: Advanced tools for computational design of engineering materials.** FP7 - Ideas - EC

01/02/2013 - 31/01/2018

**CIMNE BEE DATA URUGUAY: Contrato para la prestación de los servicios CIMNE BEE DATA en modo SAAS**

UTE Uruguay, Uruguay — 08/03/2016 - 08/05/2017

[www.cimne.com/fcl](http://www.cimne.com/fcl)



## Aulas CIMNE

Argentina	●●●●●●
Brazil	●●
Chile	●●
Colombia	●●●
Cuba	●●
El Salvador	●
Guatemala	●
Mexico	●●●●
Peru	●
Spain	●●●●●
Venezuela	●●

Aulas CIMNE are physical spaces (Joint Labs) for cooperation in education, research and technological development (RTD) activities created jointly by CIMNE and one or several universities.

The 29 Aulas CIMNE promote educational and training activities at graduate and postgraduate level and development of RTD projects in cooperation with companies around the world.

TOTAL: **29** AULAS CIMNE

### AULA FICH – CIMNE (Argentina)



**Universidad Nacional del Litoral**  
 Director: Gerardo Franck  
 Created on: October 2002  
 Activity: Applications of numerical methods to problems related to water resources, mechanical and computer engineering.

### AULA ITBA – CIMNE (Argentina)



**Instituto Tecnológico de Buenos Aires**  
 Director: Sebastián d'Hers  
 Created on: April 2015  
 Activity: Application development of numerical methods in the field of mechanical, naval, petroleum, chemical, electronics, electrical, industrial engineering and bioengineering.

### AULA IUA – CIMNE (Argentina)



**Instituto Universitario Aeronáutico**  
 Director: Carlos Sacco  
 Created on: September 2002  
 Activity: Applications of numerical methods to problems related to fluid mechanics, structures, heat transfer, etc.

### AULA UNER – CIMNE (Argentina)



**Universidad Nacional de Entre Ríos**  
 Director: José Di Paolo  
 Created on: March 2013  
 Activity: Applications of numerical methods to problems related to Bioengineering.

### AULA UNSA – CIMNE (Argentina)



**Universidad Nacional de Salta**  
 Director: Liz Nallim  
 Created on: April 2008  
 Activity: Development of computer models for application in civil engineering.

### AULA UNT – CIMNE (Argentina)



**Universidad Nacional de Tucumán**  
 Director: Guillermo Etse  
 Created on: November 2002  
 Activity: Development of computational models of bridges (degradation and repair mechanisms).

### AULA FEMEC – CIMNE (Brazil)



**Universidad Federal de Uberlândia**  
 Director: Sonia Goulart  
 Created on: April 2004  
 Activity: Forming process applications, structural design and biomechanics.

### AULA IFSP – CIMNE (Brazil)



**Instituto Federal de Educação, Ciência e Tecnologia de São Paulo**  
 Director: Écio Naves  
 Created on: July 2009  
 Activity: Applications of numerical methods in engineering problems in forming processes, solid mechanics and biomechanics.

### AULA DIMEC – CIMNE (Chile)



**Universidad Técnica Federico Santa María**  
 Director: Franco Perazzo  
 Created on: March 2004  
 Activity: Numerical methods in mechanical engineering. Development of numerical methods without mesh. Applications in Engineering.

### AULA PUCV



**Pontificia Universidad Católica de Valparaíso**  
 Director: Juan Carlos Vielma  
 Created on: October 2017  
 Activity: Numerical Methods for the evaluation of seismic vulnerability of structures, dynamic response of non-linear structures and pre-seismic reinforcement techniques.

### AULA UNC – CIMNE (Colombia)



**Universidad Nacional de Colombia**  
 Director: Jairo Andrés Paredes  
 Created on: June 2005  
 Activity: Numerical methods applied to civil engineering.

### AULA UNIMAR – CIMNE (Colombia)



**Universidad Mariana de Colombia**  
 Director: Jorge Hernan López Melo  
 Created on: May 2018  
 Activity: Structural analysis.

### AULA UNIANDÉS – CIMNE (Colombia)



**Universidad de los Andes**  
 Director: René Meziat  
 Created on: January 2003  
 Activity: Teaching and research in numerical methods, optimization, variational principles and computational mechanics.

### AULA UCI – CIMNE (Cuba)



**Universidad de las Ciencias Informáticas**  
 Director: Jorge Gulín  
 Created on: October 2015  
 Activity: Development of computational models and tools with application in high performance computation.

**AULA UCLV – CIMNE (Cuba)**



**Centro de Investigación de métodos computacionales y numéricos en la ingeniería. Universidad Central de las Villas**  
 Director: Carlos Recarey  
 Created on: July 2003  
 Activity: Modelling and analysis of structures and grounds to the application of numerical methods.

**AULA UCA – CIMNE (El Salvador)**



**Universidad Centroamericana "José Simeón Cañas" UCA**  
 Director: Mauricio Pohl  
 Created on: February 2010  
 Activity: Civil engineering applications and multi objective optimization and applications.

**AULA UMG – CIMNE (Guatemala)**



**Universidad Mariano Gálvez**  
 Director: Rolando Torres  
 Created on: February 2011  
 Activity: Development of computer models for application in civil engineering.

**AULA CIMAT – CIMNE (Mexico)**



**Centro de Investigaciones en Matemáticas**  
 Director: Salvador Botello  
 Created on: June 2006  
 Activity: Applied mathematics, numerical methods, engineering and statistical analysis.

**AULA UGTO – CIMNE (Mexico)**



**Universidad de Guanajuato**  
 Director: Mabel Mendoza  
 Created on: January 2002  
 Activity: Civil engineering applications and multi objective optimization and applications.

**AULA MORELIA – CIMNE (Mexico)**



**Universidad Michoacana de San Nicolás de Hidalgo**  
 Director: Francisco Domínguez  
 Created on: October 2015  
 Activity: Civil, mechanic and electric engineering.

**AULA ITESM – CIMNE (Mexico)**



**Inst. Tecnológico de Estudios Superiores de Monterrey**  
 Director: Sergio Gallegos  
 Created on: May 2009  
 Activity: Applications of numerical methods in civil engineering.

**AULA PUCP – CIMNE (Peru)**



**Universidad Católica de Perú**  
 Director: Rosendo Franco  
 Created on: April 2009  
 Activity: Modelling and analysis of structures and grounds to the application of numerical methods.

**AULA ESEIAAT – CIMNE (Spain)**



UPC · BarcelonaTech Terrassa  
 Directors: Roberto Flores; Óscar Fruitós  
 Created on: April 2007  
 Activity: Industrial and aeronautical engineering

**AULA EEBE – CIMNE (Spain)**



Escuela Técnica de Ingeniería Industrial  
 Director: Daniel Di Capua  
 Created on: July 2001  
 Activity: Development of numerical methods in industrial and civil engineering.

**AULA FNB – CIMNE (Spain)**



**Facultad de Náutica de Barcelona**  
 Director: Julio García  
 Created on: March 2002  
 Activity: Applications of numerical methods to problems related to marine engineering.

**AULA UDL – CIMNE (Spain)**



**Universidad de Lleida**  
 Director: Jordi Cipriano  
 Created on: July 2004  
 Activity: Numerical methods applied to the physics of buildings and renewable energy.

**AULA UPM – CIMNE (Spain)**



**Universidad Politécnica de Madrid**  
 Director: Rafael Morán; Miguel Ángel Toledo  
 Created on: May 2010  
 Activity: Applications of numerical methods in civil engineering.

**AULA UC – CIMNE (Venezuela)**



**Universidad de Carabobo**  
 Director: David Ojeda  
 Created on: April 2009  
 Activity: Applications of numerical methods in optimization and inverse problems in engineering failure analysis.

**AULA UCLA – CIMNE (Venezuela)**



**Universidad Centrooccidental "Lisandro Alvaro" (UCLA)**  
 Director: Juan Carlos Vielma  
 Created on: October 2008  
 Activity: Applications of numerical methods to civil engineering problems.

<http://aulas.cimne.com>

# Activities in Asia Pacific

## China

For over 10 years, CIMNE has been collaborating with research organizations, universities and companies in the People's Republic of China in a number of fruitful cooperation agreements, RTD projects and some educational activities.

CIMNE has strong links with the most renowned scientific institutions in China, such as Peking University, Tsinghua University and several research centres of the Chinese Academy of Sciences or the Chinese Aeronautics Establishment.

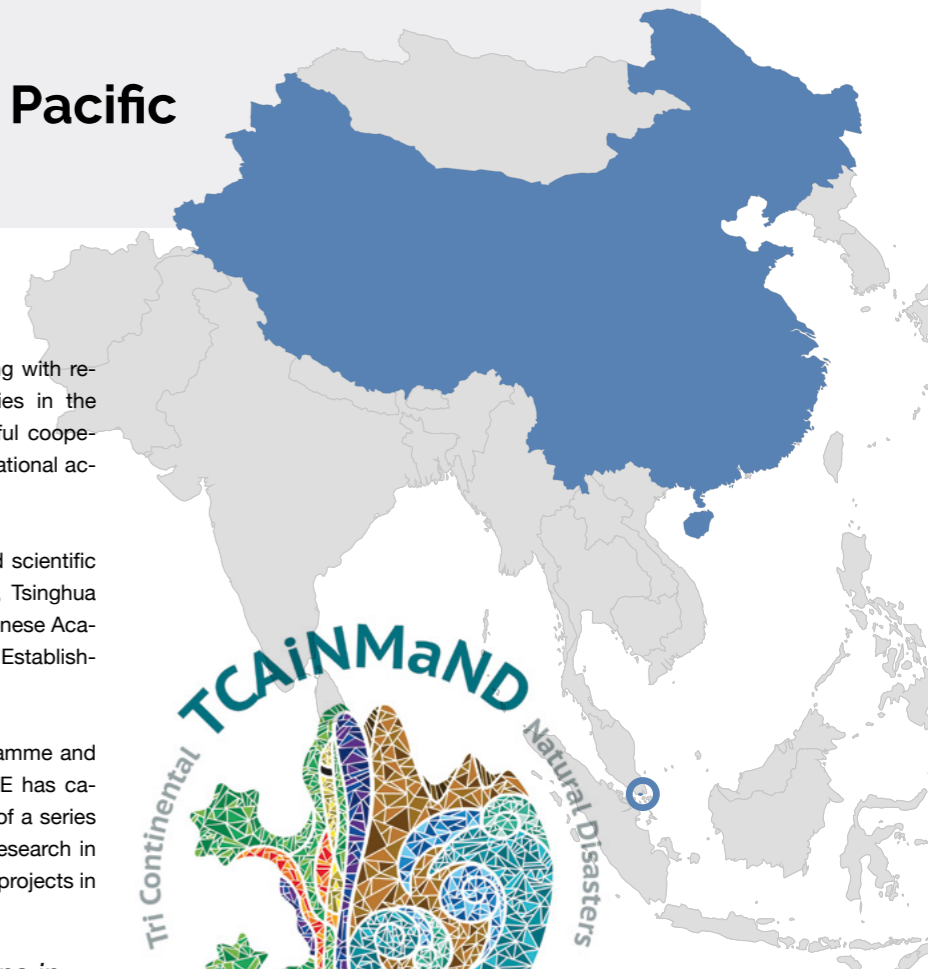
Supported by the 6th and 7th Framework Programme and the Horizon 2020 of the European Union, CIMNE has carried out the coordination on the European side of a series of projects aimed at promoting joint EU-China research in aeronautics. CIMNE also participates in research projects in areas of risk assessment of natural disasters.

*The most relevant activities with China in 2017 have been:*

» **TCAiNMaND: TriContinental Alliance in Numerical Methods applied to Natural Disasters**  
 FP7 - People - EC — Coordinated by CIMNE  
 01/01/2014 - 31/12/2017

» **IMAGE: Innovative Methodologies and technologies for reducing Aircraft noise Generation and Emission.**  
 H2020-MG-2015 — Coordinated by Chalmers  
 01/04/2016 - 31/03/2019

» **ECO-COMPASS: Ecological and Multifunctional Composites for Application in Aircraft Interior and Secondary Structures** (H2020-MG-2015)  
 Coordinated by DLR — 01/04/2016 - 31/03/2019



## Singapore

CIMNE has collaborated for many years with Singaporean research organizations and companies in the field of biomedicine, energy and marine engineering.

The most outstanding example of research collaboration with Singaporean institutions is the study carried out in cooperation with the Tan Tock Seng Hospital and NTU on mechanistic and pathology of the genesis, growth, and rupture of abdominal aortic aneurysms.

# Research

## Research lines

All the research carried out at CIMNE is developed around 10 research lines, which cover several challenging topics:

### 1. ALGORITHMS FOR MULTIPHYSICS PROBLEMS.

Numerical methods for complex coupled problems such as fluid-soil-structure interaction, aero-acoustics, electromagnetics, magneto-hydrodynamics and atmospheric/thermal flows, etc.

### 2. COMPUTATIONAL FLUID DYNAMICS.

Numerical methods for incompressible and compressible flows. Applications to internal and external flows, free-surface flows, multifluids, flow in porous media, aerodynamics and acoustics.

### 3. COMPUTATIONAL GEOMECHANICS.

FEM and particle methods for dry, saturated and partially saturated soils and rocks. Applications to geotechnical engineering: foundations, underground structures, tunnels, dams and slopes.

### 4. MATHEMATICAL AND COMPUTATIONAL MODELLING.

Mathematical models and algorithms for error estimation, mesh adaption and quality of the numerical solution. Reduced order models for (quasi) real time solution of complex engineering systems.

### 5. COMPUTATIONAL MODELLING OF ENGINEERING MATERIALS.

Methods for multiscale analysis of materials and structures. Applications to the design of new smart structural materials.

### 6. COMPUTATIONAL SOLID AND STRUCTURAL MECHANICS.

FEM and particle-based procedures for linear and nonlinear analysis of solids and structures. Applications to most engineering fields.

### 7. OPTIMIZATION.

Robust optimization procedures for shape and material design and process optimization in civil, mechanical, aerospace and naval engineering.

### 8. COMPUTATION AND INFORMATION TECHNOLOGIES.

Methods for mesh generation and visualization of huge sets of numerical results in parallel computers using data mining and cloud storage techniques. Integration of decision support systems in engineering.

### 9. NUMERICAL METHODS AND TECHNOLOGIES FOR ENERGY AND ENVIRONMENT.

Holistic risk prediction and risk management of constructions and landscape under hazards. Methods for producing fresh water via evaporation techniques. Energy management and reduction in buildings.

### 10. TRANSPORT SYSTEM ANALYSIS.

Urban mobility. Port logistics and maritime transport. Transport infrastructure management.

## Research # Overview

# Research Overview

We list below the research lines at CIMNE and the Research and Technological Development (RTD) Areas and Groups. Principal investigators (PI) leading the research lines of each group are also shown.

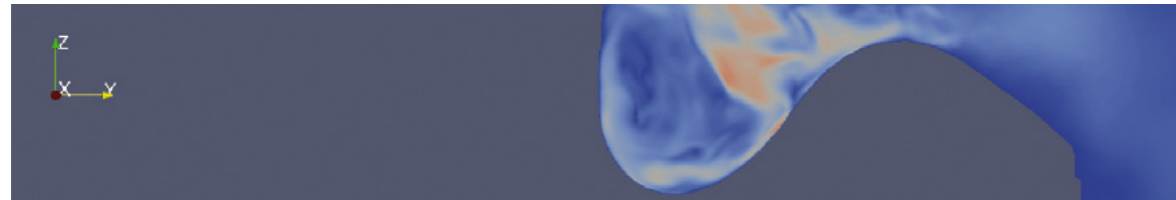
Researchers are appointed to research groups which are related to relevant engineering areas. In 2017, CIMNE had twelve research groups organized in four different research areas: **Civil and Mechanical Engineering**, **Energy and Environment**, **Computational and Information Technologies** and **Transport**.

Research lines often cover basic aspects applicable to different engineering areas. Hence it is common that researchers from different RTD groups contribute to the same research line.

RESEARCH LINES (RL)	RTD AREAS AND GROUPS	
1. Algorithms for Multiphysics Problems	<b>Civil and Mechanical Engineering Area</b>	<b>Computational and Information Technologies Area</b>
	<b>FLUID MECHANICS GROUP</b> PI's: R. Codina, S. Idelsohn, E. Oñate, R. Rossi and J. Baiges   RL's: 1 and 2.	<b>INFORMATION AND COMMUNICATION TECHNOLOGY GROUP</b> PI: J. Jiménez   RL: 8.
	<b>GEOMECHANICS GROUP</b> PI's: E. E. Alonso, E. Gens, S. Olivella, X. Sánchez-Vila   RL: 3.	<b>LARGE-SCALE SCIENTIFIC COMPUTING GROUP</b> PI: S. Badia   RL: 1 and 4.
	<b>INDUSTRIAL PROCESSES GROUP</b> PI's: M. Chiumenti and C. Agelet de Saracibar   RL's: 1 and 7.	<b>PRE AND POST-PROCESSING</b> PI: A. Coll   RL: 8.
	<b>STRUCTURAL MECHANICS GROUP</b> PI's: E. Oñate, M. Chiumenti, M. Cervera, X. Oliver and S. Oller RL's: 1, 5 and 6.	
		<b>Energy and Environment Area</b>
2. Computational Fluid Dynamics	<b>BUILDING, ENERGY AND ENVIRONMENT GROUP</b> PI: J. Cipriano   RL: 9.	<b>AEROSPACE ENGINEERING GROUP</b> PI's: J. Pons, E. Ortega and G. Bugada   RL: 2 and 7.
	<b>RISK ASSESSMENT GROUP</b> PI: A. Barbat   RL: 6 and 9.	<b>CENIT - INNOVATION IN TRANSPORT GROUP</b> PI's: S. Saurí   RL: 10 and 7.
3. Computational Geomechanics		<b>NAVAL AND MARINE ENGINEERING GROUP</b> PI: J. Garcia   RL: 2 and 7.
4. Mathematical and Computational Modelling		
5. Computational Modelling of Engineering Materials		
6. Computational Solid and Structural Mechanics		
7. Optimization		
8. Computation and Information Technologies		
9. Numerical Methods and Technologies for Energy and Environment		
10. Transport System Analysis		



# Fluid Mechanics Group



[www.cimne.com/fluid-mechanics](http://www.cimne.com/fluid-mechanics)

The Fluid Mechanics Group focuses on the development of mathematical models and numerical methods for the solution of a wide range of problems in engineering and other applied sciences involving external and internal flows.

Applications include, among others, high speed compressible flows, turbulent flows, shallow water flows, flow in porous media, bio-flows and many multidisciplinary coupled problems involving fluids, such as magneto-hydro-dynamics, fluid-structure interaction and thermal flows.

