

Annual Report

1987-2017
CIMNE^R
towards 30 years

2015

International Center for
Numerical Methods
in Engineering

ANNUAL



REPORT

2015

ANNUAL REPORT 2015

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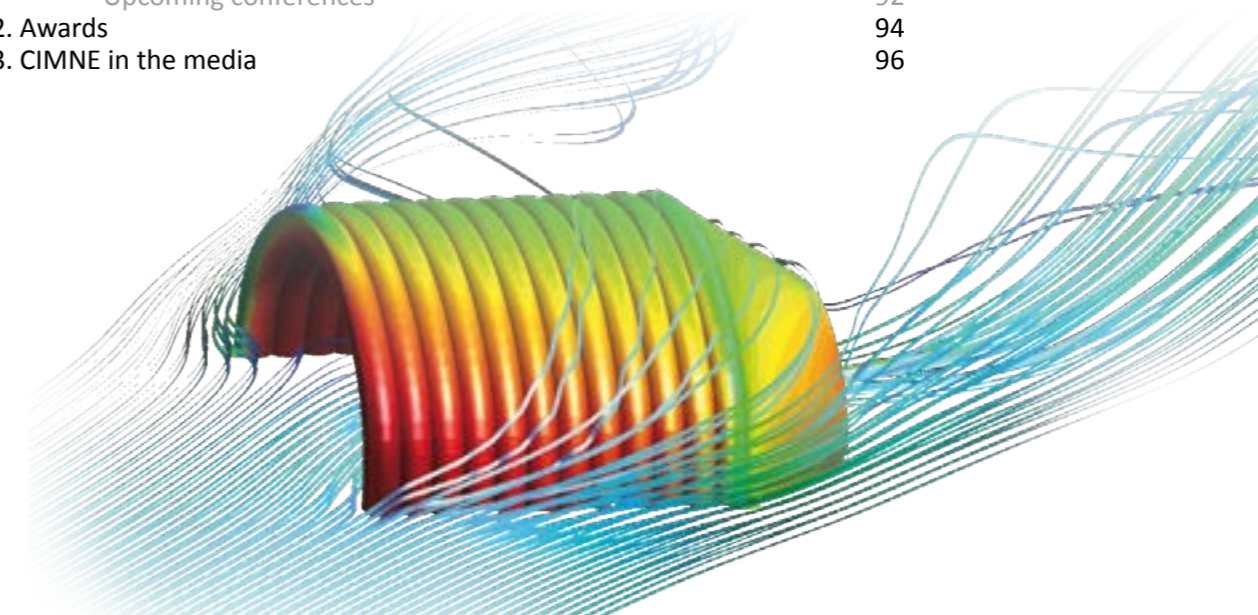
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2015 has been an important year for CIMNE. We have achieved several important scientific and technological landmarks. Also several important events have taken place that have strengthened the position of CIMNE as a leader in the field of computational engineering.



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

At the research level, CIMNE scientists working on computational mechanics have contributed new ideas and numerical methods that are useful for solving relevant problems in civil, aeronautical, marine/naval, mechanical and bio-medical engineering, among others. This work has been reflected in **103 scientific publications in prestigious international journals**, as well as in important software developments using finite element methods and particle-based numerical techniques and innovative parallel computing procedures, among others. Many of these developments have been implemented in open-source software platforms (Kratos, FemPar, etc.) that can be easily accessed by any interested user or developer.

This work has been complemented with that of the research groups at CIMNE working on problems related to pre and post-processing, energy and environment and information and communication technologies. I highlight the **important developments in big data techniques for a wide range of applications**, from the fast visualization of huge sets of numerical results to the empowering of citizens for energy management, among others.

The practical outcome of CIMNE research has taken different forms. We have produced new software codes that can solve problems of practical interest in the engineering fields above mentioned. It is also very interesting and relevant that many research developments at CIMNE have crossed over and beyond the standard borders of numerical methods. Examples of these activities are the successful development of new embedded systems integrating software, data and devices for energy management, APPs for supporting decision-making in engineering, new inflatable structures technologies and fresh water production

devices, among many others. Examples of these technology outputs are given in the section *CIMNE Products* of this report (p.65).

During 2015 **CIMNE has organized 11 international conferences** in many different engineering fields (computational plasticity, marine engineering, particle-based techniques, textile membranes, etc). These conferences have taken place in different locations in the world and have helped CIMNE researchers to disseminate the outcomes of their research. The conferences have also opened many possibilities for new research activities in cooperation with prestigious organizations and companies worldwide (see p.88-89).

The international activities of CIMNE in 2015 have also been remarkable. The international offices of CIMNE in Beijing, Santa Fe (Argentina), Singapore and USA have been very active in promoting research and cooperation projects of interest to each world region (p.22-27). We have also strengthened the Aulas CIMNE Network that has grown to have 30 members in Spain and several Latin American countries. The new *Asociación de Aulas CIMNE* (AIAC) recently created will be a useful legal instrument to consolidate and foster new activities of the network.