## Research topics

### 1. COMPUTATIONAL FLUID DYNAMICS (CFD)

- Stabilized finite element methods for problems involving waves, viscoelastic flows, compressible flows, shallow water flows, magneto-hydro-dynamics and approximation of eigenvalues. **PI: R. Codina.**
- Fractional step schemes for incompressible flows. **PI: R. Codina.**
- Weak imposition of boundary conditions. **PI: R. Codina.**
- Meshless methods in CFD. **PI: S. Idelsohn and E. Oñate.**
- FEM and particle methods for multifluids, flow in porous media and free surface flows. **PI: R. Codina, S. Idelsohn and R. Rossi.**

- FEM and particle methods for blood flow and air flow in lungs. **PIs: R. Rossi & E Soudah.**

- Multiscale modelling of turbulence. **PI: S. Idelsohn.**

### 2. ALGORITHMS FOR MULTIPHYSICS PROBLEMS

- **Aeroacoustics:** Acoustic analogies in incompressible flows, direct numerical simulation of sound, aeroacoustics in time dependent domains, application to human voice simulation. **PIs: R. Codina and J. Baiges.**
- **Optical quality of observation sites:** Numerical simulation of turbulence, estimation of optical parameters of turbulent atmospheres, application to telescope visibility. **PI: R. Codina.**
- **Reduced order models (ROM):** Domain decomposition, fluid-structure interaction, thermally coupled flows. **PIs: R. Codina and S. Idelsohn.**

## On-going RTD Projects

*ELASTIC-FLOW - Aumento de la eficacia en procesos de mezcla y transmisión de calor utilizando fluidos viscoelásticos en régimen laminar y turbulento*  
 MINECO - Retos Investigación: Proyectos de I+D+i  
**Coordinator:** CIMNE - 01/01/2016 - 31/12/2018

## Staff

Ramon Codina ( <b>Leader</b> )	Samuel Parada
Sergio Idelsohn ( <b>Leader</b> )	Arnau Pont
Joan Baiges	Ricardo Reyes
Inocencio Castañar	Álex Tello
Camilo A. Bayona	Eduardo Soudah
Laura Moreno	

# Geomechanics Group



[www.cimne.com/geomechanics](http://www.cimne.com/geomechanics)

The research achievements of the Geomechanics Group focus on the contribution to fundamental understanding and modelling of soil and rock behavior, the development of advanced computational tools and testing techniques at laboratory scale and the participation in applied engineering projects.

Achieving a proper balance among these aspects has been a permanent objective of the group over the years. The research of the group and the software developed are a reference in the analysis of coupled thermal, hydraulic, mechanical and chemical processes in porous media applied to the analysis and design of underground structures (tunnels, foundations, geo-reservoirs, etc), earth and rockfill dams and fluid-soil-structure interaction problems.

## Research topics

### 1. COMPUTATIONAL GEOMECHANICS

- Advanced modelling and laboratory testing of soils and rocks. **PIs: E. Alonso and N. Pinyol**
  - » *Particle Methods in Geomechanics*
  - » *Unsaturated Soil Mechanics*
  - » *Landslides*
- FEM for coupled problems in geotechnical engineering. Particle-based and discrete element methods for geo-mechanical problems. **PIs: A. Gens & S. Olivella**

- Bio-geo-chemical processes in artificial recharge practices. **PI: X. Sanchez-Vila**

- Reactive transport, emerging contaminants (ECs) and associated risk. **PI: X. Sanchez-Vila**

## Ongoing projects

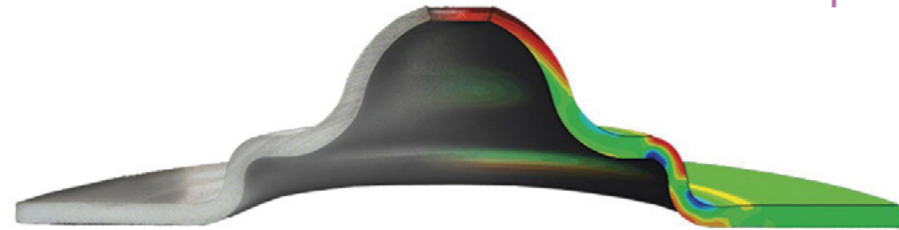
*TERRE - Training Engineers and Researchers to Rethink geotechnical Engineering for a low carbon future*  
 H2020 (2014-2020) - EC  
**Coordinator:** University of Strathclyde  
 01/11/2015 - 31/10/2019

*PARTING - Métodos de Partículas en Geomecánica*  
 MINECO - Retos Investigación: Proyectos de I+D+i  
**Coordinator:** CIMNE  
 01/01/2014 - 31/12/2017

## Staff

Eduardo E. Alonso ( <b>Leader</b> )	Peiman Khadivipannah
Antonio Gens ( <b>Leader</b> )	Miguel Ángel Manica
Núria M. Pinyol ( <b>Leader</b> )	Arisleidy Mesa
Matías Alonso	Alberto Ledesma
Mauricio Alvarado	Ivan Puig
Ramón Barboza	Enrique E. Romero
Jose A. Canas	Anna Ramón
Javier Casanova	Daniel Ruiz
Jaime Clapés	Núria Sau
Agustín Cuadrado	Mercedes Sondon
Gaia Di Carluccio	Daniel Tarragó
Alessandra Di Mariano	Erdem Toprak
Alessandro Fraccica	Saeed Tourchi
Raúl Giménez	Claudia J. Villarraga
Laura González	M. Teresa Yubero
Alejandro Josa	

# Industrial Processes Group



[www.cimne.com/industrial-processes](http://www.cimne.com/industrial-processes)

The Industrial Processes Group specializes in the field of metal forming processes, elastomers, composites and environmental impact.

The group performs applied research. There is an important collaboration in R&D with universities, research centres and companies to make them available their expertise on the following topics:

- Studies of improved manufacturing processes
- Treatment and recovery of wastes
- Development of pre/post processing interfaces for simulation softwares for specific industrial applications, including adaptations for users with disabilities.

In addition, the activities of this group are included in the context of the Help Center Network for Technology Innovation of Catalonia Regional Government and national railway sector and industry cluster RAILGRUP ([www.railgrup.net](http://www.railgrup.net)).

## Research topics

### 1. ALGORITHMS FOR MULTIPHYSICS PROBLEMS

FEM and particle methods for analysis of industrial forming processes (casting, mold filling, sheet metal stamping, 3D printing, friction stir welding, etc.).

**PIs:** M. Chiumenti & C. Agelet de Saracibar

Numerical methods for coupled thermal-mechanical problems for constructions and mechanical components.

**PIs:** M. Chiumenti & M. Cervera

### 2. OPTIMIZATION

Numerical methods for optimization of industrial forming processes. **PI:** M. Chiumenti

## On-going RTD Projects

*CAXMan - Computer Aided Technologies for Additive Manufacturing* - EC - H2020 (2014-2020)

**Coordinator:** SINTEF - 01/09/2015 - 31/08/2018

*EMUSIC - Efficient Manufacturing for Aerospace Components Using Additive Manufacturing, Net Shape HIP and Investment Casting* - EC - H2020 (2014-2020)

**Coordinator:** University of Birmingham

01/04/2016 - 31/03/2019

*StampackXXI - Desarrollo de un nuevo código para simulación de procesos de conformado de piezas laminares* - MEIC - Retos Colaboración: Proyectos I+D

**Coordinator:** Quantech - 01/10/2016 - 31/03/2019

*SIMSOLIDAM - Simulation of metal Solidification in Additive Manufacturing processes*

EC - H2020 (2014-2020) - MSCA - Marie Skłodowska-Curie actions

**Coordinator:** CIMNE - 15/03/2017 - 14/03/2019

## Staff

Michele Chiumenti (**Leader**)

Carlos Agelet de Saracibar

Josep M. Carbonell

Miguel Cervera

Jesús Conde

Narges Dialami

Alberto Ferriz

Oscar Fruitós

Vicente Mataix

Emilio Salsi

# Structural Mechanics Group



[www.cimne.com/structural-mechanics](http://www.cimne.com/structural-mechanics)

The Structural Mechanics Group specializes in the development of next-generation numerical methods and software for the accurate and efficient solution of large scale multidisciplinary engineering problems in structural mechanics.

The research activities of the Structural Mechanics Group have spread over a range of multidisciplinary fields to which it has contributed relevant theories and methods of practical relevance.

The research achievements of the Structural Mechanics Group can be found in the field of numerical methods for the analysis and design of structures, new materials, fluid-structure interaction problems and industrial manufacturing processes are internationally recognised.

## Research topics

### 1. ALGORITHMS FOR MULTIPHYSICS PROBLEMS

- FEM and particle-based methods for fluid-soil-structure interaction. NM for the oil and gas industry. **PI:** E. Oñate

### 2. COMPUTATIONAL MODELLING OF ENGINEERING MATERIALS

- Constitutive models for metallic and frictional materials (concrete, rocks, soil, ceramics, etc). Multi-scale FEM analysis of materials. Optimum material design. **PI:** X. Oliver

- Material models for discrete element methods (DEM).

**PI:** E. Oñate

### 3. COMPUTATIONAL SOLID AND STRUCTURAL MECHANICS

FEM for non-linear analysis of solids and structures. Fracture analysis in solids. **PIs:** M. Cervera & X. Oliver

Rotation-free shell elements. Meshless and particle-based methods in solid mechanics. Multifracture analysis of solids with the DEM and coupled DEM-FEM procedures.

**PI:** E. Oñate

## Staff

Eugenio Oñate (**Leader**)

Ferran Arrufat

Alejandro Cornejo

Pooyan Davvand

Juan Miquel Canet

Juan Carlos Cante

Alessandro Franci

Jose Manuel González

Joaquín A. Hernández

Joaquín Irazábal

Sergio Jiménez

Joel Jurado

Miguel Masó

Mercè López

Oriol Lloberas-Valls

Xavier Martínez

Alejandro Núñez

Xavier Oliver

Arnau Pont

Albert Puigferrat

Marcelo Raschi

Fernando Rastellini

David Roca

Carlos A. Roig

Riccardo Rossi

Pavel Ryzhakov

Fernando Salazar

Javier San Mauro

Deniz Cagri Tanyildiz

Ignacio Valero

David J. Vicente

Daniel Yago

Francisco Zárate

Xue Zhang

**On-going RTD Projects**

ACOMBO - Desarrollo de un código de cálculo para el análisis termo-tenso-deformacional complejo de las presas bóveda

MINECO - Retos Colaboración: Proyectos I+D

Coordinador: JGICSA - 01/09/2015 - 31/12/2018

ACASIAS - Advanced Concepts for Aero-Structures with Integrated Antennas and Sensors

EC - H2020 (2014-2020)

Coordinador: NLR - 01/06/2017 - 31/05/2020

CALA - Mejora de la seguridad hidrológica e incremento de la capacidad de embalse de presas de fábrica mediante la implementación de CAñales Laterales

MEIC - Retos Colaboración: Proyectos I+D

Coordinador: CITECHSA - 01/09/2016 - 31/08/2019

COMETAD - Desarrollo de técnicas computacionales y experimentales para el análisis y el diseño de polímeros retardantes al fuego

MINECO - Retos Investigación: Proyectos de I+D+i

Coordinador: CIMNE - 01/01/2015 - 30/06/2018

COMP-DES-MAT - Advanced tools for computational design of engineering materials

EC - FP7 (2007-2013) - IDEAS

Coordinador: CIMNE - 01/02/2013 - 31/01/2018

COMP-MAT-DYN - Diseño computacional de materiales resistentes a acciones dinámicas en la ingeniería estructural

MINECO - Retos Investigación: Proyectos de I+D+i

Coordinador: CIMNE - 01/01/2015 - 31/12/2017

DIABLO - Desarrollo de un código de diseño óptimo de aliviaderos formados por bloques en forma de cuña

MINECO - Retos Colaboración: Proyectos I+D

Coordinador: PREHORQUI - 01/09/2014 - 31/12/2017

DSS4RA - Desarrollo de un Sistema de Apoyo a las Decisiones basado en Técnicas de Inteligencia Artificial para el manejo rutinario de la Artritis Reumatoide

ISCIII - Acción Estratégica en Salud

Coordinador: Hospital de la Princesa

01/01/2015 - 31/12/2017

DRAGY - Drag Reduction in Turbulent Boundary Layer via Flow Control

EC - H2020 (2014-2020)

Coordinador: CIMNE - 01/04/2016 - 31/03/2019

e-CAERO 2 - European Collaborative Dissemination of Aeronautical research and applications 2

EC - H2020 (2014-2020)

Coordinador: CIMNE - 01/12/2014 - 30/11/2017

ECO-COMPASS - Ecological and Multifunctional Composites for Application in Aircraft Interior and Secondary Structures

EC - H2020 (2014-2020)

Coordinador: DLR - 01/04/2016 - 31/03/2019

ECOVENT - Nuevo sistema de ventilación para túneles en construcción por métodos convencionales, eficaz y eficiente energéticamente, minimizando la emisión de contaminantes gaseosos y partículas

MINECO - Retos Colaboración: Proyectos I+D

Coordinador: OSSA - 01/09/2015 - 31/12/2017

ELASTIC-FLOW - Aumento de la eficacia en procesos de mezcla y transmisión de calor utilizando fluidos viscoelásticos en régimen laminar y turbulento

MINECO - Retos Investigación: Proyectos de I+D+i

Coordinador: CIMNE - 01/01/2016 - 31/12/2018

HIRMA - Desarrollo y validación de una aplicación para la determinación del hidrograma de rotura de presas de materiales sueltos a partir de la configuración geomecánica particular

MEIC - Retos Colaboración: Proyectos I+D

Coordinador: INCLAM - 01/09/2016 - 31/08/2019

ICEBREAKER

EC - H2020 (2014-2020) - ERC (PoC)

Coordinador: CIMNE

01/10/2016 - 30/09/2017

IMPRESIÓN - Desarrollo de una herramienta para el tratamiento de imágenes de presas tomadas mediante drones y su integración en el sistema de auscultación de la presa

MEIC - Retos Colaboración: Proyectos I+D

Coordinador: TECOPY - 01/10/2016 - 31/12/2018

MONICAB - Desarrollo de herramientas para la modelación numérica del efecto de la contaminación del balasto con arena en líneas de alta velocidad

MINECO - Proyectos de I+D: Retos de la Sociedad 2015

Coordinador: CIMNE - 01/01/2016 - 31/12/2018

MOVASE - Desarrollo de nuevos métodos y herramientas para la optimización del proceso de fabricación de envases de vidrio

MEIC - Retos Colaboración: Proyectos I+D

Coordinador: COMPASS ING. Y SISTEMAS, S.A.

01/07/2016 - 31/12/2018

NUMA - Desarrollo de una plataforma para la integración de modelos NUMéricos de base física y Modelos basados en datos en la gestión de la Auscultación de presas

MEIC - Retos Colaboración: Proyectos I+D

Coordinador: DACARTEC - 01/06/2016 - 31/12/2018

OMMC - Optimización multi-escala y multi-objetivo de estructuras de laminados compuestos

MINECO - Retos Investigación: Proyectos de I+D+i

Coordinador: CIMNE - 01/01/2015 - 31/12/2017

ResCiclo - Evaluación de la resistencia residual de estructuras de hormigón armado sometidas a eventos sísmicos

MINECO - Retos Investigación: Proyectos de I+D+i

Coordinador: CIMNE - 01/01/2016 - 31/12/2018

SCAVE - Espacio inmersivo, interactivo e itinerante para la gestión colaborativa de proyectos constructivos

MEIC - Retos Colaboración: Proyectos I+D

Coordinador: PMS - 01/10/2016 - 31/03/2019

SimPhoNy - Simulation framework for multi-scale phenomena in micro- and nanosystems

EC - FP7 (2007-2013)

Coordinador: Fraunhofer - 01/01/2014 - 31/05/2017

T-MAPPP - Training in Multiscale Analysis of multi-Phase Particulate Processes

EC - FP7 (2007-2013)

Coordinador: University of Edimburgh

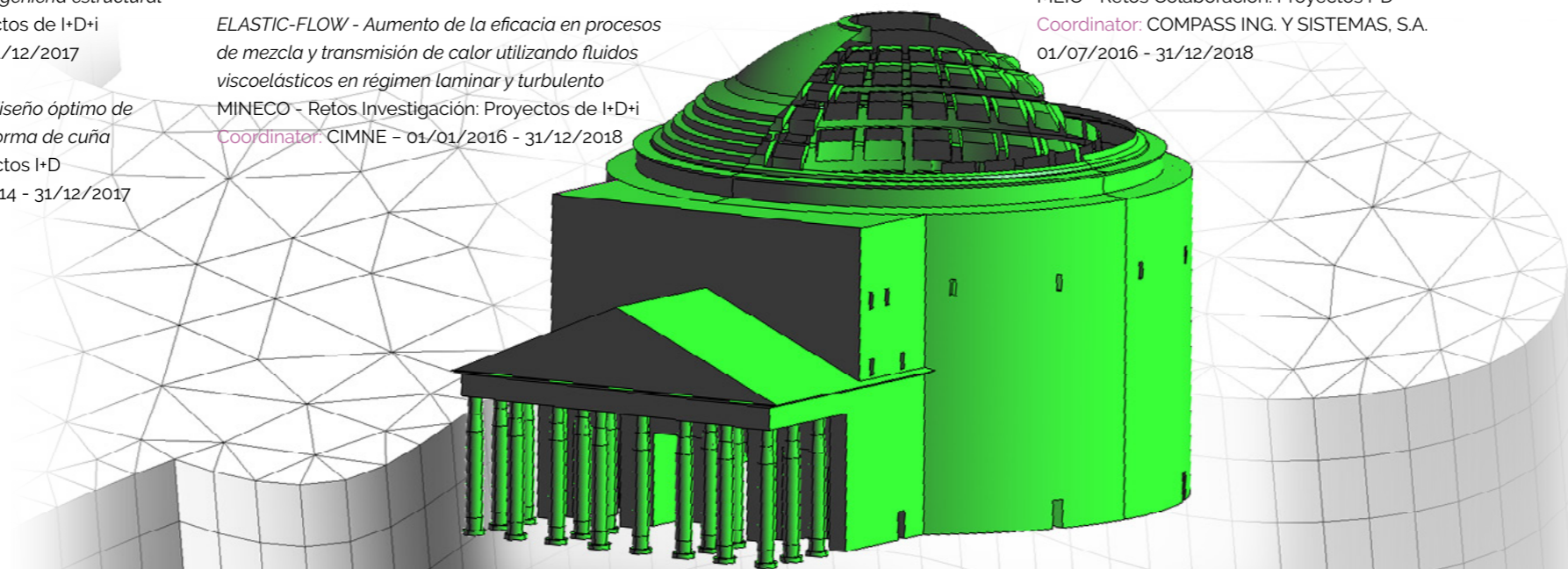
01/03/2014 - 28/02/2018

VOLADAPT - Nuevo proceso de voladura mediante técnicas predictivas y adaptativas, eficaz y eficiente en la utilización de recursos y materias primas, minimizando las emisiones

MINECO - Retos Colaboración: Proyectos I+D

Coordinador: OSSA

01/02/2014 - 31/05/2017



# Building, Energy and Environment Group



[www.beegroup-cimne.com](http://www.beegroup-cimne.com)

The Building, Energy and Environment Group (BEE Group) focus on the development of numerical methods in energy saving, at building and consumer levels, and the environment.

The Building Energy and Environment Group (BEE Group) is an autonomous research unit of CIMNE centre involving over 20 researchers (Physics, Engineering, ICT, Environmental Science and Statistics specialists). It was founded in 2001 and has two main offices, one in the GAIA building of the UPC Campus in Terrassa and the other in the EURO-TRADE building (C/Pere de Cabrera,16,2° G, 25002, Lleida).

BEE Group meets the challenge of employing our knowledge and experience to help users to get the best possible use out of the energy that they consume.

## Staff

Jordi Cipriano (Leader)	Jaime E. Martí
Javier Cipriano	Gerard Mor
Xavier Cubillas	José Santos López
Stoyan Danov	Jaume Palmer
Eloi Gabaldón	Daniel Pérez
Benedetto Grillone	

## Research topics

### 1. COMPUTATION AND INFORMATION TECHNOLOGIES

- **Big Data Analytics For Energy Efficiency in Buildings:** Development of data driven models to get insights of the energy performance of huge amounts of buildings in real operation conditions.