I would like to highlight the importance of the activities of the sixteen companies that CIMNE has created over the years. Most of these have been born in the last four years by initiative of CIMNE and CIMNE Tecnología SA (p.72-73). The mission of CIMNE Tecnología is to transfer the technology outputs of CIMNE to industry via license agreements with third party companies, or by participating in their stock-in-trade as shareholder. The final goal is to make of these business initiatives a successful story so that the revenues for CIMNE can be used to fund further research activities.

I finally remark the importance of the construction of a new CIMNE building in the North Campus of the Technical University of Catalonia (UPC · BarcelonaTech). This building, finished on December 2015, will expand the research capabilities of CIMNE and will also host the premises of the Flumen Institute for River Dynamics and Hydraulic Engineering. This institute was created in 2014 as a joint initiative of CIMNE and UPC (p.19 & p.76-77).

When you read these lines we will be probably approaching 2017. In that year we will celebrate the 30th anniversary of CIMNE. We would like to take the opportunity of this important year to explain what is CIMNE and how we can help towards making this world a little better by means of cooperative research and affordable technology.

You are cordially invited to visit us in CIMNE any time.



about

cimne

The International Center for Numerical Methods in Engineering (CIMNE) is a R+D centre in computational mechanics created in 1987, with a strong focus on knowledge transfer, dissemination and application of numerical methods in engineering. CIMNE is a consortium between the Government of Catalonia and UPC · BarcelonaTech, in cooperation with Unesco. The mission of CIMNE is the development of numerical methods and computational techniques for advancing knowledge and technology in engineering and applied sciences. The research center has taken part in over 2,000 RTD projects in cooperation with some 500 companies, universities and research centers worldwide.

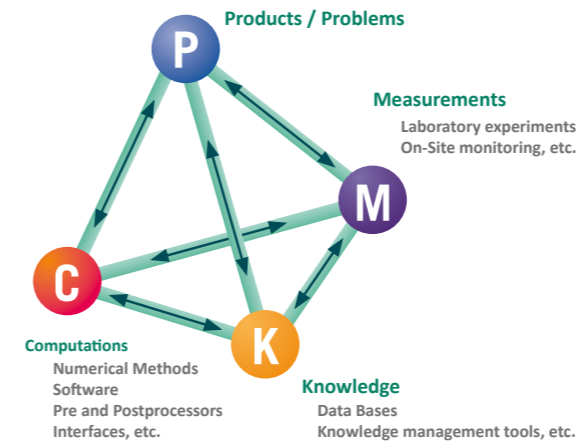
CIMNE maintains close cooperation links with many universities and RTD centers in the field of computational engineering and sciences worldwide. The center has also access to the computing facilities of several supercomputer centers in Spain and Europe. CIMNE employs some 250 scientists and engineers who work in the different offices of CIMNE around the world (Barcelona, Madrid, Washington DC –USA–, Singapore, Santa Fe –Argentina–, Beijing –China–). CIMNE scientists oversee doctorate students in cooperation with several universities in Spain and worldwide. The research center publishes books, monographs, research reports and technical reports; and organizes international conferences and workshops in the different areas of interest. It has organized some 150 conferences since 1987.

Holistic view of CIMNE RTD activities

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.

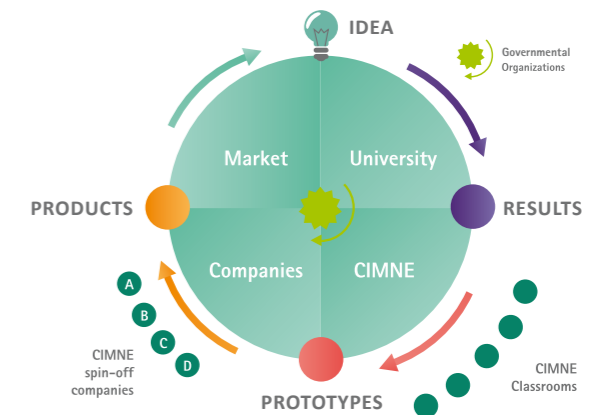
These four concepts: the **problem** to be solved, **computational methods**, **experimental methods** and **existing knowledge** can be represented by the tetrahedron shown in the figure above. Each of the nodes is connected to the other three by lines that represent information transfer pipelines.

The holistic approach for solving problems at CIMNE:



The Cycle of Ideas

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. It is like a seed, that even being very important it is far from becoming a fruit.