### 2. NUMERICAL METHODS AND TECHNOLOGIES FOR ENERGY AND ENVIRONMENT

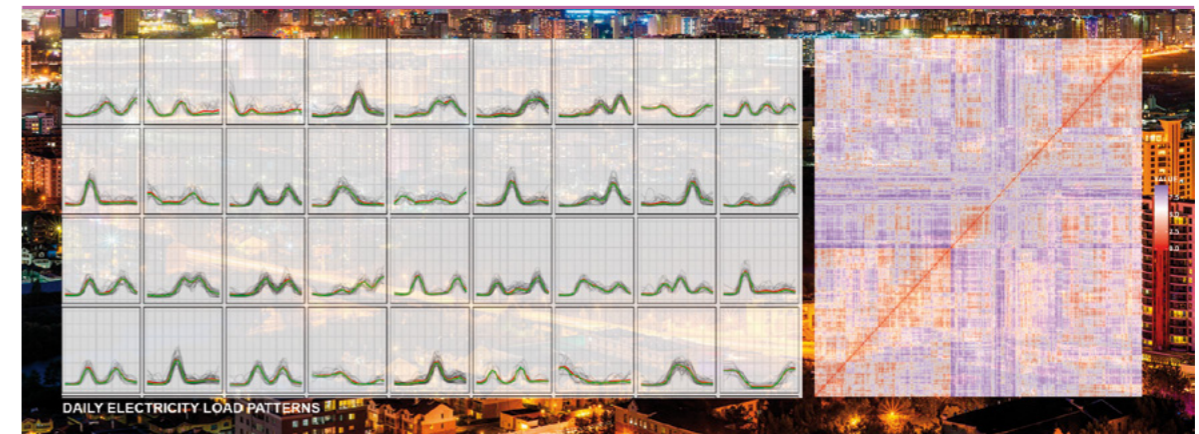
- **Small & Medium Scale Bio-Digesters:** A comprehensive work about design, implementation and installation of domestic and industrial bio-digesters, adapting to simple technologies in cold climates. More than 2000 bio digesters have been installed in Latin America.

- **Energy Positive Living:** Working actively to raise the awareness of the trend towards near zero and energy positive buildings; towards the time in the near future when buildings will produce as much or more energy than they consume.

### 3. OPTIMIZATION

- **Demand Response in Buildings:** Developing technologies to maximize the flexibility of the electricity network while optimizing the use of Renewable Energy Sources in urban environments.

- **Energy Empowerment & User Behaviour:** Help energy users to save energy by positively manage their energy consumption with new developments to understand their behavior and performance.



## On-going RTD Projects

*EDI-Net - The Energy Data Innovation Network*  
EC - H2020 (2014-2020)  
Coordinator: DMU  
01/03/2016 - 01/03/2019

*FCU - Fortalecimiento de la cooperación universitaria AECID*  
Coordinator: ISF  
01/09/2017 - 30/03/2019

*FLEXEDINET - Gestió activa intel·ligent d'energia en edificis terciaris: mercat,usuaris,càrregues i manteniment*  
ACC1Ó - Projectes col·laboratius recerca industrial i/o innovació  
Coordinator: RSM Gassó CIMNE Energy, S.L.  
01/07/2016 - 31/12/2017

*FLEXCoop - Democratizing energy markets through the introduction of innovative flexibility-based demand response tools and novel business and market models for energy cooperatives*  
EC - H2020 (2014-2020)  
Coordinator: Fraunhofer  
01/10/2017 - 30/09/2020

*REFER - Reducció Energètica i Flexibilitat en Edificis en Rehabilitació*  
ACC1Ó - Projectes col·laboratius recerca industrial i/o innovació  
Coordinator: COMSA EMTE, S.L.  
01/06/2016 - 31/12/2018

*SHERPA - Shared knowledge for Energy renovation in buildings by Public Administrations*  
EC - MED Programme 2014-2020  
Coordinator: GENCAT  
27/09/2016 - 31/10/2019

*Sim4Blocks - Simulation Supported Real Time Energy Management in Building Blocks*  
EC - H2020 (2014-2020)  
Coordinator: ZAFH  
01/04/2016 - 31/03/2020

*SIE3 - Sistema de Informació Energètica de Edificis en Ecuador*  
AECID - Coordinator: CIMNE  
01/04/2017 - 30/09/2018

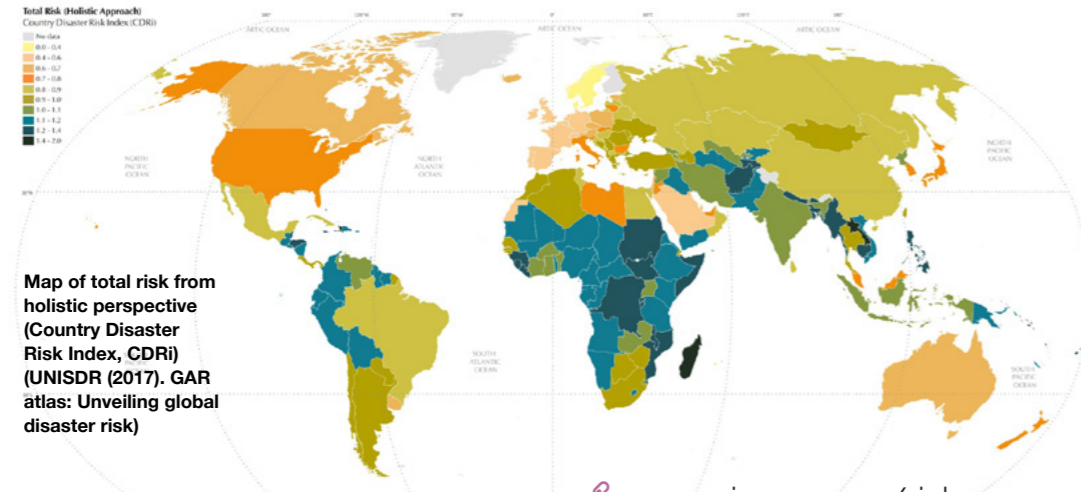
## Technology transfer

The BEE Group collaborates with national and international companies and institutions since 2001, a long journey with more than 41 national and international RTD projects that has carried on a trade to emerge two new business "Start-ups": Inergy (created in 2012) and Beedata Analytics (created in 2017).



Further information at "Spin-off Companies" section at page 70.

# Risk Assessment Group



[www.cimne.com/risk-assessment](http://www.cimne.com/risk-assessment)

The Risk Assessment Group has made important contributions to seismic vulnerability and risk studies in Spain, Europe and Latin America. This group has developed numerous natural hazards and risk modelling studies for several countries in the Latin America and Caribbean Region, Europe, South-East Asia and Indic Ocean.

These studies have been developed for different resolution levels and with different objectives; thus, their results have been used for risk reduction, land use planning, financial risk transfer, insurance and re-insurance, and for integrated disaster risk management.

The developments performed on the vulnerability and risk evaluation and on the holistic risk approach, as well as on the development and use of risk indicators and the development of urban risk scenarios, are well known in the scientific community.

More recently, contributions have been made in the fields of probabilistic modelling of hazard and risk, economic evaluations for risk transfer and financial protection.

### On-going RTD Projects

- E-ZUANA - Evaluación de la vulnerabilidad y el riesgo de Zonas Urbanas expuestas a Amenazas Naturales y Antrópicas*  
MINECO - Retos Investigación: Proyectos de I+D+i  
Coordinator: CIMNE  
30/12/2016 - 29/12/2019

### Staff

- Alex Barbat (Leader)
- M. Liliانا Carreño (Leader)
- Lucía G. Barbu
- Ignasi de Pouplana
- Antonia Larese
- Bàrbara Llacay
- Julio M. Martí
- Sergio H. Oller
- Cecilia Soriano

# Large-scale Scientific Computing Group



[www.cimne.com/large-scale](http://www.cimne.com/large-scale)

The large scale scientific computing group develops advanced numerical methods for the simulation of problems governed by PDES, e.g., solid and fluid mechanics and electromagnetics, together with the design and implementation of scalable solvers for the arising linear systems.

### Research topics

PI: S. Badia

#### 1. MATHEMATICAL AND COMPUTATIONAL MODELLING

- Weakly scalable algorithms for finite element problems
- Unfitted finite element methods
- hp-adaptive finite elements
- Space-time formulations and solvers
- Optimization at large scales
- Uncertainty and quantification at large scales

#### 2. ALGORITHMS FOR MULTIPHYSICS PROBLEMS

- Preconditioners for multiphysics problems
- Interface problems with unfitted finite elements
- Large scale multiphysics simulations
- Coupling of electromagnetical, thermal, and solid and fluid mechanics problems

### On-going RTD Projects

- CLOUDFLOW - Computational Cloud Services and Workflows for Agile Engineering*  
EC - FP7 (2007-2013)  
Coordinator: STAM - 01/07/2013-30/04/2017

- EFES - Algoritmos de elementos finitos para exaescala y su implementación en código libre*  
PLAN ESTATAL (2013-16) - MINECO  
Coordinator: CIMNE  
01/01/2015 - 31/12/2018

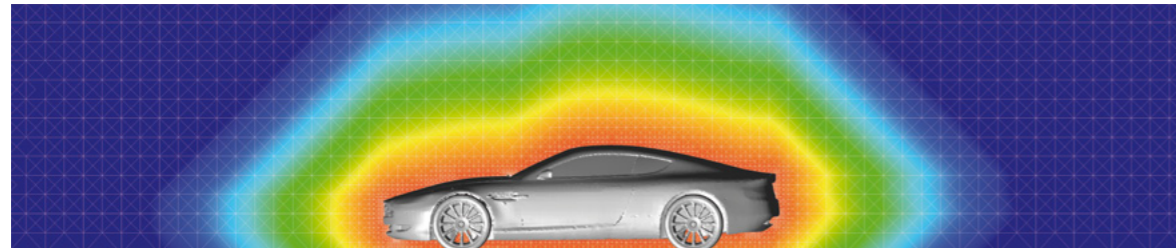
- EUROFUSION*  
EC - H2020 (2014-2020)  
Coordinator: EURATOM  
01/01/2014 - 31/12/2018

- NuWaSim - On a Nuclear Waste Deep Repository Simulator*  
EC - ERC-2016-PoC  
Coordinator: CIMNE  
01/11/2016 - 30/04/2018

### Staff

- |                         |                   |
|-------------------------|-------------------|
| Santiago Badia (Leader) | Pere A. Martorell |
| Jesús Bonilla           | Eric Neiva        |
| Manuel A. Caicedo       | Marc Olm          |
| Àlex Ferrer             | Javier Príncipe   |
| Alberto F. Martín       | Francesc Verdugo  |

# Pre and Post-Processing Group



[www.cimne.com/pre-post](http://www.cimne.com/pre-post)

The Pre and Postprocessing Group works on the development of advanced methods for efficient generation of data for numerical simulations and visualization of computational results.

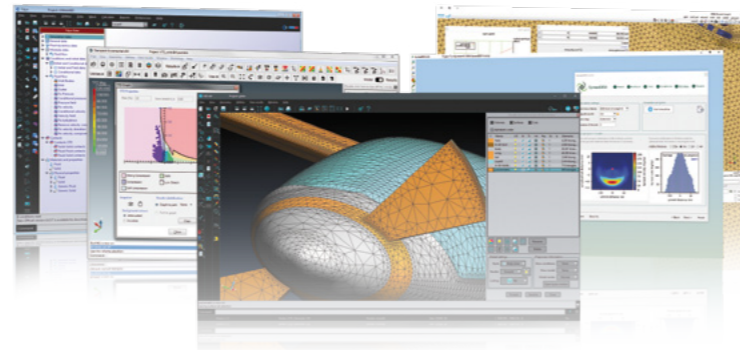
Research and development activities include:

- Geometry creation, importation and edition (CAD).
- Mesh generation.
- Interfacing between preprocessor, solvers and postprocessor.
- Visualization of huge amount of data in a 3D environment.
- Advanced visualization techniques for stereoscopic and realistic visualization.

## Technology transfer

The main commercial product of the group is the software GiD, which is a universal pre and postprocessor ([www.gidhome.com](http://www.gidhome.com)) able to be connected with several numerical simulation codes and provide them with several advanced tools in the geometry creation and edition, mesh generation, assignation of data to the geometry or mesh, advanced visualization tools, and results visualization.

Further information at [www.gidhome.com](http://www.gidhome.com)



## On-going RTD Projects

*ACASIAS - Advanced Concepts for Aero-Structures with Integrated Antennas and Sensors*

EC - H2020 (2014-2020)

Coordinator: NLR

01/06/2017 - 31/05/2020

## Staff

Abel Coll (**Leader**)

Enrique Escolano

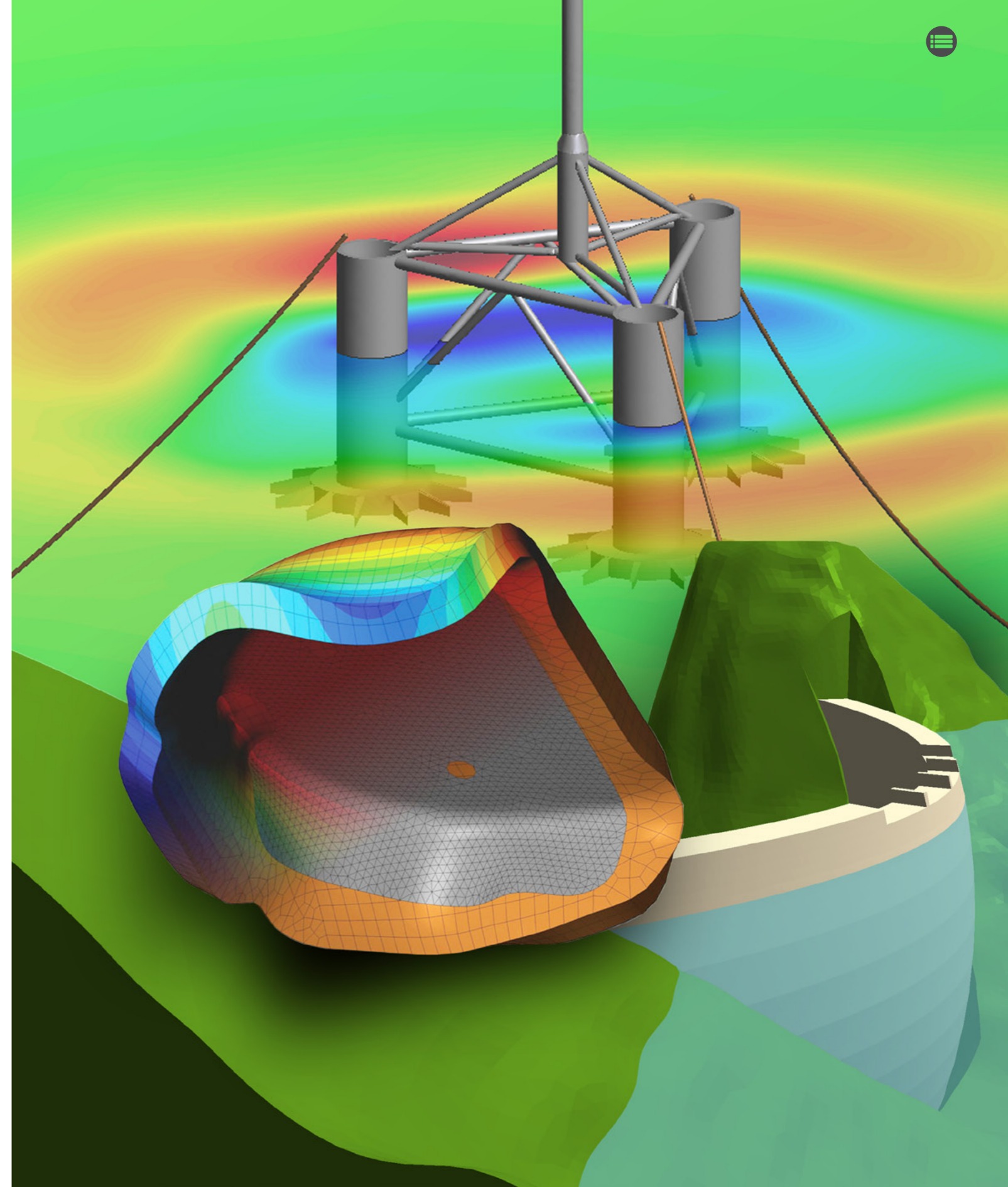
Javi Gárate

Adrià Melendo

Anna Monros

Miguel A. Pasenau

Jorge S. Pérez





"Victoria", the biggest no manned European vessel drone. Developed under the Ulises project.

[www.cimne.com/ict](http://www.cimne.com/ict)

# Information and Communication Technology Group

The Information and Communication Technology Group of CIMNE specializes in research, development and innovation of new and disruptive technologies, applicable to multiple engineering areas.

The group activities aim to improving simulation tools, smart embedded systems, Artificial Intelligence (AI) and GIS in order to develop Decision Support Systems (DSS) and prediction systems for advancing knowledge and technology in engineering and applied sciences.

## Research topics

### 1. COMPUTATION AND INFORMATION TECHNOLOGIES

(PI: J. Jiménez)

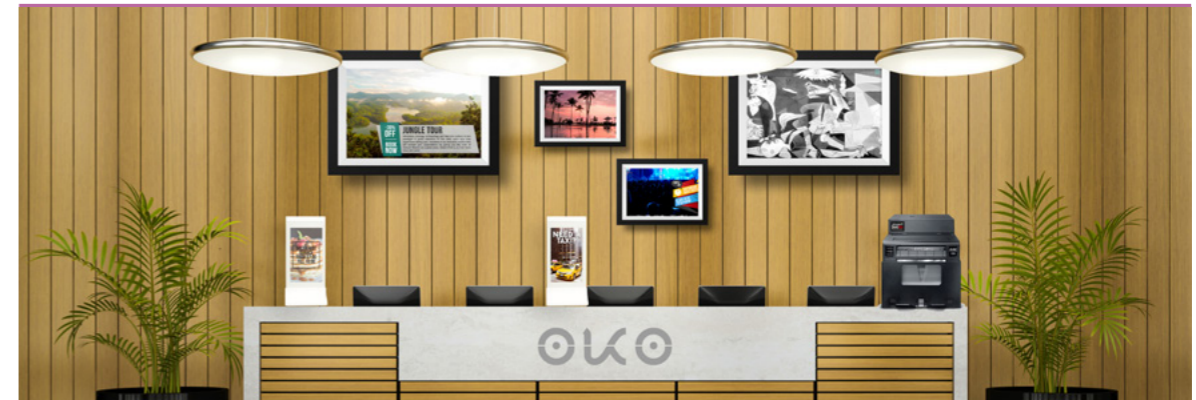
- Decision Support Systems
- Smart Management Systems
- Internet of Things
- App Technology
- Embedded ICT Systems
- Internet Tools
- GIS (2D/3D)
- WSN Deployments
- BOT Technology
- Blockchain
- Machine Learning
- Virtual and Augmented Reality
- Data Science and Artificial Intelligence

## Staff

Jordi Jiménez (Leader)	Gilbert Pepper
Pedro A. Arnau	Ángel Diego Priegue
Alexis Cid	Andreu Tarracó
Pavlina Karagianni	Alberto Tena
Andreu Marí	Javier Tous
Francisco J. Mora	Sergio Valero
José Luis Oñate	Claudio M. Zinggerling



Development of monitoring systems for efficient and smart irrigation



OKO technology is being implemented in hotels, promoting the digital transformation of this sector: [www.okobusiness.com](http://www.okobusiness.com)

## On-going RTD Projects

**GAINN4MOS** - Sustainable LNG Operations for Ports and Shipping - EC - CEF Programme 2014-2020 - MAP

Coordinator: Valencia Port  
01/01/2015 - 31/07/2017

**GAINN4SHIP INNOVATION** - LNG Technologies and Innovation for Maritime Transport

EC - CEF Programme 2014-2020 - MAP  
Coordinator: Valencia Port  
01/01/2015 - 30/06/2019

**IMPRESIÓN**: Desarrollo de una herramienta para el tratamiento de imágenes de presas tomadas mediante drones y su integración en el sistema de auscultación de la presa - MEIC - Retos Colaboración: Proy. I+D

Coordinator: TECOPY  
01/10/2016 - 31/12/2018

**IPIDO** - Implementación de un prototipo pre-industrial de desalinización en un entorno operacional

PLAN ESTATAL (2013-16) - MINECO  
Coordinator: FWN - 01/02/2015 - 31/07/2017

**MODELGES** - Modelos flexibles adaptados a sensores embebidos para la gestión de infraestructuras

MINECO - Retos Colaboración: Proy. I+D  
Coordinator: COPASA - 01/10/2015 - 31/12/2017

**PICASSO** - Preventing Incident and Accident by Safer Ships on the Oceans

EC - INEA - CEF Programme 2014-2020  
Coordinator: Sasemar  
01/05/2016 - 30/06/2018

**SCAVE** - Espacio inmersivo, interactivo e itinerante para la gestión colaborativa de proyectos constructivos

MINECO - Retos Colaboración: Proyectos I+D  
Coordinator: PMS  
01/10/2016 - 31/03/2019

**SciShops.eu** - Enhancing the Responsible and Sustainable Expansion of the Science Shops Ecosystem in Europe

H2020 (2014-2020) - EC  
Coordinator: SYNNO  
01/09/2017 - 29/02/2020

**STM Validation Project**

EC - CEF Programme 2014-2020  
Coordinator: Swedish Maritime Administration  
01/01/2015 - 31/12/2018

**RCMS** - Rethinking Container Management Systems

H2020 (2014-2020) - EC  
Coordinator: Circle  
01/05/2015 - 31/01/2017

**TERRE** - Training Engineers and Researchers to Rethink geotechnical Engineering for a low carbon future

H2020 (2014-2020) - EC  
Coordinator: University of Strathclyde  
01/11/2015 - 31/10/2019

**ULISES** - Desarrollo de una plataforma autónoma para vigilancia y defensa en entornos Offshore

MINECO - Retos Colaboración: Proy. I+D  
Coordinator: Industrias Ferri  
28/01/2014 - 31/07/2017

# CENIT - Innovation in Transport Group



[www.cenit.es](http://www.cenit.es)

The Centre for Innovation in Transport (CENIT) has been incorporated in 2017 to CIMNE as a new research group in the area of transport.