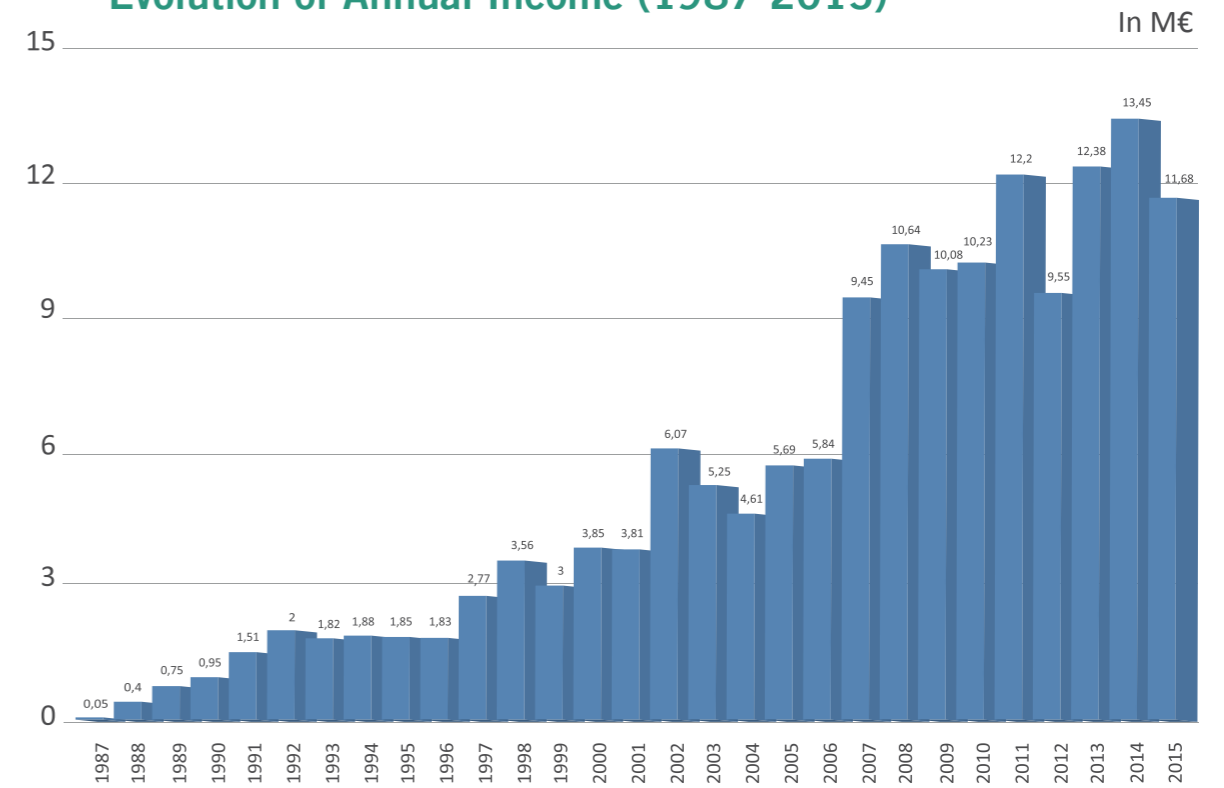
The idea matures until it produces **tangible results** (thesis, papers, computer programs, physical devices, etc.) that have to be filed and protected. Results evolve until they reach the level of a **prototype** (a software code, a system, a device, etc.). The transit of a result to a **prototype** 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**.