With the integration of CENIT in CIMNE, synergies in research, development and technology transfer on the transport field is enhanced. This contributes to provide solutions on the transport and mobility area of interest to society from a cross-cutting point of view.



## 1. TRANSPORT SYSTEM ANALYSIS (PI: S.Saurí)

### URBAN MOBILITY

- Public Transport
- Travel Behavior
- Transport Economics
- Urban Freight Distribution
- Electromobility and Traffic Modelling

### PORT LOGISTICS AND MARITIME TRANSPORT

- Demand Analysis
- Transport Economics
- Operational Research at Terminals Port Management
- Port Management

### TRANSPORT INFRASTRUCTURE MANAGEMENT

- Transport Economics Public
- Private partnership

## 2. OPTIMIZATION

- Assessment of transport investments and policies, improvement of public transport networks, optimization of operations, application of technology to transportation, demand modeling and urban mobility. **PI: S. Saurí**

### Staff

Sergi Saurí (Leader)	Aleix Pons
Miriam Benítez	Sara A. Puignau
Marc Busquets	Ester Raventós
Germán de Melo	Jaume Roca
Miquel Iranzo	Francisco Rodero
Pau Morales	Francisca Rosell
Domingo Peñalver	Jose Ignacio Torres



## On-going RTD Projects

*INTERMODEL - Simulation using Building Information Modeling Methodology of Multimodal, Multipurpose and Multiproduct Freight Railway Terminals Infrastructures (TRA.16P042)*

EC - H2020 (2014-2020)

**Coordinator:** IDP Ingenieria y Arquitectura Iberia SL  
01/09/2016 - 31/08/2019

*NOVELOG - New cooperative business models and guidance for sustainable city logistics Infrastructures (TRA.15P027)*

EC - H2020 (2014-2020)

**Coordinator:** CERTH  
01/06/2015 - 31/05/2018

*ELIPTIC - Electrification of public transport in cities*  
EC - H2020 (2014-2020)

**Coordinator:** FHB - 01/06/2015 - 31/05/2018

*GrowSmarter - Transforming cities for a smart, sustainable Europe (TRA.14P024)* - EC - H2020 (2014-2020)

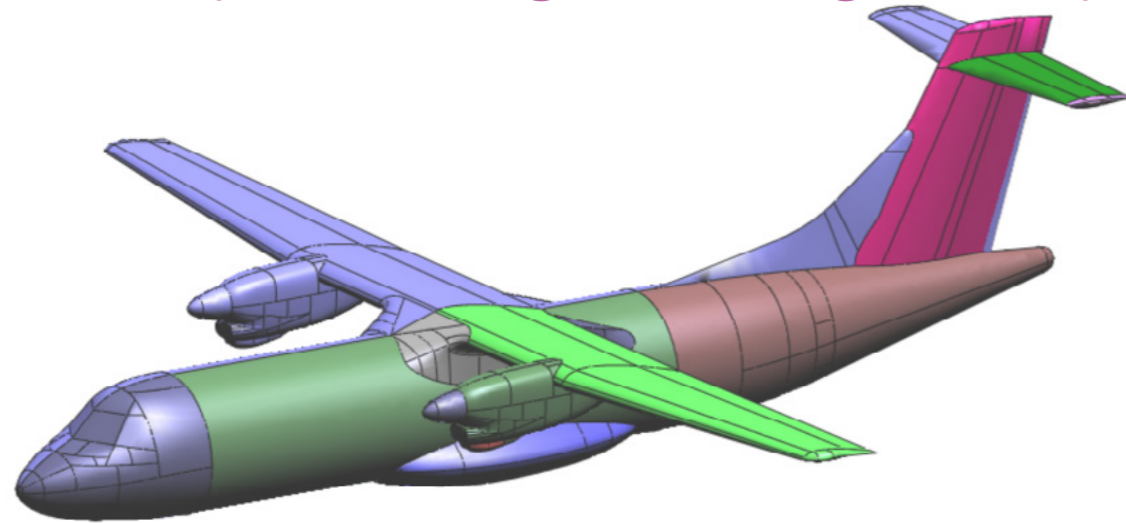
**Coordinator:** STOCKHOLMS STAD  
01/01/2015 - 31/12/2019

*REG4SSEA - Estrategias regulatorias para fomentar el transporte sostenible a través del Short Sea Shipping (TRA.16g053)*

MINECO - Retos Investigación: Proyectos de I+D+i  
**Coordinator:** CENIT - 30/12/2016 - 29/12/2019



# Aerospace Engineering Group



[www.cimne.com/aero](http://www.cimne.com/aero)

The Aerospace Engineering Group develops innovative research in the fields of aeronautics and space, optimization and data modelling, as well as fuel cells.

The group deals with research in fluid dynamics, optimization, and fuel cells technology and also collaborates with other CIMNE groups in composites materials analysis and IT technology applied to sensing and data management.

## Research topics

### 1. COMPUTATIONAL FLUID DYNAMICS (CFD)

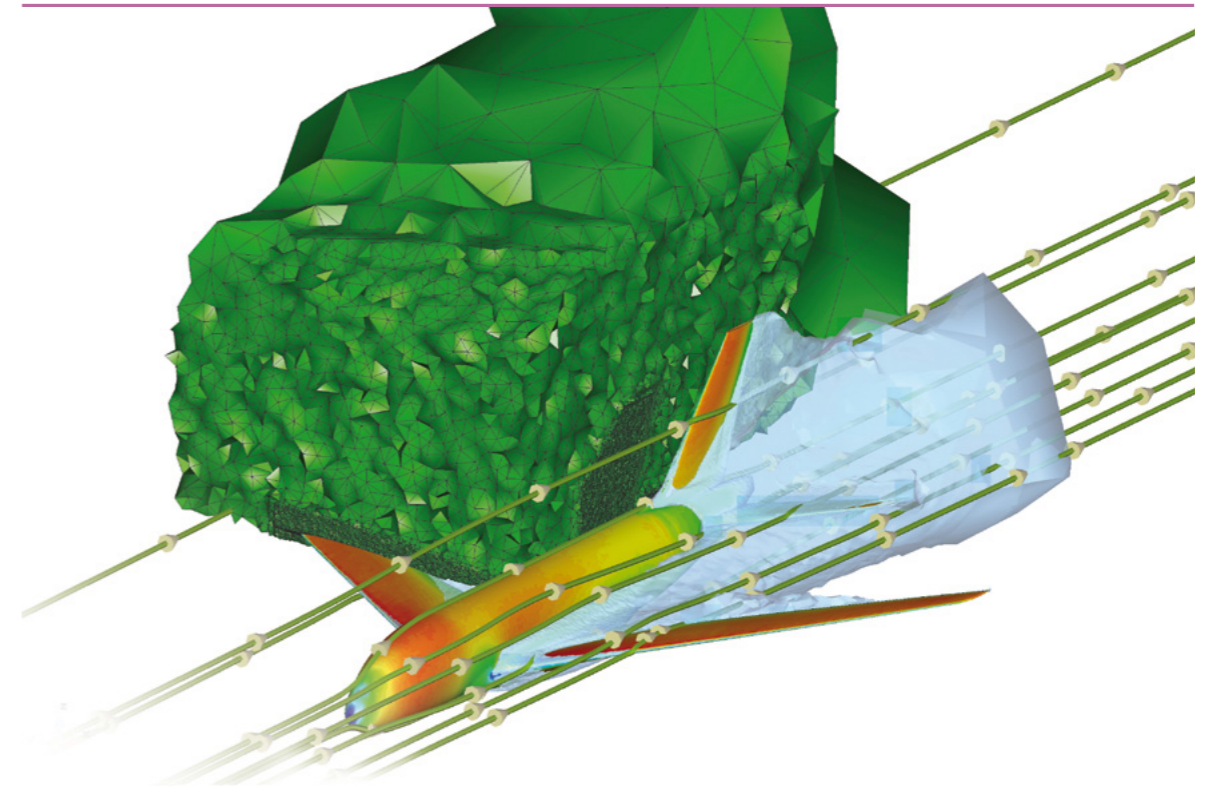
- FEM and meshless methods for aerodynamics analysis and drag reduction in aeronautics. **PIs:** J. Pons and E. Ortega

### 2. OPTIMIZATION

- Optimization algorithms for robust optimal design, shape optimization and material design in aeronautics. **PI:** G. Bugada

## Staff

Jordi Pons (Leader)  
 Gabriel Bugada  
 Martí Coma  
 Roberto M. Flores  
 Jacques Périaux  
 Enrique Ortega



## On-going RTD Projects

*AVINT - Estratègies de mecanitzat i predicció de la rugositat per a una integritat superficial òptima*  
 ACCIÓ - RIS3CAT  
 Coordinator: CTM - 01/07/2017 - 30/06/2020

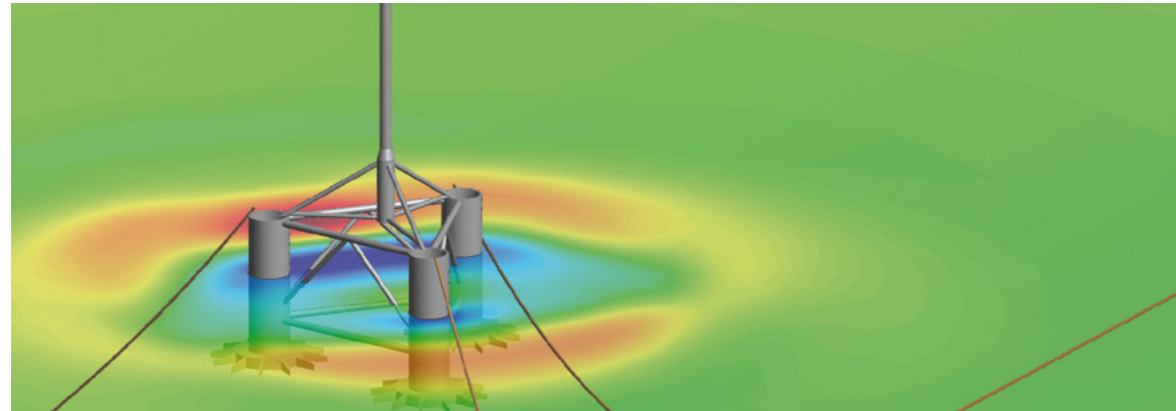
*DRAGY - Drag Reduction in Turbulent Boundary Layer via Flow Control*  
 EC - H2020 (2014-2020)  
 Coordinator: CIMNE  
 01/04/2016 - 31/03/2019

*ECO-COMPASS*  
 Ecological and Multifunctional Composites for Application in Aircraft Interior and Secondary Structures  
 EC - H2020 (2014-2020)  
 Coordinator: DLR - 01/04/2016 - 31/03/2019

*e-CAERO 2*  
 European Collaborative Dissemination of Aeronautical research and applications 2  
 Coordinator: CIMNE - 01/12/2014 - 30/11/2017

*IMAGE - Innovative Methodologies and technologies for reducing Aircraft noise Generation and Emission*  
 EC - H2020 (2014-2020)  
 Coordinator: Chalmers - 01/04/2016 - 31/03/2019

# Naval and Marine Engineering Group



[www.cimne.com/naval-marine](http://www.cimne.com/naval-marine)

CIMNE has a large experience in conducting RTD projects in naval and marine engineering.

The main activities of the Naval and Marine Engineering Group are related to the development and application of computational methods and computer aided design and verification tools on the following topics:

- Hydrodynamic and seakeeping analysis of vessels and marine structures
- Hydro-elasticity and fatigue analysis in large marine structures
- Navigation in ice (ice-structure interaction)
- Environmental problems in marine and ocean engineering
- Near-time simulation (operational) tools for ocean wave converters
- Design and assessment of offshore wind turbines and ocean energy converters
- Optimization and design support systems in naval architecture and ocean engineering
- Health structural monitoring

## Research topics

### 1. COMPUTATIONAL FLUID DYNAMICS (CFD)

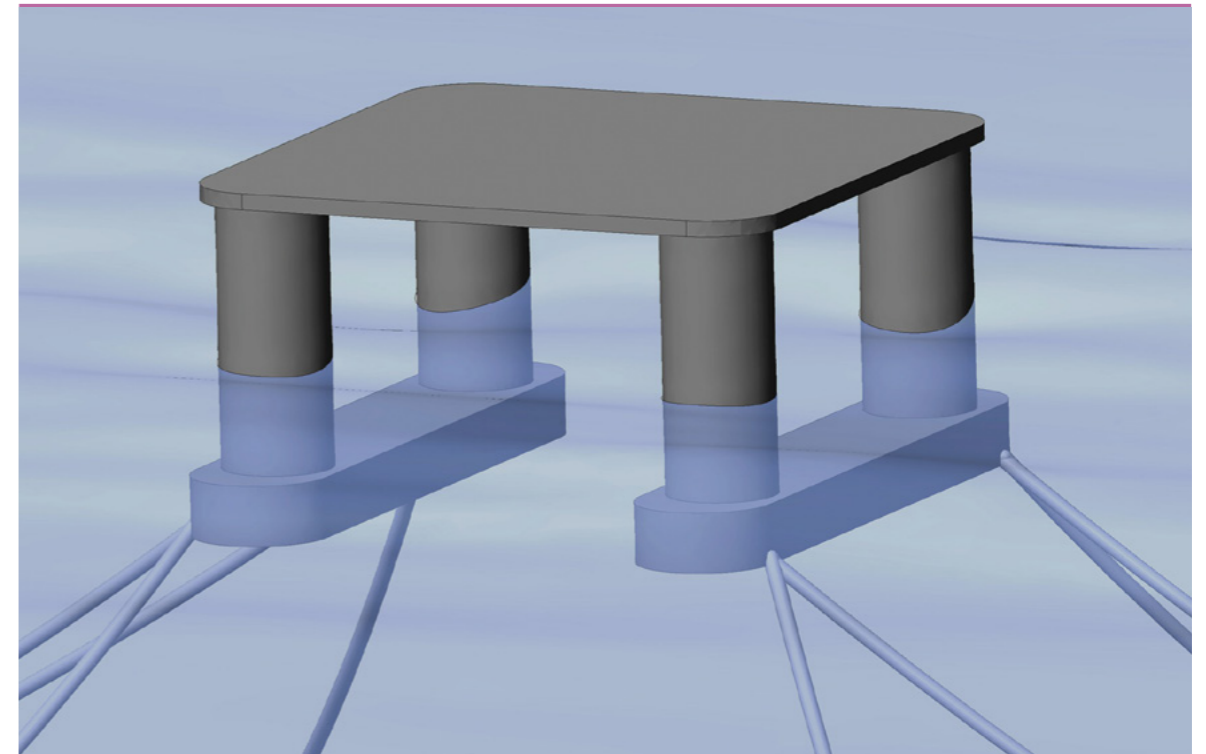
Semi-Lagrangian methods for hydrodynamic analysis of ships and marine structures. **PI: B. Serván and J. García**

### 2. OPTIMIZATION

Optimal design of ship hulls, wind energy structures and offshore structures. **PI: J. García**

## Staff

Julio García (**Leader**)  
 Daniel di Capua  
 Jesús Carbajosa  
 Jonathan Colom  
 Rafael Pacheco  
 Borja Serván



## On-going RTD Projects

**FIBRESHIP** - Engineering, production and life-cycle management for massive application of FIBRE-based materials in large-length SHIPs  
 EC - H2020 (2014-2020)  
**Coordinator:** TSI  
 01/06/2017 - 31/05/2020

**STM Validation Project**  
 EC - CEF Programme 2014-2020 - MAP  
**Coordinator:** Swedish Maritime Administration  
 01/01/2015 - 31/12/2018

**GAINN4SHIP INNOVATION** - LNG Technologies and Innovation for Maritime Transport for the Promotion of Sustainability, Multimodality and the Efficiency of the Network  
 EC - CEF Programme 2014-2020 - MAP  
**Coordinator:** Valencia Port  
 01/01/2015 - 30/06/2019

**GAINN4MOS** - Gainn4mos Sustainable Lng Operations for Ports and Shipping – Innovative Pilot Actions  
 EC - CEF Programme 2014-2020  
**Coordinator:** Valencia Port  
 01/01/2015 - 31/07/2017

**NICE-SHIP** - Development of new Lagrangian computational methods for ice-ship interaction problems  
 ONR - NICOP  
**Coordinator:** CIMNE  
 30/09/2016 - 01/10/2019

**MOVASE** - Desarrollo de nuevos métodos y herramientas para la optimización del proceso de fabricación de envases de vidrio  
 MEIC - Retos Colaboración: Proyectos I+D  
**Coordinator:** COMPASS Ing. y Sistemas, S.A.  
 01/07/2016 - 31/12/2018

# Research Rankings

[www.cimne.com/research-rankings](http://www.cimne.com/research-rankings)

CIMNE is ranked in the 52th position in terms of visibility in Spain, according to Webometrics ranking.

In the world ranking, CIMNE is in the 1458th position in a list of 7953 research centers worldwide in production and scientific activities.

Sorted by the number of papers and citations for each academic domain, CIMNE is positioned at number 427 in the world (based on the database of Google Scholar Citations -GSC-).

In February 2018, Webometrics ([www.webometrics.info](http://www.webometrics.info)) has published a **list of the most cited Spanish scientists**. The study, based on citations from Google Scholar, includes **105 researchers of CIMNE among the 48,011 most cited scientists of Spain**.