Download PDF:
www.cimne.com/cicle-ideas

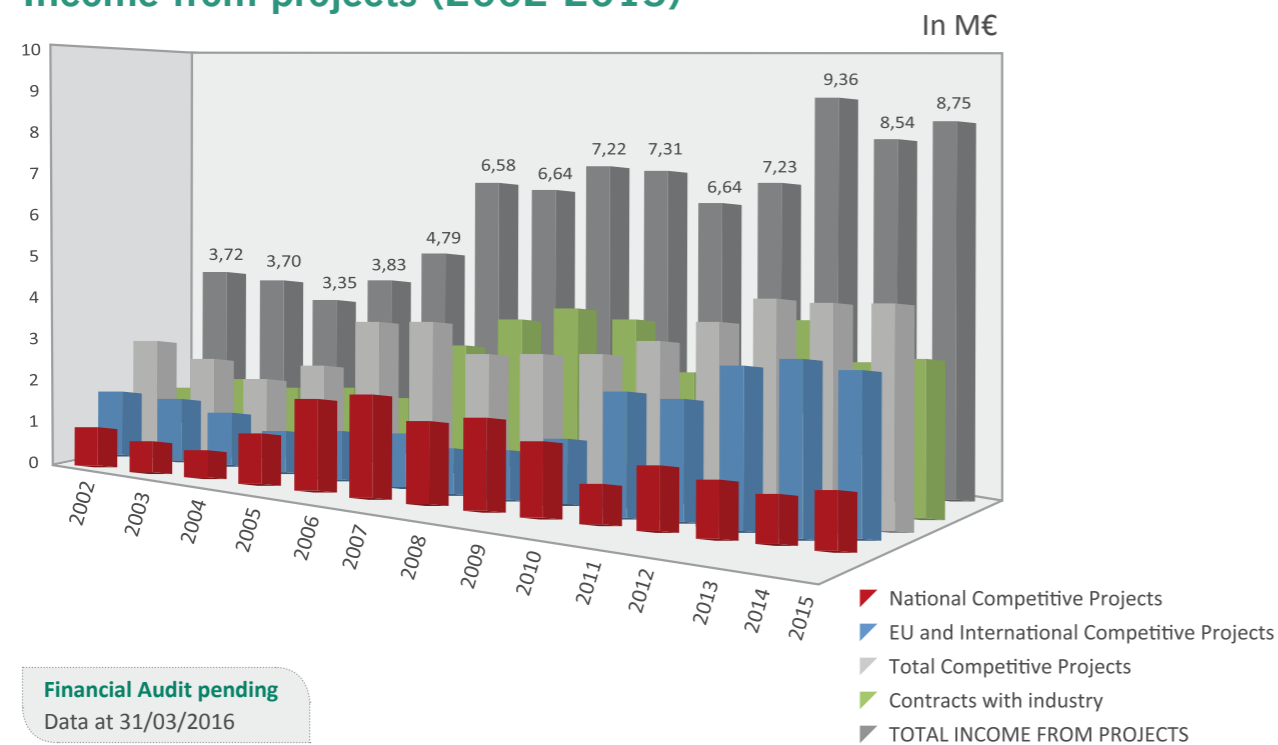
STAFF / POSITION TITLE	2015	ACTIVITIES	2015
Management staff	2	Postgraduate studies	4
Administration staff	35	Conferences	11
Research staff	84	Seminars	12
Full Research Professors	25	Courses	4
Associate Research Professors	13	Coffee Talks	13
Assistant Research Professors	12	Publications	117
Post Docs	24	Books	1
Staff Scientists	8	Monographs	9
Visiting Scientists	2	Research reports	4
Research Engineers	49	Papers in journals	103
Research Students	75	Spin-off companies	16
PhD Students	53	Aulas CIMNE	30
Master Students	19	Patents	0 (5)
Ungraduate Students	3	Contracts with industry	71 (119)
TOTAL Staff	245	Competitive projects	27 (81)
		National projects	17 (36)
		International projects	10 (45)

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

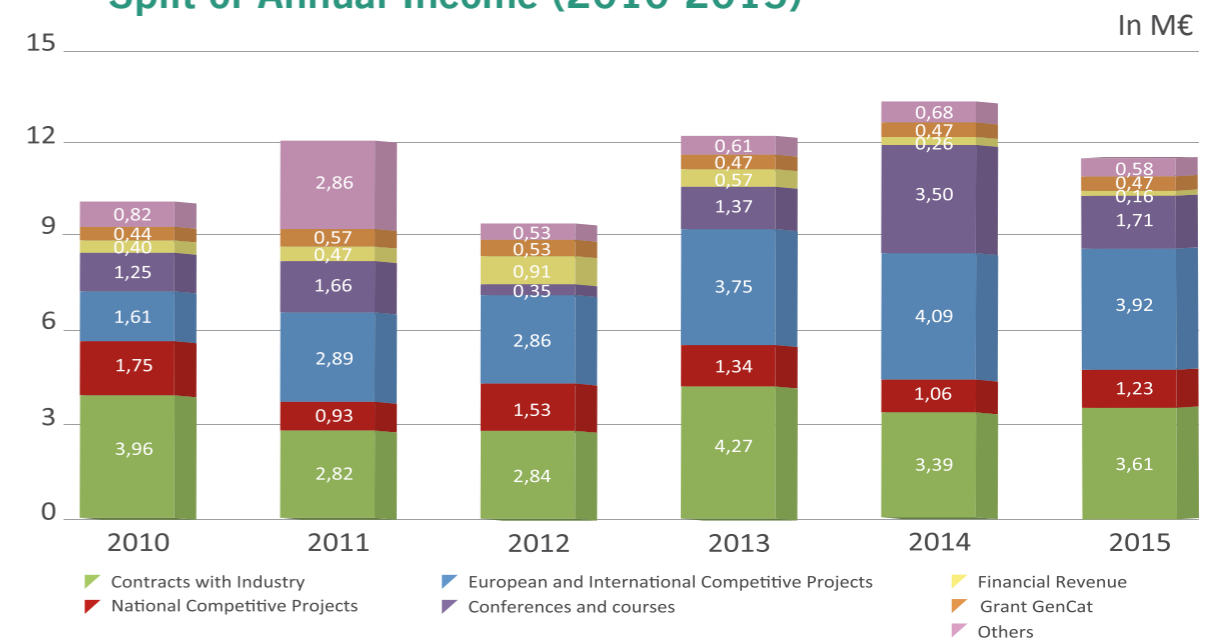
Evolution of Annual Income (1987-2015)



Income from projects (2002-2015)



Split of Annual Income (2010-2015)



Financial Audit pending
Data at 31/03/2016

Financial Audit pending
Data at 31/03/2016

Governing Council

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Mr. Jordi Baiget

Conseller Empresa i Coneixement, Generalitat de Catalunya

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Catedràtic (UPC · BarcelonaTech)

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ACCIÓ, Generalitat de Catalunya

Dr. Antoni Susin

UPC · BarcelonaTech



Sitting down (from left to right): B Schrefler, R. Löhner, R. Owen and P. Wriggers | Standing up (from left to right): M. Casteleiro, M. Kleiber, X. Oliver, A. Combescure, M. Doblaré, E. Oñate, M. Papadrakakis, B. Kröplin and S. Idelsohn

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Geomechanics Group

Leaders - E. Alonso and A. Gens

Industrial Processes Group

Leaders - M. Chiumenti and O. Fruitós

Structural Mechanics Group

Leader - E. Oñate

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Leader - J. Pons

Naval and Marine Engineering Group

Group

Leader - J. García

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Leader - S. Badia

Mathematical and Computational Modelling Group

Leader - A. Huerta

Pre and Post-Processing Group

Leader - A. Coll

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Nature Group

Leader - P. Arnau

Risk Assessment Group

Leader - A. Barbat

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PROJECT MANAGEMENT

Leader - S. Pérez

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PUBLICATIONS and COMMUNICATION

Leader - M.J. Samper

LEGAL

Leader - R. Casanova

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Santiago Badia
Alex Barbat
Gabriel Bugeda
José A. Canas
Miguel E. Cerrolaza
Miguel Cervera
Michele Chiumenti
Ramón Codina
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Antonio Huerta
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Sebastián Olivella
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 Artemii Sattarov
 Reinaldo Wiener
 Daniel Yago
 Boyi Ye

Undergraduate students

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 Esteban Pérez
 Halina Sylwia Koszur

Visiting Scientists

CIMNE promotes the visits of academics and researchers from around the world. Visiting Scientists at CIMNE in 2015:

Liesner Acevedo
UCI, Cuba

Enmanuel Amaya
UCA, El Salvador

Gilberto Arias
UCI, Cuba

Samia Bouzoubaa
ULB, Belgium

Rafael Bravo
Universidad de Granada, Spain

Deniz Cagri
Technische Universität München, Germany

Alberto Cardona
UNL, Argentina

Víctor Eduardo Cardoso
CIMAT, Mexico

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Universidad Central de Las Villas, Cuba

Feng Chun
Chinese Academy of Sciences, China

Elena Davydova
Bauman Moscow State Technical University, Russia

Facundo del Pin
Livermore Software Technology Corporation, US

Denis Demidov
JSCC RAS, Russia

Wenjie Duan
Institute of Mechanics, China

Carlos A. Felippa
University of Colorado at Boulder, US

Miguel Fernández
EPFL-ENAC-IIC-GE, Switzerland

Fernando Flores
UNL, Argentina

Alfredo Edmundo Huespe
UNL, Argentina

Halina Sylwia Koszur
Lodz University of Technology, Poland

Rainald Löhner
The George Mason University, US

Ilya Marchevsky
BMSTU, Russia

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Écio Neves
IFPS, Brazil

Norberto Nigro
CIMEC-INTEC, Argentina

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Lulea University of Technology, Sweden

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CIMAT, Mexico

Pablo Ortiz
Universidad de Granada, Spain

Marice Pace
PHELMA, France

Jacques Periaux
Filand University of Jyväskylä, France

Massimo Petracca
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Ministerio de Educación Superior, Cuba

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University of Texas at Austin, US

Celia Varga
Instituto Eduardo Torroja, Spain

Tomás Varona
UC, Spain

Wibke Wriggers
TUHH, Germany

Stefano Zaghi
Università di Bologna, Italy

Administration**Director**

Eugenio Oñate

General Manager

Anna Font

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

Accountancy and Finances

M^a Carmen Linares (Head of Unit)
 Mónica Camanforte
 Valentín Catalán
 Cristina Luque

Congress Bureau

Cristina Forace (Head of Unit)
 Laia Aranda
 Alessio Bazzanella
 Iztok Potokar
 Marcela Silhankova

Director Secretary

Mercè Alberich

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Merce Linares (Head of Unit)
 Irene Latorre

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 Manuel López
 Gabriel Molina
 Javier Piazzese
 Sònia Sagristà

Legal

Roger Casanova

Project Management

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 Daniel Cuadrat
 Francisco J. De La Rosa
 Elena Martín
 Elena Herrero
 Erlantz Marín