Also, we note the presence of **five CIMNE scientists in the top 1,000 list**:

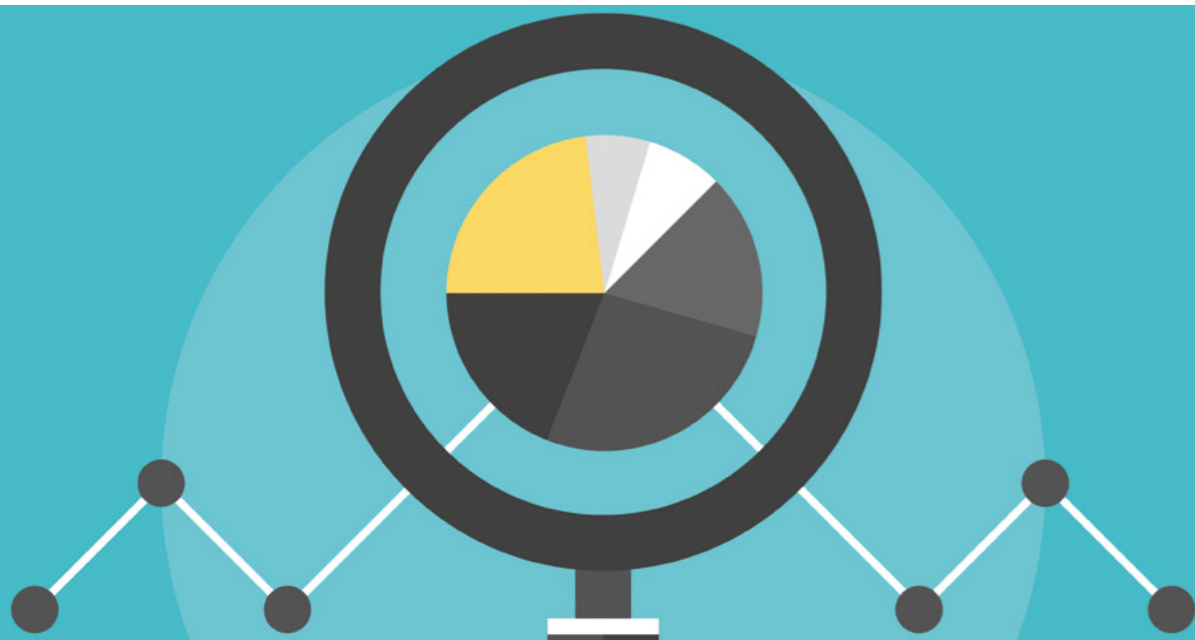
» **Prof. Eugenio Oñate** has the 217th position in the list with an h-index of 65 and 17983 citations.

» **Prof. Antonio Gens**, the 404th position; **Prof. Eduardo E. Alonso**, the 598th position; **Prof. Antonio Huerta**, the 840th position; **Prof. Ramon Codina**, the 961th position.

## RANKING OF CIMNE SCIENTISTS IN SPAIN (WEBOMETRICS.INFO)

RANK	NAME	H-INDEX	CITATIONS
217	Eugenio Oñate	65	17983
404	Antonio Gens	56	14829
598	Eduardo Alonso	51	12491
840	Antonio Huerta	47	7807
961	Ramón Codina	45	7629
1173	Javier Oliver	42	9583
1251	Miquel Cervera	42	5019
1287	Sergio Idelsohn	41	6729
1321	Alex H Barbat	41	5610
1882	Sergio Oller	36	6186
2824	Sebastià Olivella	31	4245
3143	Marino Arrovo	30	3355
3330	Enrique Romero	29	4588
4928	Santiago Badia	25	2253
5209	Melba Navarro	24	2657
5470	Carlos Azelet de Saracibar	24	1726
5818	Michele Chiumenti	23	1912
5954	Pedro Díez	23	1624
7034	Antonio Rodríguez Ferran	21	1457
7562	Riccardo Rossi	20	1494
8537	José Sarrate	19	1079
10236	Javier Principe	17	876
10755	Gabriel Buaeda	16	1070
10892	Julio García Espinosa	16	974
11531	Martha Liliana Carreño	15	1436
13298	Juan Carlos Cante	14	689
14075	Luca Pelà	13	839
14561	Cecilia Soriano	13	607
16125	Xavier Martínez	12	484
16176	Jaime Martí Herrero	12	473
17022	Francisco Zarate	11	598
18731	Marcelo Raschi	10	531
18741	Pedro Arnau	10	528
19003	Joan Baiges	10	430
19269	Narges Dialami	10	376
19669	Josep María Carbonell	10	319
20758	Julio Martí	9	381
21252	Pavel Rvzhakov	9	302
21269	Francisco Javier Mora	9	300
21691	Alberto F Martín	9	255
21932	Rafael Morán	9	229
22730	Daniel Di Capua	8	332
22872	Antonia Larese	8	302
23582	Omar Salomon	8	219
24484	Roubin Emmanuel	8	137
24488	Francesc Verduo	8	136
24638	Miquel Àngel Celiqueta	7	491
24689	Oriol Lloberas	7	405
24991	Fernando Salazar	7	266
25107	Fernando Rastellini	7	245
25442	Enrique Orteaga	7	206
25614	Boria Serván Camas	7	192

RANK	NAME	H-INDEX	CITATIONS
26033	Antonio R Marí	7	165
26174	Jordi Cipriano	7	158
26310	Mario A Salgado	7	151
27331	Pooyan Davdand	6	288
28266	Xue Zhang	6	145
28310	Enrique Escolano	6	143
28714	Manuel A. Caicedo	6	124
28863	Roberto Flores	6	119
30623	Eduardo Soudah	5	132
30926	Alessandro Franci	5	113
31381	Prashanth Nadukandi	5	95
31711	Ernesto Castillo	5	85
32562	Alessandra di Maríano	5	64
32562	Lucia Gratiela Barbu	5	64
33713	Stoyan Viktorov Danov	4	97
33975	Fermín Otero	4	80
34111	Héctor Espinoza	4	74
35189	Jordi Pons Prats	4	51
35189	Miguel A. Pasenau	4	51
35616	Hieu Nguyen	4	44
35735	Jackson Tellez Álvarez	4	42
36904	Abel Coll	3	88
36914	Salvador Latorre	3	87
36936	Pablo A Becker	3	84
37039	Jordi Cotela Dalmau	3	71
37109	Lorenzo Benedetti	3	66
37267	Oriol Colomé	3	57
37479	Jordi Carbonell Morera	3	49
37508	Kazem Kamran	3	48
37856	Alba Hierro	3	40
38028	Joaquín Irazábal	3	37
38104	David J Vicente	3	36
38598	Nelson Lafontaine	3	30
38914	Alex Ferrer	3	27
39374	Alex Jarauta	3	23
39605	Ester Comellas	3	21
40682	Miquel Santasusana	2	42
40708	Guillermo Casas	2	40
40837	Adrià Melendo	2	34
40920	Claudio Zinggerling	2	31
40920	Ehsan Hajiesmaili	2	31
41721	Jesús Bonilla	2	18
41848	David Roca	2	17
42316	Barbara Llacay	2	14
42316	Marina Arbat Bofill	2	14
42937	Arnau Pont	2	11
43954	Javier Marcipar	2	7
44696	José Manuel González	1	57
45351	Ignasi de Pouplana	1	8
45861	Daniel Pérez	1	5
46191	Javier San Mauro Saiz	1	4
46625	Arbab S. Chaudhuri	1	3



# Publications

CIMNE publishes books, journals, monographs, scientific reports and educational software on the theory and applications of numerical methods in engineering and applied science.

The publications of CIMNE can be visited and ordered via Internet on the website [cimne.com](http://cimne.com). Most publications can be freely downloaded from the web. We list below the publications of CIMNE in 2017.

## Journals

*Archives of Computational Methods in Engineering*. **Editors:** Kleiber M., Oñate E. *Springer*, 2017. Journal Impact Factor (2016): 5.061; 5 Year Impact Factor: 5.710.

*Revista Internacional de Métodos Numéricos para Cálculo y Diseño en Ingeniería*. **Editors:** Oñate E., Idelsohn S.R., *Elsevier*, 2017. Journal Impact Factor (2016): 0.431; 5 Year Impact Factor: 0.345.



NUMBER OF CIMNE PUBLICATIONS (1987-2017)	
Edited books	82
Text books	46
Research reports	417
Technical reports	643
Monographs	258
Papers in journals (since 2009)	674

## Monographs

Caicedo M.A., Oliver X., Huespe A.E. *Computational multiscale modeling of fracture problems and its model order reduction*. M176. CIMNE, 2017.

Escrig, C., Gil, L. *Vigas de hormigón armado reforzadas a flexión con materiales tipo Fabric-Reinforced Cementitious Matrix. Estudio experimental y analítico*. M171. CIMNE, 2017.

Ferrer A., Oliver X., Cante J.C. *Multi-Scale Topological Design of Structural Materials: An Integrated Approach*. M172. CIMNE, 2017.

Irazábal J., Oñate E. *Numerical analysis of railway ballast behaviour using the Discrete Element Method*. M174. CIMNE, 2017.

Oller Aramayo S. A., Nallim L. G., Oller S., Martínez X. *A river bed hydrokinetic turbine. A laminated composite material rotor design*. M169. CIMNE, 2017.

Rodríguez A., Oñate E., Marcipar J. *Design of an inflatable, modular and portable footbridge*. M175. CIMNE, 2017.

Salazar F., Oñate E., Toledo M. A. *A machine learning based methodology for anomaly detection in dam behaviour*. M170. CIMNE, 2017.

## Research reports

Oñate E., Zárate F., Celigueta M. A., González J. M., Miquel J., Carbonell J. M., Arrufat F., Latorre S., Santasusana M., *Advances in the DEM and coupled DEM and FEM techniques in non linear solid mechanics*, CIMNE, PI416, pp. 20, 2017.

Oñate E. *The CIMNE model for generating knowledge on computational engineering and its transfer to society*, CIMNE, PI417, pp. 35, 2017.

## Papers in Journals

Abbas, A., Bugada, G., Ferrer, E., Fu, S., Periaux, J., Pons-Prats, J., Valero, E., Zheng, Y. Drag reduction via turbulent boundary layer flow control, *Science China Technological Sciences*, vol. 60(9), 1281 - 1290, 2017.

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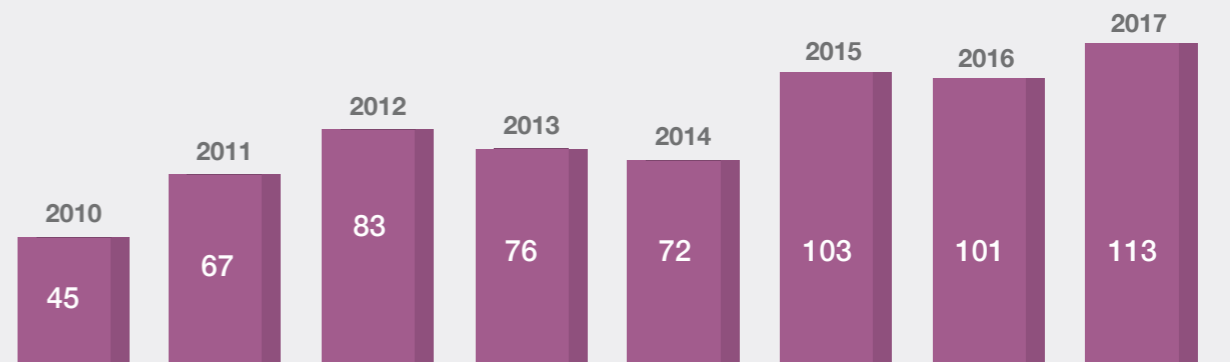
Baiges, J., Codina, R. Variational Multiscale error estimators for solid mechanics adaptive simulations: An Orthogonal Subgrid Scale approach, *Computer Methods in Applied Mechanics and Engineering*, vol. 325, 37 - 55, 2017.

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Nº of papers in Scientific Journals indexed in the Journal Citation Report (JCR)



75% of the papers have been published in Q1 Journals



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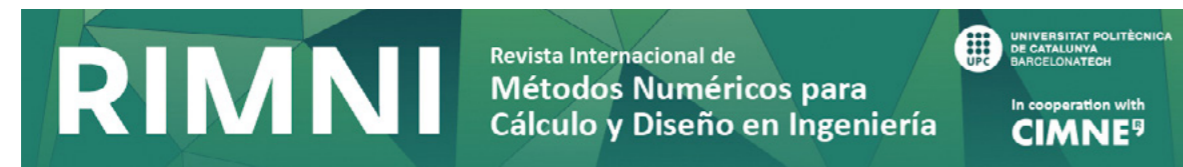
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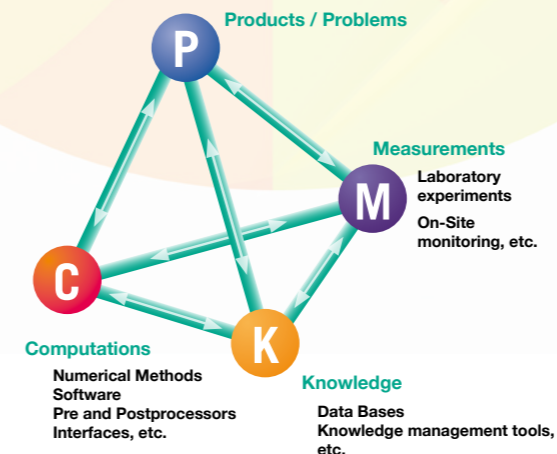
# Innovation and technology transfer

CIMNE RTD activities are based on a holistic approach.

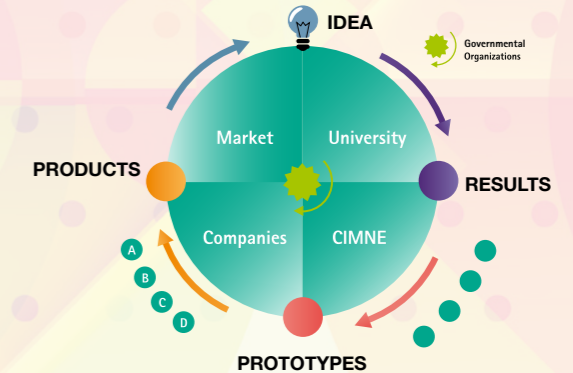
CIMNE aims at providing comprehensive solutions for solving problems that affect human beings, through the integration of existing knowledge in a particular field with quantitative information emanating for prediction methods, such as computational-based techniques, and experimental measurements.

These four concepts: the **problem** to be solved, **computational methods**, **experimental methods** and existing **knowledge** can be represented by the tetrahedron shown in the figure above. Each of the nodes is connected to the other three by lines that represent information transfer pipelines.

The holistic approach for solving problems at CIMNE:



The mission and activity of CIMNE can be explained through the so called **Cycle of Ideas**:



**Ideas** (scientific advances) usually originate in university environments, where many professionals study, investigate and discover new areas of knowledge. The idea matures until it produces **tangible results** (thesis, papers, computer programs, physical devices, etc.) that have to be filed and protected. **Results** evolve until they reach the level of a prototype (a software code, a system, a device, etc.). The transit of a result to a **prototype** demands an organization, efficient and capable staff and resources. What it is desirable is that the idea follows its route on specialized institutions, adjacent to the university, such as **CIMNE**, with the mission of transforming knowledge into tangible things (prototypes). The **prototype** develops into a **product** within a company. The cycle follows with the **marketing** of the product and ends up with the **reinvestment** of part of the revenues in the **development of new ideas**.



# CIMNE Products

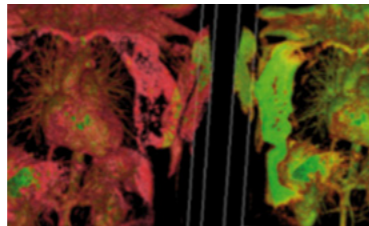
## PRE AND POST PROCESSING SOFTWARE

### GID



A universal and adaptive pre and post-processor for computer simulation in engineering and applied science. *Developed & marketed by CIMNE since 1998.* [www.gidhome.com](http://www.gidhome.com)

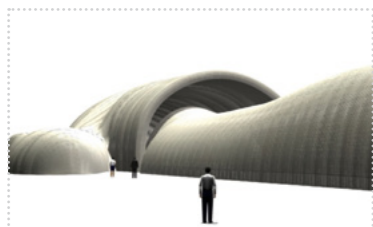
### DIPPO



Versatile platform for digital image processing combined with numerical modelling and simulations. *Developed and marketed by CIMNE since 2011.*

## ENGINEERING SYSTEMS AND HARDWARE

### INFATABLE STRUCTURES



Inflatable pavilions, shelters and bridges for applications in engineering and architecture. *Developed by Buildair and CIMNE. Marketed by Buildair since 2002.* [buildair.com](http://buildair.com)

### OKO



Interactive frame for displaying images and videos. *Developed by CIMNE. Marketed by Tecnologías Avanzadas para el Ocio (TAOC), SL since 2016.* [okoproject.com](http://okoproject.com)

### WATER-PS



Fresh water production system. *Developed by CIMNE and Fresh Water Nature, Ltd. Marketed by Fresh Water Nature, Ltd. since 2016.*

## COLLABORATIVE WORK PLATFORMS

### MI COLEGIO EN RED



Communications system and integrated services designed specifically for schools via the Internet. *Developed and marketed by CIMNE since 2000.* [cimne.com/mcr](http://cimne.com/mcr)

### FRAKTALIS



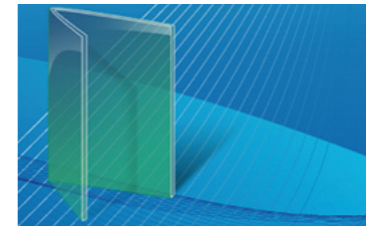
Fully customizable web application that creates virtual communities where users can communicate and share. *Developed and marketed by CIMNE since 2009.* [fraktalis.com](http://fraktalis.com)

### LHINGS



Cloud platform to provide access and links to all kind of things and let users manage, share and interaction with them. *Developed and marketed by Lyncos SL and CIMNE.* [lhings.com](http://lhings.com)

### SIGPRO



Integrated software platform for the management of the research and financial activities and reports in RTD projects. *Developed by CIMNE.* [cimne.com/sigpro](http://cimne.com/sigpro)

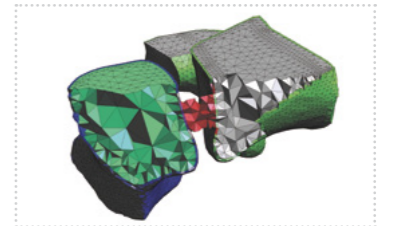
### SCIPEDIA



Web platform for free publishing and open access of scientific publications. *Developed by Scipedia, S.L. in cooperation with CIMNE. Marketed by Scipedia, S.L. since 2016.* [scipedia.com](http://scipedia.com)

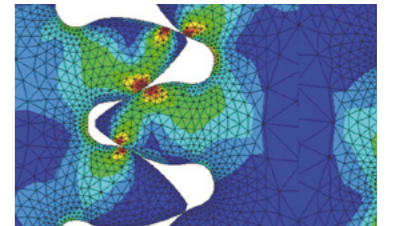
## EDUCATIONAL SOFT.

### EDUCATIONAL SOFTWARE



Educational software for interactive learning about structural design and finite element method. *Developed and marketed by CIMNE.* [cimne.com/educational](http://cimne.com/educational)

### MAT-FEM



Educational program in MATLAB for introduction to the finite element method for analysis of structures and field problems. *Developed by CIMNE.* [cimne.com/mat-fem](http://cimne.com/mat-fem)

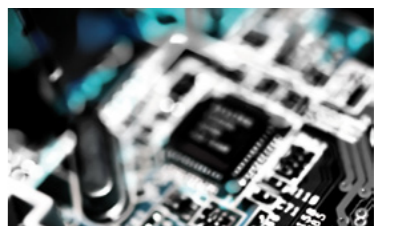
## DECISION SUPPORT SYSTEMS

### BEACHING



Information system for management of tourism activities in beach areas. *Developed by CIMNE and marketed by TAOC SA since 2011.* [beaching.com](http://beaching.com)

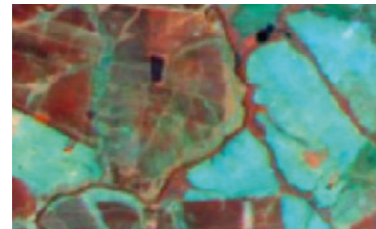
### RMOP



Integrated platform for robust multiobjective optimization in engineering. *Developed by CIMNE.* [tts.cimne.com/RMOP](http://tts.cimne.com/RMOP)

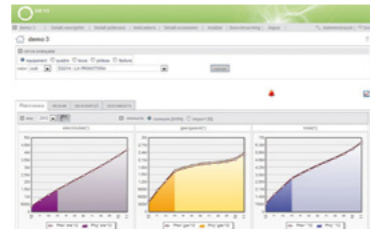
DECISION SUPPORT SYSTEMS

GIS+



Web-based interactive Geographic Information System.  
Developed by CIMNE.