Postgraduate Training

Lelia Zielonka
 Cristina Pérez

Publications and Communication

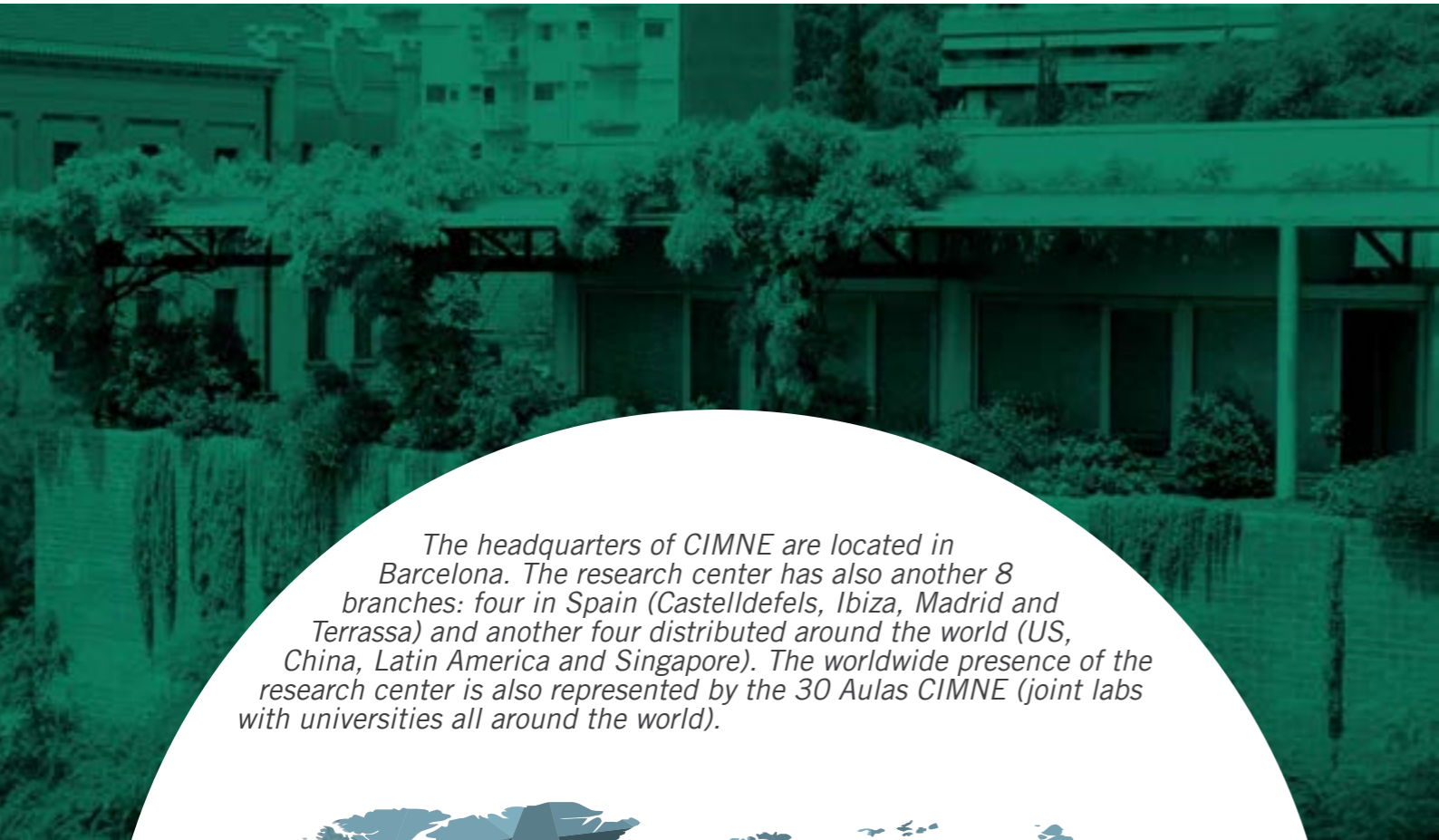
M^a Jesús Samper (Head of Unit)
 Laura Bermúdez
 Sonia López
 Jordi López

Reception

Nuria Holgado

Systems

Miguel Alonso (Head of Unit)
 Alberto Burgos
 Joaquim Lozano
 Aitor Lázaro



The headquarters of CIMNE are located in Barcelona. The research center has also another 8 branches: four in Spain (Castelldefels, Ibiza, Madrid and Terrassa) and another four distributed around the world (US, China, Latin America and Singapore). The worldwide presence of the research center is also represented by the 30 Aulas CIMNE (joint labs with universities all around the world).



Headquarters

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 m² 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

Director: E. Oñate
 Campus Nord UPC, CIMNE Building C1
 C/ Gran Capità, S/N, 08034 Barcelona, Spain
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B0 Building

In September 2014 CIMNE started the construction of a new building of some 2,000 m² at the North Campus of the Universitat Politècnica de Catalunya · BarcelonaTech.

The new building (B0), that will host the Flumen Institute, was completed **by the end of 2015**. Researchers will be moving 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 (masters, doctoral and postdoc) and for senior researchers from CIMNE and UPC · BarcelonaTech.

Premises in Spain

CIMNE - TERRASSA

CIMNE's offices in Terrassa opened in 2001. The premises cover an area of 150m² and house part of the department of Building Energy and Environment Group (BeeGroup).

Director: J. Cipriano

CIMNE - TERRASSA

Campus de Terrassa UPC

Edifici GAIA (TR14)

C/ Rambla Sant Nebridi, 22

08222 Terrassa (Barcelona), Spain

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CIMNE - CASTELLDEFELS

CIMNE's headquarters in Castelldefels were inaugurated on October 15th 2008. The facilities are located in the building CIMNE-C3 of the Mediterranean Technology Park, and occupy 1,500m² in a new building constructed in collaboration with the UPC. The premises are shared with the Technical School of Castelldefels.

Director: E. Oñate

CIMNE - TERRASSA

Campus del Baix Llobregat UPC

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+34 93 413 41 86



CIMNE - MADRID

CIMNE - MADRID started its activities in September 2007 and on May 2008 CIMNE opened its premises located in the center of the city (150m²). 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 and partner companies and research centers based in Madrid.

Director: F. Salazar

CIMNE - MADRID

Paseo General Martínez Campos, 41, 9^º

28010 Madrid, Spain

Tel. +34 91 319 13 59



CIMNE - IBIZA

CIMNE inaugurated the CIMNE - IBIZA branch in 2009. It has 80m² and is located in the city of Ibiza. The main line of research of the branch is environmental acoustics, developing new algorithms to be used to study the propagation of environmental noise with applications to *noise mapping*.

Director: G. Molina

CIMNE - IBIZA

C/Bisbe Azara, 4, 3^º 2^a

07800 Ibiza, Spain

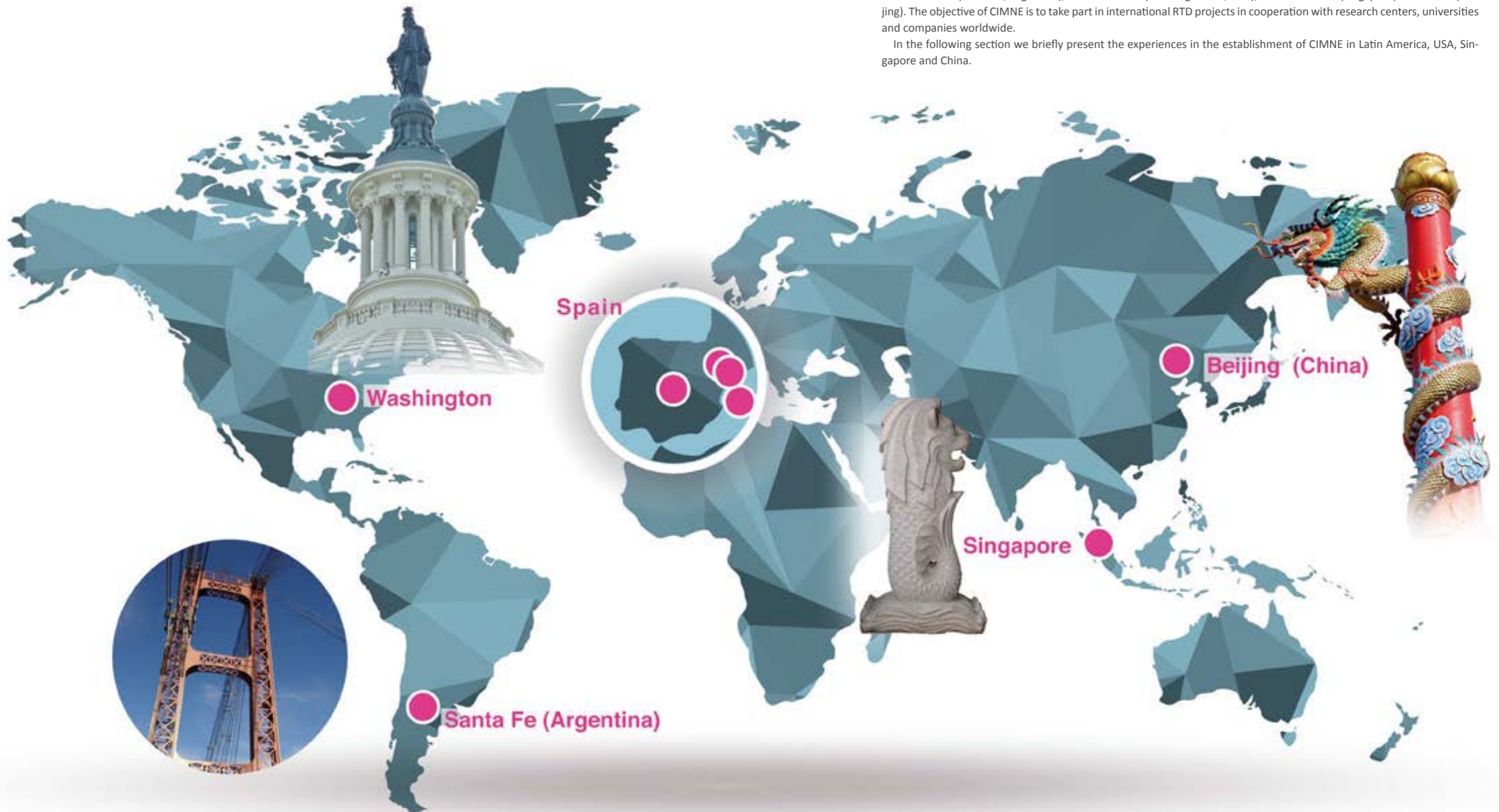
Tel. +34 97 193 11 94



CIMNE has expanded its presence in different geographical areas in the world:

South America (Santa Fe, Argentina), North America (Washington DC, USA), South East Asia (Singapore) and China (Beijing). The objective of CIMNE is to take part in international RTD projects in cooperation with research centers, universities and companies worldwide.