SIE



Information system for management of energy consumption in public buildings and municipalities.  
Developed by CIMNE. Marketed since 2005 by Gassó Auditores SL and CIMNE. [inergybcn.com](http://inergybcn.com)

ROEM



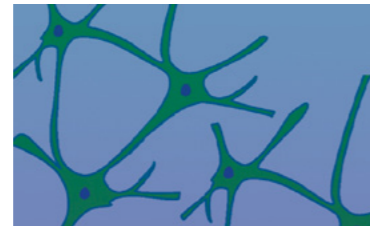
Information system for assessment of the environmental quality in reservoirs and lakes.  
Developed by CIMNE.

E-TESTING



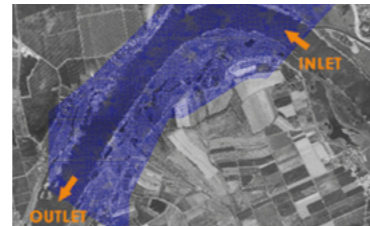
Web-based platform for e-management of experimental tests.  
Developed by CIMNE and Applus.

FLOOD



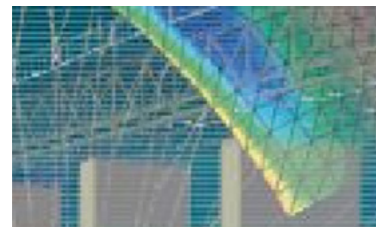
Artificial neuronal network package.  
Developed by CIMNE.  
[cimne.com/flood](http://cimne.com/flood)

RAMFLOOD



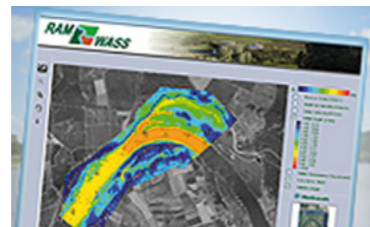
Decision support system (DSS) for risk assessment and managing of floods.  
Developed by CIMNE and Flumen.  
[www2.cimne.com/ramflood](http://www2.cimne.com/ramflood)

WSNP



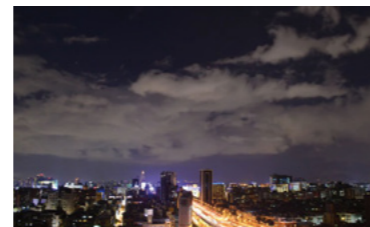
An integrated platform for e-monitoring using wireless sensor network technology.  
Developed by CIMNE.  
[www2.cimne.com/wsnap](http://www2.cimne.com/wsnap)

RAMWASS



Decision support tool for the risk assessment and management of environmental and human-induced hazards on the water/sediment/soil system in fluvial ecosystems.  
Developed by CIMNE.  
[www.cimne.com/ramwass](http://www.cimne.com/ramwass)

BEE DATA



Open source BiG Data Analytics platform for deep analysis of massive data coming from smart metering infrastructure of utility companies.  
Developed by CIMNE and marketed by Inergy.  
[beedataanalytics.com](http://beedataanalytics.com)

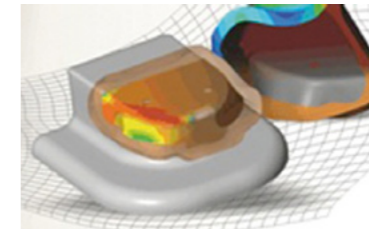
SIMULATION SOFTWARE FOR INDUSTRIAL PROCESSES

WELDPACK



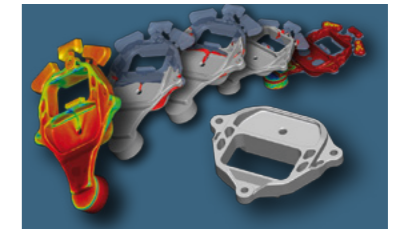
Welding processes software.  
Developed by CIMNE.

STAMPACK



Software for sheet metal forming processes.  
Developed by Quantech ATZ, SA and CIMNE. Marketed by Quantech ATZ, SA since 1999. [stampack.com](http://stampack.com)

CLICK2CAST



Software for fast simulation of casting processes.  
Developed by Quantech ATZ in cooperation with CIMNE. Marketed by Altair since 2015.

SCUT



Software able to simulate cutting processes for the metal manufacturing industry.  
Developed by CIMNE.

ADD2MAN



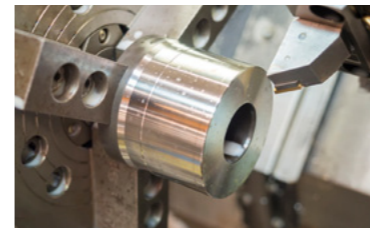
Additive manufacturing processes software.  
Developed by CIMNE in cooperation with Eurecat.

FORGEPACK



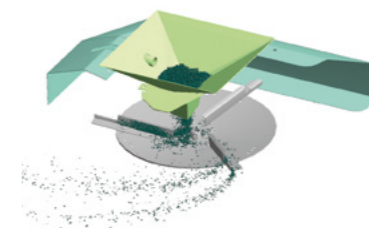
Forging manufacturing processes software.  
Developed by CIMNE.

MACHPACK



Software able to simulate machining manufacturing processes.  
Developed by CIMNE.

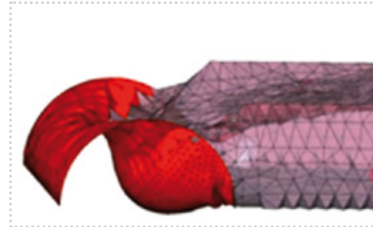
SpreadDEM



Simulation software for the study of the particle flow on centrifugal fertilizer spreaders.  
Developed and marketed by CIMNE.  
[cimne.com/spreaddem](http://cimne.com/spreaddem)

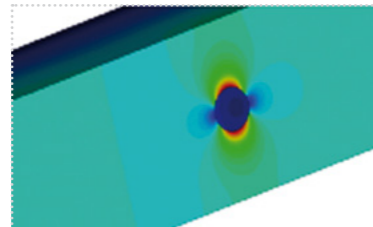
SIMULATION SOFTWARE FOR MULTIPHYSICS

KRATOS



Object-oriented software platform for the development and application of finite element codes for multidisciplinary applications. *Developed by CIMNE.*  
[cimne.com/kratos](http://cimne.com/kratos)

ERMES



Computational electromagnetics using advanced finite element methods. *Developed by CIMNE.*  
[tts.cimne.com/ermes](http://tts.cimne.com/ermes)

PFIRE



Analysis of propagation of fire and its effect on the burning and melting of objects. *Developed by CIMNE.*

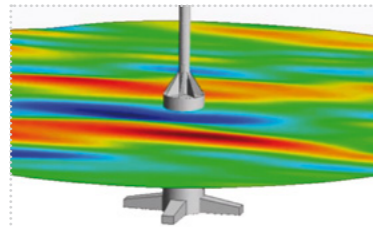
SIMULATION SOFTWARE FOR FLUID DYNAMICS

TDYN



Finite element code for analysis of a wide range of multi-physic problems in engineering and applied science. *Developed by Compass Ingeniería y Sistemas, SA. and CIMNE.*  
*Marketed by Compass since 2003.*  
[compassis.com](http://compassis.com)

SEAFEM



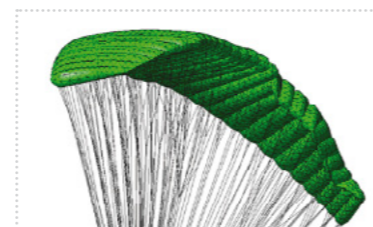
Hydrodynamics and seakeeping analysis of ships and marine structures. App for wind tower generators in the sea. *Developed by Compass Ingeniería y Sistemas, SA. and CIMNE.*  
*Marketed by Compass since 2011.*  
[compassis.com](http://compassis.com)

PFLOW



Analysis of fluid dynamics and fluid-structure-soil-thermal interaction problems into the Particle Finite Element Method (PFEM). *Developed by CIMNE.*  
[cimne.com/pfem](http://cimne.com/pfem)

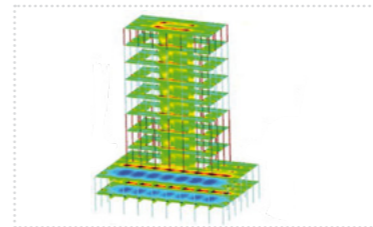
PARACHUTES



Computer program for the fast simulation of parachute-payload systems. *Developed and marketed by CIMNE since 2016.*  
[cimne.com/parachutes](http://cimne.com/parachutes)

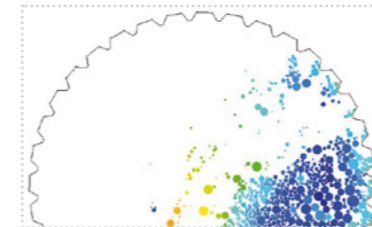
SIMULATION SOFTWARE FOR STRUCTURAL ENGINEERING

RAMSERIES



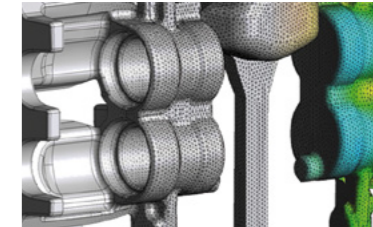
Finite element code for analysis of structures in engineering and architecture. *Developed by Compass Ingeniería y Sistemas, SA. and CIMNE.*  
*Marketed by Compass since 2003.*  
[www.compassis.com](http://www.compassis.com)

DEMPACK



Analysis of granular systems and multifracturing problems in geomechanics and industrial processes using discrete and finite element methods. *Developed by CIMNE.*  
[cimne.com/dem](http://cimne.com/dem)

COMET



Finite element code for none linear analysis of thermomechanical problems in solid and structural mechanics accounting for frictional contact situations. *Developed by CIMNE.*  
[cimne.com/comet](http://cimne.com/comet)

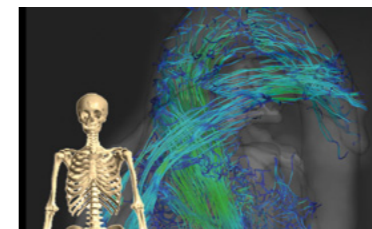
BIOMECHANICS & HEALTH

HEALTH APP



App to control eating disorders. *Developed by HealthApp in cooperation with CIMNE. Marketed by HealthApp SL since 2014.*  
[bcnhealthapp.com](http://bcnhealthapp.com)

BODYGID



Multiscale representation and analysis of the human body. *Developed by CIMNE.*  
[cimne.com/bodygid](http://cimne.com/bodygid)

VISIT CIMNE PRODUCTS AT  
**CIMNE.COM/PRODUCTS**

# Spin-off companies



**SOLUCIONES INTEGRALES DE FORMACIÓN Y GESTIÓN STRUCTURALIA, SA**  
**Created in 2001**  
[structuralia.com](http://structuralia.com)  
 Training and consulting activities in the civil engineering via Internet. It was sold in 2011 to KAPLAN (The Washington Post Group).



**COMPASS INGENIERÍA Y SISTEMAS, SA**  
**Created in 2002**  
[compassis.com](http://compassis.com)  
 It develops commercial activities related to numerical methods in engineering, with emphasis on civil, naval and maritime engineering. CIMNE owns 24% of COMPASS.

**INGENIA AIE**  
**Created in 2006**  
 EIG formed by several companies and CIMNE. The objective is to promote the participation of its members in projects of aeronautics and the space field, in cooperation with the main international manufacturers in the sector.

**QUANTECH ATZ**  
**Created in 1996**  
[quantech.es](http://quantech.es)  
 Development and marketing of simulation software for production processes.

## CIMNE TECNOLOGÍA, SA

**Created in 2011**  
[cimnetecnologia.com](http://cimnetecnologia.com)  
 Company 100% owned by CIMNE aiming to industrialize and market the products and technology developed at CIMNE. CIMNE Tecnología SA. is also an incubator and promoter of new companies.



**BUILDAIR INGENIERÍA Y ARQUITECTURA, SA**  
**Created in 2001**  
[buildair.com](http://buildair.com)  
 Inflatable structures for engineering and architecture applications. CIMNE Tecnología SA owns 2,51% of BUILDAIR.



**BEEDATA ANALYTICS, SL**  
**Created in 2017**  
[beedataanalytics.com](http://beedataanalytics.com)  
 ICT services based on mass analytical data treatment to users and business intelligence for companies and institutions. CIMNE Tecnología owns 49,36% of Beedata Analytics, SL.



**BIOMECHANIC DEVELOPMENTS, SL**  
**Created in 2015**  
[bd-biomechanics.com](http://bd-biomechanics.com)  
 Software solutions and services in biomedical field. CIMNE Tecnología SA owns 43,67% of Biomechanics Developments.



**COMPUTATIONAL AND INFORMATION TECHNOLOGIES, SA**  
**Created in 2012**  
[citechsa.com](http://citechsa.com)  
 Computational methods and information technology systems in engineering. 100% owned by CIMNE Tecnología SA.



**FRESH WATER NATURE, SL**  
**Created in 2013**  
 Solutions for obtaining fresh water from desalination and distillation of waste water. The company is 92,99% owned by CIMNE Tecnología SA.



**HEALTHAPP, SL**  
**Created in 2013**  
[bcnhealthapp.com](http://bcnhealthapp.com)  
 Software for treatments of eating disorders. It improves the links therapist / patient. 18,52% owned by CIMNE Tecnología SA.



**RSM GASSÓ CIMNE ENERGY, SL**  
**Created in 2012**  
[inergybcn.com](http://inergybcn.com)  
 Advanced engineering energy services. 50% owned by Servicios Energéticos Avanzados, SL, which is 100% owned by CIMNE Tecnología, SA.



**INLOC ROBOTICS, SL**  
**Created in 2014**  
[inlocrobotics.com](http://inlocrobotics.com)  
 Positioning and navigation solutions for mobile robots in buried environments. CIMNE Tecnología owns 7,73% of INLOC Robotics since October 2015.



**LYNCOS TECHNOLOGIES, SL**  
**Created in 2012**  
[lhings.com](http://lhings.com)  
 Software and systems for the Internet of Things. CIMNE Tecnología SA owns 4,77% of Lyncos Technologies, SL.



**PORTABLE MULTIMEDIA SOLUTIONS, SL**  
**Created in 2013**  
[portablemultimediasolutions.com](http://portablemultimediasolutions.com)  
 Mobile pavilions with multimedia technology for leisure, sport and events. 17,96% owned by CIMNE Tecnología SA.



**PNEUMATIC STRUCTURES TECHNOLOGIES, SL**  
**Created in 2015**  
[ps-technologies.com](http://ps-technologies.com)  
 Pneumatic structures for a wide range of engineering problems. 10% owned by CIMNE Tecnología SA.



**SCIPEDIA, SL**  
**Created in 2015**  
[scipedia.com](http://scipedia.com)  
 Free publishing and open access for scientific publications. CIMNE Tecnología owns 16,67% of Scipedia, SL.



**TECNOLOGÍAS AVANZADAS PARA EL OCIO, SL - Created in 2012**  
[beaching.com](http://beaching.com)  
 Information systems for leisure sectors (tourism, music...). 100% owned by CIMNE Tecnología SA.

# VISIT

CIMNE COMPANIES AT

## CIMNE.COM/ COMPANIES



Prof. Olgierd C. Zienkiewicz, UNESCO Chair until his death (2009)

Host of UNESCO Chair of Numerical Methods in Engineering  
Since 1989

SEMNI

Secretariat of SEMNI  
Since 1989



Pilot Center of ERCOFTAC in Spain  
Since 1989



Secretariat of ECCOMAS  
Since 1992



Secretariat of IACM  
1994 - 2016



Partner of FLUMEN  
Since 2012



Creation of AIAC  
Since 2015

CIMNE, leader in research on computational engineering, has established relevant alliances with international institutions and companies since its creation in 1987.

# ALLIANCES

## Unesco Chair in Numerical Methods in Engineering

In 1989, UNESCO and UPC · BarcelonaTech reached an agreement to create the first UNESCO chair in the world: the UNESCO Chair of Numerical Methods in Engineering.



Dr. Jacques Périaux

The main mission of the Chair is to **promote the development, dissemination and application of numerical methods in engineering at an international level**, through education, research and technology transfer, with the aim of contributing to the solution of complex problems in lower income countries.

**Prof. O. C. Zienkiewicz** held the UNESCO Chair since its creation in 1989 until his death on January 2nd, 2009. Since 2009, the Unesco Chair of Numerical Methods in Engineering is held by **Dr. Jacques Périaux**. He is a recognized expert in the field of numerical methods applied to aerospace engineering. Dr. Périaux contributions have resulted in a significant increase in the RTD activities of CIMNE in the aerospace sector, in particular with academic organizations and industry in China, the organization of numerous training courses, exchanges with leading scientists worldwide and several RTD projects at an international level.

It is important to note that **computational methods are especially useful in resource-limited countries** because they enhance the ability of people to predict outcomes and optimize solutions before committing resources to specific investments.

An important UNESCO Chair activity over the years has been the **creation of a series of "Aulas CIMNE" (CIMNE Classrooms)**, physical spaces of collaboration with other research groups in universities and research centers located mainly in Latin America and Europe. All nodes in the network connected to each other are using, transforming and broadcasting knowledge generated in CIMNE over the last thirty years.

Both the **people and the knowledge** generated by the network members easily **circulate within the network**. "Aulas CIMNE" is now a growing network of centers of excellence in research and training in the field of numerical methods. A priority in the network is the **promotion of joint projects in research and training using international competitive funds** and existing programs that target specific local needs. Links with scientific groups and other organizations established locally are also actively encouraged. The network is the seed for creating other expected nodes in countries of Africa and Asia.



Organización de las Naciones Unidas para la Educación, la Ciencia y la Cultura

Cátedra UNESCO de Métodos Numéricos en Ingeniería, Universidad Politécnica de Cataluña, BarcelonaTech

[cimne.com/unesco](http://cimne.com/unesco)



# FLUMEN Institute

In 2012, the Government of Catalunya created the FLUMEN Institute for River Dynamics and Hydrologic Engineering as a partnership between CIMNE and UPC · BarcelonaTech.

FLUMEN Institute is the outcome of merging the prestigious Flumen RTD group existing since 2005 at the School of Civil Engineering of UPC · BarcelonaTech and CIMNE, bringing together the numerical and experimental expertise of Flumen RTD group in hydraulics with the broad experience of CIMNE on numerical methods, computer simulation and integration of decision support systems.

The objectives of FLUMEN are the promotion of RTD and technology transfer activities in the field of river dynamics and hydrologic engineering. The Flumen Institute is directed by Prof. J. Dolz.

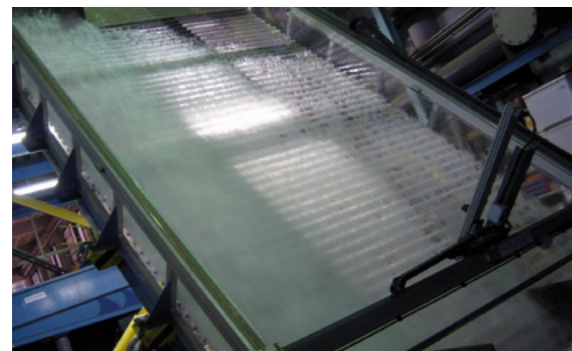


## FLUMEN Premises



The new building that hosts the Flumen Institute **was completed by the end of 2015**. Researchers moved to the new facilities during the first months of 2016. This new building, located at the North Campus of UPC · BarcelonaTech is **equipped with modern experimental facilities for model scale testing of river dynamic and hydraulic problems**. It also provides work areas for researchers at the graduate level (masters, doctoral and postdoc) and for senior researchers from CIMNE and UPC · BarcelonaTech.

[www.flumen.upc.edu](http://www.flumen.upc.edu)



# SEMNI

## Sociedad Española de Métodos Numéricos en Ingeniería

In 1989, CIMNE contributed to the creation of the Spanish Society for Numerical Methods in Engineering (SEMNI).

The basic aims of SEMNI are the **organization and coordination of all activities related to numerical methods in engineering in Spain** and being the Spanish representative in the International Association for Computational Mechanics (IACM).

SEMNI is **linked to similar associations in other countries**, such as the European Community on Computational Methods in Applied Sciences (ECCOMAS), the International Association for Computational Mechanics (IACM), the *Groupe pour l'Avancement des Méthodes Numériques de l'Ingénieur in France*, the United States Association for Computational Mechanics in the United States, and the *Asociación Argentina de Mecánica Computacional*, among others.



The headquarters and the **secretariat of SEMNI are based in CIMNE**. Currently, SEMNI has over 400 members worldwide. Some of the main activities of SEMNI include the organization of technical workshops and the organization of the Spanish Conference on Numerical Methods in Engineering, held every two years.

In July 2017, the **13<sup>th</sup> SEMNI Congress (CMN 2017)** was held at Campus de la Vera, in Valencia (Spain). This jointly event SEMNI-APMTAC (Portuguese Association) was a forum for the discussion of relevant scientific and technical developments in computational mechanics, numerical methods and engineering applications.



Views of CMN 2017

The CIMNE researcher Pavel Ryzhakov receiving the Juan Carlos Prize from SEMNI

[www.semni.org](http://www.semni.org)

# ECCOMAS

## European Community on Computational Methods in Applied Sciences

[www.eccomas.org](http://www.eccomas.org)

ECCOMAS is a scientific organization founded in 1992. It groups European associations with interests in the development and application of computational methods in applied sciences and technology.



The mission of ECCOMAS is to **promote joint efforts of European universities**, research institutes and industries which are active in the broad field of numerical methods and computer simulation in Engineering and Applied Sciences (i.e. Computational Solid and Structural Mechanics, Fluid Dynamics, Acoustics, Electromagnetics, Physics, Chemistry, Applied Mathematics, and Scientific Computing), to address critical societal and technological issues with particular emphasis on multidisciplinary applications and disseminate innovative research.

The three main scientific events that ECCOMAS organizes every four years are the **ECCOMAS Congress**, the **ECCOMAS Conference on Computational Solid and Structural Mechanics (ECCM)** and the **ECCOMAS Conference on Computational Fluid Dynamics (ECFD)**. They attract approximately 5,000 participants in total.

The ECCOMAS Congress is addressed to **scientists and engineers both in and outside Europe**. Its main objective is to provide a forum for presentation and discussion of state-of-the-art in scientific computing applied to engineering, with emphasis on basic methodologies, scientific development and industrial applications. It also includes invited lectures, Special Technological Sessions (STS), contributed papers from Academy and Industry and organized Minisymposia. Proceedings of the ECCOMAS Congresses are widely disseminated in Europe.

The next **ECCOMAS Congress** will be jointly organized with the 14th World Congress on Computational Mechanics in Paris, France, on 19-24 July 2020.

These series of ECCOMAS global meetings are complemented with more focused thematic conferences on state-of-the-art topics in computational sciences and engineering.

# IACM

## International Association for Computational Mechanics

The International Association for Computational Mechanics (IACM) was founded in 1981 and, since then, it has been strongly connected to CIMNE.



The goal of IACM is the **promotion of advances in computational mechanics** in a wide sense. IACM defines computational mechanics as the development and application of numerical methods and digital computers to solve problems in engineering and applied sciences with the objectives of understanding and harnessing the resources of nature.

Computational Solid Mechanics (CSM) and Computational Fluid Dynamics (CFD) are at the core of IACM activity. Subjects such as thermodynamics, electromagnetics, rigid body mechanics, control systems and some aspects of particle physics fall naturally within the scope of the IACM. Indeed providing a common forum for discussion, education and research information transfer between the diverse disciplines represented is the main *raison d'être* of IACM.

The International Association for Computational Mechanics (IACM) and the United States Association for Computational Mechanics (USACM), in cooperation with the Columbia University and the University of Texas, are organizing jointly the **13th World Congress on Computational Mechanics (WCCM XIII) and 2nd Panamerican Congress on Computational Mechanics (PANACM II) in New York City (EEUU)**, which will be held from 22 to 27 July, 2018.

IACM publishes a biannual bulletin and supports the organization of special interest conferences, IACM Symposia and courses in various fields of computational mechanics.

[www.iacm.info](http://www.iacm.info)



# ERCOFTAC

## European Research Community on Flow, Turbulence and Combustion



The ERCOFTAC network was founded in 1987. It is promoted by several European aerospace companies and it groups together more than 60 research centers and companies working primarily in the numerical simulation of fluid mechanics problems in engineering.

Since 1989, **CIMNE is a Pilot Centre of ERCOFTAC in Spain.**

CIMNE, acting as Pilot Centre, has organized a number of activities, including, among others, the 8th European Turbulence Workshop (Barcelona 2000), the Europe-Russia Workshop (Barcelona 2006), the 3rd Workshop on Research in Turbulence (Seville 2008), the 5th Workshop on Research in Turbulence (Tarragona 2010) and ERCOFTAC Spring Festival (Terrassa 2014).

**CIMNE has coordinated the FP7 E-Caero projects 1 and 2** (E-CAERO: European Collaborative Dissemination of Aeronautical research and applications, 2009-2013 and 2014-2017). Both projects aim to promote joint activities of different scientific associations in the aeronautic field in Europe. ERCOFTAC is a partner in both projects.



[www.ercoftac.org](http://www.ercoftac.org)

# AIAC

## International Association of Aulas CIMNE

The International Association of Aulas CIMNE (AIAC) is a non-governmental non-profit civil organization with the objective of fostering the advances of numerical methods in a common academic space: the Aulas CIMNE (Joint Labs). Aulas CIMNE are the basis for cooperation in scientific, technological and training among its members, aiming to achieve social and economic improvements in society.



**AIAC**  
Asociación Internacional de  
Aulas **CIMNE**

### Mission

To contribute to the development, strengthening and consolidation in:

- **Training**, by promoting and organizing courses of interest to its members.
- **Scientific and technological research**, including the processes of innovation, adaptation and technology transfer in strategic areas.
- The use of numerical methods in engineering as a tool to help developing countries.

The interaction of the members of the Association with the society at large, by disseminating scientific and technological advances that drive progress.

### AIAC members benefit from:

- Continuous education, enhancing the set of high-level human resources of Aulas CIMNE and the Network and by the competitive advantage of installed capacity in the regions.
- The development of multi- and inter-disciplinary activities in areas of basic research, applied research and experimental developments.
- Exchange programs for teachers, researchers, students and academic and innovation managers.
- Research and development programs in emerging knowledge areas, related to new professional profiles identified as strategic.

### AIAC's vision

To promote a common project and create a network of experts from around the world, which results in the international benchmark in the field of numerical methods in engineering.

AIAC intends to encompass an international environment in which scientists, technical staff and engineers can benefit directly from CIMNE's tools (developed or in development), international collaborations, participation in projects, exchange of information and industry technology transfer, among others.

[aiac.cimne.com](http://aiac.cimne.com)





POST-GRADUATE STUDIES

COURSES

SEMINARS

COFFEE TALKS

CONFERENCES

## Dissemination

Knowledge transfer is of vital importance for CIMNE, which invests great efforts in training and education addressed to its research staff as well as to graduates and professionals from schools of engineering and universities in applied sciences.

CIMNE regularly organises seminars, coffee talks, courses and post-graduate studies related to the theory and application of numerical methods in engineering. It has also developed a web environment for distance learning education via Internet.

The research centre plays also an important role as event organizer in the field of computational engineering. In the following pages, a summary of the conferences organized by CIMNE Congress Bureau during 2017 can be found. The wide agenda of congresses and conferences that will take place during 2018-2019, it is also included.

## Training # Post-Graduate Studies and Courses

# Training



## Post-graduate Studies

CIMNE supports the organization of the following postgraduate degrees awarded by the UPC · BarcelonaTech.

### Master Degrees

#### Master on Numerical Methods in Engineering

Duration: 2 academic years, 120 ECTS

[cimne.com/mumni](http://cimne.com/mumni)

#### Master of Science on Computational Mechanics

Duration: 2 academic years, 120 ECTS

[cimne.com/mcm](http://cimne.com/mcm)

### Doctoral Degrees

#### Simulation in Engineering and Entrepreneurship Development- SEED

Duration: PhD studies, 3-4 years period

[cimne.com/emjd-seed](http://cimne.com/emjd-seed)

## Courses

CIMNE is also been organizing courses and workshops related to its field of expertise:

#### JORNADA I: Un compromís vintcentista per a una nova territorialitat (Bases culturals)

La Pedrera, Barcelona, Spain, 22/03/2017

#### JORNADA II: Cap a un nou model de desenvolupament basat en l'eficiència ambiental (Bases biofísiques)

La Pedrera, Barcelona, Spain, 26/04/2017

#### III Seminario Internacional - Red TELESCOPI

Barcelona, Spain, 17/05/2017-19/05/2017

#### JORNADA III: Una estratègia de país per fer compatible la vocació global amb la vinculació local (Bases polítiques)

La Pedrera, Barcelona, Spain, 18/05/2017

#### 6th Interdisciplinary Workshop on Rockfall Protection

Barcelona, Spain, 22/05/2017-24/05/2017

#### JTC1 Workshop

Barcelona, Spain, 24/05/2017-26/05/2017

#### COMPLAS Course

Barcelona, Spain, 03/09/2017-04/09/2017

#### Ibercursos

Online courses held in 2017:

- IBER Basic Course
- Advanced course dam break and rafts
- Advanced course on water quality
- Hydraulic modelling for structures
- Sediment transport

[www.cimne.com/courses](http://www.cimne.com/courses)



# Coffee Talks in 2017

## Engineering mechanics of epithelial cell monolayers

**Dr. Marino Arroyo**, UPC · BarcelonaTech, Barcelona, Spain — 18/01/2017

**Computational Modelling of Internal Combustion Motorvalves: Thermomechanics, Fatigue and Wear**  
**Dr. Alberto Cardona**, CIMEC, Santa Fe, Argentina — 31/01/2017

## Computational material design for acoustic cloaking

**Prof. Alfredo Huespe**, Universidad Nacional del Litoral, Argentina — 07/02/2017

**Material Point Method for coupled thermo-hydro-mechanical problems**  
**Dra. Núria M. Pinyol**, UPC · BarcelonaTech, Barcelona, Spain — 15/02/2017

**Validation of the PFEM for Simulation of Tsunami Forces on Bridge Superstructures**  
**Prof. Michael H. Scott**, Oregon State University (US) — 02/03/2017

**eXtended Hybridizable Discontinuous Galerkin (X-HDG)**  
**Sònia Fernández**, UPC · BarcelonaTech, Barcelona, Spain — 29/03/2017

**Time domain simulation of coupled sloshing-seakeeping problems by coupling PFEM-2 and SeaFEM**  
**Mr. Jonathan Colom**, CIMNE, Barcelona, Spain — 26/04/2017

## Challenges to Aviation - a Need for Enhanced Technologies

**Dr. Dietrich Knörzer**, RWTH Aachen University, Aachen, Germany — 28/04/2017

## Can I Manufacture that?

**Mr. Martín Solina**, Altair Engineering Inc., Barcelona, Spain — 23/05/2017

## Brief introduction to Discrete Exterior Calculus

**Dr. Rafael Herrera Guzmán**, CIMAT, Guanajuato, México — 05/07/2017

## Particle Finite Element Method (PFEM) for Large-deformation Geotechnical Problems

**Dr. Xue Zhang**, CIMNE, Barcelona, Spain — 27/07/2017

## Model reduction of non-linear structural dynamic models: a path in the jungle

**Prof. Daniel Rixen**, University of Munich, Munich, Germany — 19/09/2017

## Fully coupled fluid-electro-mechanical cardiovascular simulations

**Prof. Mariano Vázquez**, Barcelona Supercomputing Center, Barcelona, Spain — 08/11/2017

## Audio Signal Processing for Dynamic Noise Mapping in Smart Cities

**Dr. Francesc Alías**, Universitat Ramon Llull (URL), Barcelona, Spain — 22/11/2017

**Curved high-order mesh generation: an overview**  
**Dr. Josep Sarrate**, UPC · BarcelonaTech, Barcelona, Spain — 29/11/2017



# Seminars in 2017

## An introduction to Virtual Reality Technologies and possible applications in Architecture and Engineering

**Arnau Rigol, Soraya Araujo, Óscar De Coss, David Arroyo and Marc Martínez**; UPC · BarcelonaTech, Barcelona, Spain — 21/02/2017

## Can we “automatically” write an Element?

**Dr. Riccardo Rossi**, UPC · BarcelonaTech, Barcelona, Spain — 08/03/2017

## CIMNE Intellectual Property Model: Application to the GiD Case

**Dr. Abel Coll**, CIMNE, Barcelona, Spain — 22/03/2017

## Computational Modeling of Flow Diverting Devices in Intracranial Aneurysms

**Marcelo Raschi**, CIMNE, Barcelona, Spain — 04/04/2017

## Numerical simulation of metal forming processes for the evaluation of microstructures and the optimization of the process

**Emilio Salsi**, CIMNE, Barcelona, Spain — 03/05/2017

## Numerical simulation of problems in large displacement and large deformation regime with an implicit Material Point Method

**Ilaria Iconeta**, CIMNE, Barcelona, Spain — 17/05/2017



## The role of the Orthogonal Sub-Grid Scales - Variational Multi-Scale (OSGS-VMS) method in describing the Burgers “turbulence” phenomena

**Camilo Bayona**, CIMNE, Barcelona, Spain — 31/05/2017

## New developments in Computational Aeroacoustics for the simulation of human phonation using the Variational Multiscale Method

**Arnau Pont**, CIMNE, Barcelona, Spain — 14/06/2017

## Details of the taxation of projects financed by the Catalan, Spanish and European administrations

**Marta Santos and José Antonio Buendía** (InDi-TeC), Madrid, Spain — 28/06/2017

## Augmented and virtual reality applied to the Construction sector

**Oscar de Coss and Sara Rebollo**, CIMNE, Barcelona, Spain — 12/07/2017

## FEM applications based on automatic reconstruction of 3D centerlines from 2D projections

**MC Fernando Cervantes Sánchez**, Centro Investigación de Matemáticas de México (CIMAT), Guanajuato, México — 10/10/2017

## Working on octrees

**MC Jorge López Ruiz**, Centro Investigación de Matemáticas de México (CIMAT), Guanajuato, México — 28/11/2017

# Conferences in 2017

We list below the conferences organised by CIMNE in 2017. For further details visit [congress.cimne.com](http://congress.cimne.com)

\*NP: Number of participants



**JTC1 Workshop**  
24-26 May 2017, Barcelona, Spain # NP: 53



**19th International Conference on Finite Elements in Flow Problems - FEF 2017**  
5 April 2017, Rome, Italy # NP: 308



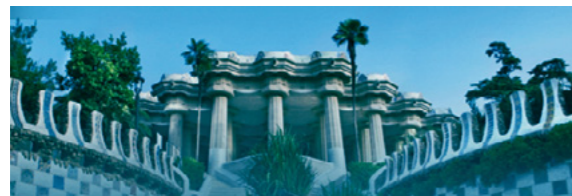
**8th Conference on Smart Structures and Materials - SMART 2017**  
5-8 June 2017, Madrid, Spain # NP: 191



**VII International Conference on Computational Methods in Marine Engineering - MARINE 2017**  
15-17 May 2017, Nantes, France # NP: 199



**VII International Conference on Coupled Problems in Science and Eng. - COUPLED PROBLEMS 2017**  
12-14 June 2017, Rhodes Island, Greece # NP: 414



**III Seminario Internacional Telescopi: La internalización de la Universidad**  
17-19 May 2017, Barcelona, Spain # NP: 46



**International Conference on Adaptive Modeling and Simulation - ADMOS 2017**  
26-28 June 2017, Verbania, Italy # NP: 97

# Conferences in 2017



**IX Simposio Nacional sobre Taludes y Laderas Inestables**  
27-30 June 2017, Santander, Spain # NP: 196



**V International Conference on Particle-based Methods - Particles 2017**  
26-28 Sept. 2017, Hannover, Germany # NP: 327



**Congress on Numerical Methods in Engineering - CMN 2017**  
3-5 July 2017, València, Spain # NP: 293



**International Conference on Textile Composites and Inflatable Structures - Structural Membranes 2017**  
9-11 October 2017, Munich, Germany # NP: 126



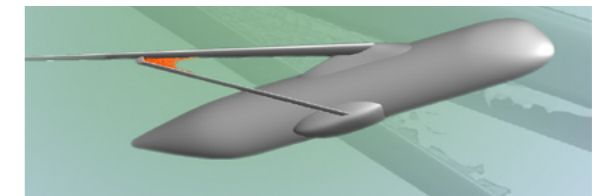
**XIV International Conference on Computational Plasticity - COMPLAS 2017**  
5-7 September 2017, Barcelona, Spain # NP: 388



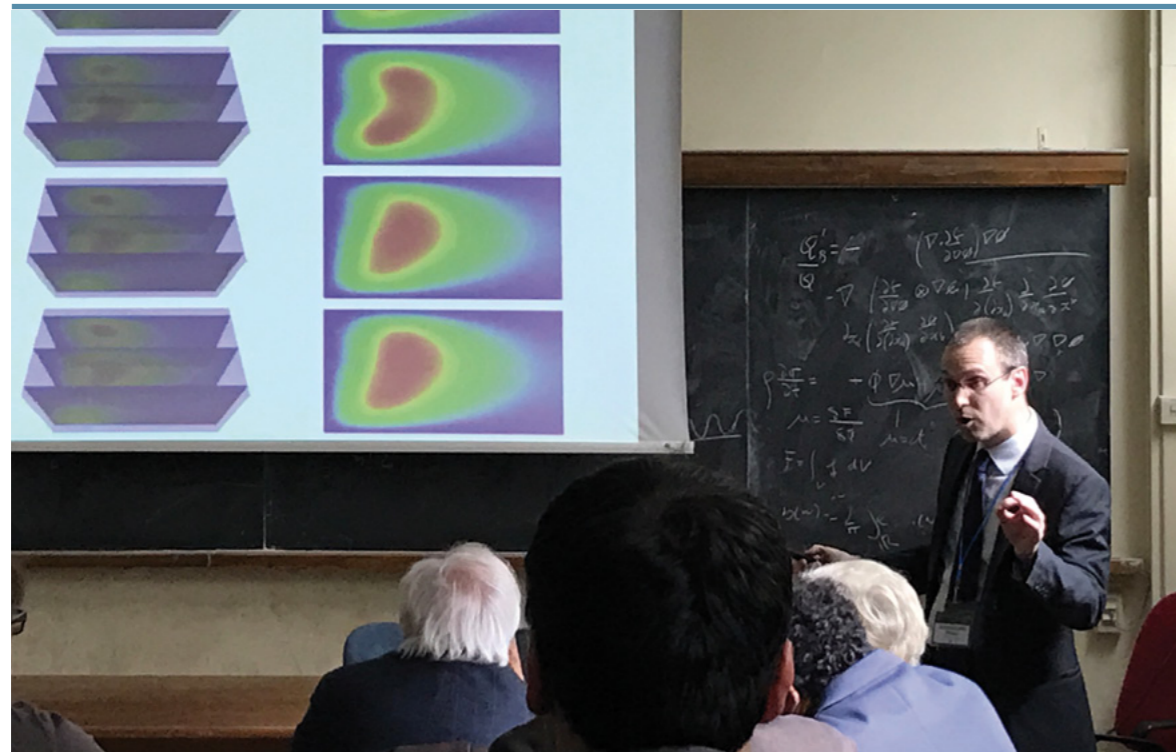
**CM3-2017 - Computation and Big Data in Transport**  
22-24 November 2017, Brussels, Belgium # NP: 30



**IGA 2017 - International Conference on Isogeometric Analysis**  
11-13 September 2017, Pavia, Italy # NP: 173



**Platform for Aircraft Drag Reduction Innovation - PADRI 2017 # NP: 12**  
29 November - 1 December, 2017, Barcelona, Spain



Images of the FEF Congress, held in Rome from 5 to 7 April 2017

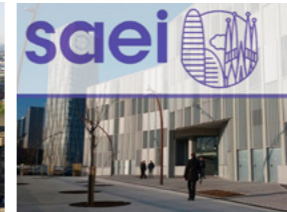


# Upcoming conferences (2018 -2019)

We list below the conferences that CIMNE will organise in 2018 and 2019. For further details visit [congress.cimne.com](http://congress.cimne.com)



**ECCM - ECFD 2018**  
VI European Conference on Computational Mechanics & VII European Conference on Computational Fluid Dynamics  
11-15 June, 2018, Glasgow, UK



**SAEI 2018**  
25th Annual Seminar on Automation, Industrial Electronics and Instrumentation  
4-6 July, 2018, Barcelona, Spain



**EUCEET 2018**  
4th International Conference on Civil Engineering Education: Challenges for the Third Millennium  
5-8 Sept. 2018, Barcelona, Spain



**IAMU 2018**  
19th International General Assembly - AGA 2018  
17-19 Oct., 2018, Barcelona, Spain



**MARINE 2019**  
VIII Conference on Computational Methods in Marine Engineering  
13-15 May, 2019, Göteborg, Sweden



**ADMOS 2019**  
International Conference on Adaptive Modeling and Simulation  
27-29 May, 2019, El Campello, Spain



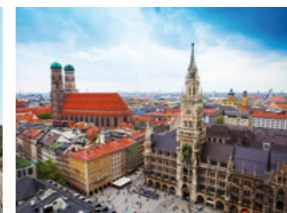
**COUPLED 2019**  
VIII International Conference on Coupled Problems in Science and Engineering  
3-5 June, 2019, Sitges, Spain



**CFRAC 2019**  
VI International Conference on Computational Modeling of Fracture and Failure of Materials and Structures  
12-14 June, 2019, Braunschweig, Germany



**COMPLAS 2019**  
XV International Conference on Computational Plasticity  
3-5 Sept., 2019, Barcelona, Spain



**IGA 2019**  
International Conference on Isogeometric Analysis  
18-20 Sept., 2019, Munich, Germany



**FORM AND FORCE 2019**  
IASS 60th Anniversary Symposium & 9th Int. Conference on Textile Composites and Inflatable Structures  
7-10 Oct. 2019, Barcelona, Spain



**PARTICLES 2019**  
VI International Conference on Particle-Based Methods  
28-30 Oct., 2019, Barcelona, Spain

# Awards



## Chronology of the prizes awarded to CIMNE

Below we briefly review some of the awards granted to the research centre along its history.

### SPECIAL MENTION TO THE CIUTAT DE BARCELONA AWARD 1998

The city of Barcelona awarded CIMNE a Special Mention to the Ciutat de Barcelona Award 1998 in the category of Technological Research for the work carried out by Drs. P. Roca, M. Cervera and E. Oñate on the modelling and structural analysis of the Barcelona Cathedral.

### NARCÍS DE MONTURIOL PLATE AWARD TO THE SCIENTIFIC AND TECHNOLOGICAL MERIT 1999

On November 3rd, 1999, the Generalitat de Catalunya granted to CIMNE the Narcís de Monturiol Plate Award for Scientific and Technological Merit:

- For its contribution to the development of new methods for analysis and design for products and processes in engineering.
- For fostering the cooperation between industry and university research groups.
- For the organization of training activities and the promotion of science and technology at an international level.

### 2002 IST PRIZE TO THE BEST PRODUCT OF THE INFORMATION SOCIETY TECHNOLOGIES, EUROPEAN COMMISSION (EC)

The EC granted the IST Award to the pre/post processor system GiD developed at CIMNE.

### CIUTAT DE BARCELONA 2002 AWARD IN TECHNOLOGICAL RESEARCH

On February 11th, 2003, the Ciutat de Barcelona Award in Technological Research was awarded to the CIMNE research team formed by Eugenio Oñate, Ramon Ribó, Enrique Escolano, Miquel Pasenau and Jorge Suit Pérez.

The prize recognized the development of the pre/postprocessor GiD. This simulation software is an innovative and user-friendly graphic interface that allows the geometric modelling and visualization of the results of numerical simulations.

### AWARD DURAN I FARRELL FOR RESEARCH AND TECHNOLOGY UNIVERSITAT POLITÈCNICA DE CATALUNYA, 2004

The Award was delivered to CIMNE scientists Dr. Oñate and Dr. García for their work entitled: "Development of a new finite element code for the hydrodynamic study of vessels. Applications to the design of sailing ships for the America Cup race".

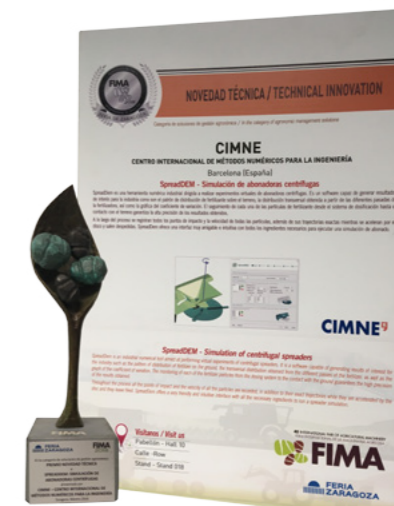
### CUBAN NATIONAL PRIZE 2016 TO THE SCIENTIFIC RESEARCH RESULT BY THE CUBAN ACADEMY OF SCIENCES

This award is a recognition of the research work entitled "Development of advanced technologies for the generation and packaging of particles focused on the methods of discrete elements".

The research was carried out by the Central University "Las Villas" of Cuba (UCLV) and the CIMNE within the Aula UCLV-CIMNE. It also involved the collaboration of the universities of Leuven (KU Leuven, Belgium), and Brasilia (UnB, Brazil), as well as foreign and local institutions.

### FIMA 'TECHNICAL NOVELTY' AWARD 2018

The Centrifugal Spreading Simulation Software, SpreadDEM, developed by CIMNE, has been awarded by the 40th International Fair of Agricultural Machinery (FIMA) with the "Technical Novelty" award in the category of "Agricultural Management Solution". With this award, the Fair recognizes the companies that present devices and systems with direct application in agriculture and rural areas, which bring remarkable innovation to the sector.



## Recent Awards and honours to CIMNE Scientists

### 1. EDUARDO ALONSO

**Baker Medal** for the paper "Thermo-poro-mechanical analysis of landslides: from creeping behavior to catastrophic failure", by the British Institution of Civil Engineers (ICE), 2017.

### 2. CARMEN ANDRADE

**ACHE Award**, by the Scientific-Technical Association for Structural Concrete (Spain), 2017.

### 3. ANTONIO GENS

**Kevin Nash Gold Medal**, by the International Society for Soil Mechanics and Geotechnical Engineering (ISSMGE), 2017.

### 4. NÚRIA PINYOL

**Telford Gold Medal** for the paper "The material point method for unsaturated soils", by the British Institution of Civil Engineers (ICE), 2016.

**Most innovative contribution in the thematic area "Analysis and modelling"** in the IX Simposio Nacional sobre Taludes y Laderas Inestables (IX National Symposium on Slopes and Unstable Slopes) (27-30 June 2017, Santander, Spain) to the contribution "Mechanisms controlling the landslide velocity" authored by Núria M. Pinyol, M. Rosaria Scoppettuolo (Università degli Studi di Salerno) and Prof. Eduardo E. Alonso.

**Baker Medal for the paper "Thermo-poro-mechanical analysis of landslides: from creeping behavior to catastrophic failure"**, by the British Institution of Civil Engineers (ICE), 2017.

### 5. FERNANDO SALAZAR

**Innovation Challenge. Verbund (Austria)**, 2017.

### 6. PAVEL RYZHAKOV

**Juan Carlos Simó Prize 2017**, by SEMNI, 2017.

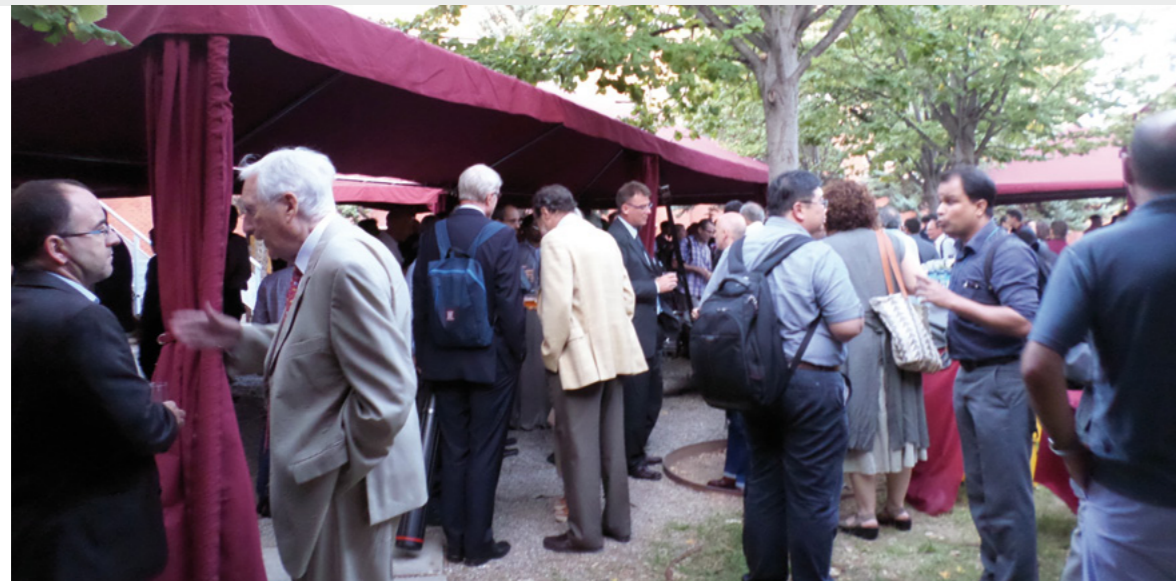


See full list of CIMNE Awardees in

[cimne.com/awards](http://cimne.com/awards)



## CIMNE 1987-2017: 30 years generating Knowledge and solutions



Views of the 30th years anniversary meeting



### The International Centre for Numerical Methods in Engineering (CIMNE) has celebrated on 5th September, 2017, an event to commemorate its 30 years of history.

The event, that brought together 400 people and took place in the Vertex Building of North Campus of the UPC · BarcelonaTech, had the participation of Mr. Ferran Falcó, General Secretary of the Department for Territory and Sustainability of the Generalitat de Catalunya.

Mr. Falcó highlighted that “these 30 years of celebration are important because they represent the start and the consolidation of a country project. The trajectory of CIMNE represents the values that we want to project to the world: ideas for a better world and knowledge at the service of society”.

The event also counted with the participation of other authorities of the Technical University and the Generalitat of Catalonia. The Deputy Director General for Research at the Department of Enterprise and Knowledge, Ms. Iolanda Font de Rubinat, stated: “The centre needs new investments to recover the levels achieved before the crisis. On the part of the Generalitat, we will do our best to achieve this goal and we will offer CIMNE our cooperation and support”.

The Vice Rector of the Technical University of Catalonia, Prof. Fernando Orejas, highlighted the success of CIMNE, the oldest research centre of the UPC. The Director of the School of Civil Engineering, Prof. Pedro Díez, stressed the fact of “CIMNE is more than a research centre”; and the Director of CIMNE, Prof. Eugenio Oñate, said: “We have the challenge ahead to make CIMNE a sustainable organization and this will imply taking all the knowledge accumulated over 30 years for the purpose of increasing the welfare of our citizens”.

# CIMNE in the media

[cimne.com/media](http://cimne.com/media)



**DIARIO MEDICO.COM**  
25 aniversario

INICIO **ÁREA PROFESIONAL** ÁREA CIENTÍFICA OPINIÓN / PARTICIPACIÓN MULTIMEDIA FORMACIÓN

Sanidad | Profesión | Normativa | Gestión | Entorno | La consulta |

Portada > Área Profesional > Gestión

UNIVERSIDADES Y CENTROS DE 5 AUTONOMÍAS

## Un 'corazón virtual', objetivo de la red 'V-Heart SN'

**Aldia.cat** Investigadors espanyols conjuninen forces per crear un "cor virtual"

ESPAÑA ECUADOR

# redacción médica

POLÍTICA SANITARIA ESPECIALIDADES CONOCIMIENTO EMPRESAS

Especialidades > Cardiología

## Científicos españoles trabajan para crear el primer 'corazón virtual'

El descubrimiento servirá para comprender mejor qué genera las arritmias cardíacas y permitirá optimizar las terapias

---

LA VANGUARDIA | Barcelona

Al Mímino Internacional Política Opinión Vida Deportes Economía Local Gente Cultura Sucesos Temas

Local Barcelona Barcelona\*

## Investigadores españoles aúnan fuerzas para crear un "corazón virtual"

Nace la red española V-Heart SN, que buscará mejorar las terapias personalizadas

---

HERALDO

Martes, 16 de enero de 2018, actualizado a las 16:43 horas

Aragón Zaragoza provincia Zaragoza Inicio

## Un "corazón virtual", adaptado a cada paciente

La Universidad de Zaragoza, junto a ocho universidades y centros de investigación, colaborará en el desarrollo del proyecto.

DE LA CIENCIA AL MERCAT BUBOTICA

20-25

## Millorant el control del clavegueram

Indec: Robòtica desenvolupa nous equips per a la inspecció d'infraestructura enterrada

Barcelona Títol de Ben

La postveritat i el consumidor

L'impacte dels programes start

FARO DE VIGO

Empresas en Galicia Constituciones Nominamientos Licencias Subvenciones Finanzas Personas

farodevigo.es • Economía

## La primera embarcación "no tripulada" de España se pone a prueba en la ría viguesa

El dron autónomo de Ferri tiene 12 metros de eslora y dos motores de 300 CV

José Semerari | Vigo | 23.02.2017 | 10:11

El Victoria, el primer dron marino autónomo desarrollado íntegramente en España (la embarcación se mueve de forma autónoma, sin control remoto), se pone a prueba estos días en la ría de Vigo. El barco, de 12 metros de eslora y desarrollado por la minorista industrial Ferri, ha comenzado sus pruebas de mar después del acto de botadura oficial, el pasado diciembre.

CONSTRUMAT

CASES SOSTENIBLES

**BIM Table**

ORIGINAL TITLE: "Construmat. Cases sostenibles"

TITLE IN ENGLISH: Construmat. Sustainable homes.

SOURCE: TV3

PUBLICATION DATE: 05/2017

**AUTONOMOUS DRON**

ORIGINAL TITLE: "La primera embarcación 'no tripulada' de España se pone a prueba en la ría viguesa"

TITLE IN ENGLISH: The first 'unmanned' boat in Spain is tested in the Vigo estuary.

SOURCE: Faro de Vigo

PUBLICATION DATE: 23/02/2017

**INLOC**

ORIGINAL TITLE: "Millorant el control del clavegueram"

TITLE IN ENGLISH: Improving control of the sewer system.

SOURCE: La Vanguardia

PUBLICATION DATE: 19/02/2017

bez

Material reciclado para buques de guerra

20 de junio de 2017

**Fibreship**

ORIGINAL TITLE: "Material reciclado para buques de guerra"

TITLE IN ENGLISH: Recycled material for war ships.

SOURCE: Bez

PUBLICATION DATE: 20/06/2017

sector marítimo INGENIERIA NAVAL

LA INGENIERÍA ESPAÑOLA A LA CABEZA DE FIBRESHIP EN EL HORIZONTE 2020

Junio 19 2017

0 Comments

Imprimir este artículo

Compartir este artículo

**Fibreship**

ORIGINAL TITLE: "La ingeniería española a la cabeza de Fibreship en el Horizonte 2020"

TITLE IN ENGLISH: Spanish engineering at the head of Fibreship in Horizon 2020.

SOURCE: Sector Marítimo

PUBLICATION DATE: 19/06/2017

el Periódico

ECONOMÍA • MÁS INNOVACIÓN ACTUALIDAD MOBILE ZONA FRANCA FIRA DE BCN VIVIENDA

IDEAS DE NEGOCIO

## Puentes de urgencia

PSTECH-PneumaticStructures Technologies prevé empezar en septiembre a vender sus emergencias, alcanzar este año ventas de 200.000 euros y tener beneficios en el 2017

AGUSTÍ SALA / BARCELONA

Martes, 20/06/2017 a las 17:37 CEST

**Emergency bridges**

ORIGINAL TITLE: "Puentes de urgencia"

TITLE IN ENGLISH: Emergency bridges.

SOURCE: El Periódico

PUBLICATION DATE: 20/06/2017



### @2017 IN TWEETS

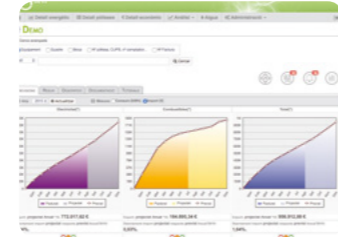
CIMNE carries out an intensive activity through social media, with special attention to Twitter, where the centre has more than 800 followers. Below we highlight some of the 2017 tweets to explain CIMNE's activities through the networks.

J Hernandez from @cimne presenting his lecture at the III #CSMASEMNI workshop at Jaca



01/02/2017

El @consorciedubcn utilitzarà el SIE per gestionar els seus subministraments d'energia en 370 edificis



27/02/2017

RT @ICERCA El prof Oñate @cimne fent la glossa d'homenatge al Prof Benjamin Suarez @la\_UPC @icerca



01/03/2017

RT @visions Our #SEPS project partners at @cimne aim to produce biogas at a slaughterhouse in Quito, Ecuador.



19/04/2017

RT @EEBE Signat el conveni de col·laboració amb @cimne per la creació d'una #AULACIMNE a l'@EEBE\_UPC



12/05/2017

RT @joseprull Visitem el @cimne a @la\_UPC. Eina clau per a la provisió de coneixement i solucions en l'àmbit, entre d'altres, de les infraestructures.



26/05/2017

Ahir @cimne va rebre l'acreditació de centre del segell #TECNIO @accio\_cat



01/06/2017

RT @ACER\_Rercerca Julio García, investigador del @cimne presenta la plataforma Scipedia. #EscolaPrimaveraACER



22/06/2017

Dr C Soriano representing the @UNESCO chair on Numerical Methods for Eng. in Mobilizing UNESCO Science Chairs for policy action towards 2030



06/07/2017

RT @icerca Celebrant els 30 anys de @cimne @ICERCA N'esperem minim 30 mes! #COMPLAS17



05/09/2017

Presentació de @okosmartframe a la fira @expohogar



12/09/2017

# International Centre for Numerical Methods in Engineering

# CIMNE<sup>R</sup>

## generating knowledge and solutions since 1987

# www.cimne.com



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Numerical Methods in  
Engineering**

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**Generalitat  
de Catalunya**



**UNIVERSITAT POLITÈCNICA  
DE CATALUNYA  
BARCELONATECH**

**In cooperation with:**