In the following section we briefly present the experiences in the establishment of CIMNE in Latin America, USA, Singapore and China.



CIMNE-China (Beijing, China)

In 2006 CIMNE started a fruitful cooperation with the People's Republic of China. During these several years, CIMNE has developed a number of partnerships with some of the most renowned scientific institutions in China, such as Peking University, Tsinghua University, several research centers of the Chinese Academy of Sciences or the Chinese Aeronautics Establishment.

Resulting from these collaborations, CIMNE has been engaged in a number of research and technology development projects. 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 on aeronautics.

CIMNE is also participating in research projects in areas of risk assessment of natural disasters.

In 2011, CIMNE promoted the creation of the CIMNE Beijing office in cooperation with Professor Mingwu Yuan from Peking University and President of the International Chinese Association for Computing Mechanics. In 2013, the China office was officially established.

Ms. Sònia Sagristà is the director of this branch.

Selected RTD Projects

GRAIN 2: Greener Aeronautics International Networking
EC - FP7 Cooperation-Coordinated by CIMNE.
1/10/2013 - 31/5/2016

Tri Continental Alliance in Numerical Methods applied to Natural Disasters (TCAiNMaND)
EC-FP7 People-Coordinated by CIMNE.
01/01/2014 - 31/12/2017

Activities

International Technology Transfer Conference. Sino-Europe Innovation and Industry Partnership Symposium
"Contributions in the Aeronautical area."
Sònia Sagristà — Beijing, April 22nd, 2015

Second GRAIN-2 Open Workshop — Xi'an, May 5-8th, 2015

Seminar Module (20h) in the master course Numerical Methods in Engineering. Course Coordinator: Prof. Xi Lin
State Key Laboratory of Solidification Processing (SKLSP)
School of Material Sciences and Engineering, Northwestern Polytechnical University (NWPU).

Dr. Michele Chiumenti — Xi'an, June 15th to July 15th

Seminar at the Tsinghua University
"Constitutive Modelling of Engineering Materials".
Dr. Xavier Martínez — Beijing, September 28th, 2015

Society for Underwater Technology 2015 Technical Conf.
"Analysis of Ultra Low Cycle Fatigue failure in pipes using the Barcelona plastic-damage model".
Dr. Xavier Martínez — Beijing, October 23rd, 2015

Photos:

1. Ms. Sagristà at the International Technology Transfer Conference (Beijing, April 2015)
2. Dr. Martínez delivering a lecture at the SUTTC 2015 (Beijing, October 2015)
3. Official photo of the second GRAIN 2 Workshop (Xi'an, May 2015)

www.cimne.com/china



CIMNE-SGP (Singapore)

CIMNE settled CIMNE-Singapore (CIMNE-SGP) in 2010 under the auspices of A*Start National Agency of the Singapore Government, with the objective of fostering CIMNE's RTD activities and projects in Singapore and the South East Asia region.

CIMNE-SGP is strategically located in CleanTech Park, a research and innovation-intensive environment in the city state of Singapore, the renowned international hub for education and research with largest influence in Malaysia, Indonesia, Thailand, Philippines, Vietnam and even China.

CIMNE-SGP has conducted several research projects jointly with Biomedical Research Council (A*Star-BMRC), Singapore Bioimaging Consortium (A*Star-SBIC), Institute of High Performance Computing (A*Star-IHPC), Nanyang Technological University of Singapore and Energy Research Institute (ERIAN@NTU) and has signed MOU with all of them.

Singaporean companies, as Nitto Denko Pte. Ltd., Sembcorp Marine Ltd. or National Healthcare Group (Tan Tock Seng Hospital), have trusted CIMNE-Singapore successful innovative researches.

CIMNE-SGP keeps an open communication channel with the CEO's from Marine Port Authority, Energy Market Authority and Land Transport Authority of Singapore the most relevant institutions to CIMNE within the Government of Singapore, in order to meet their needs for innovation in these areas. CIMNE-SGP also maintains an extensive activity of institutional relations with many countries represented in Singapore to promote collaborations in the research field.

With the aim to reach original objectives of CIMNE-SGP, in the last years CIMNE-SGP has spread its activities in Malaysia, becoming a research center of european reference for the Ministry of Science, Technology and Innovation (MOSTI) and MIMOS Berhad National R&D Centre in ICT. Universiti Teknologi Malaysia, Universiti Teknologi PETRONAS, Universiti Malaysia Terengganu and CIMNE-SGP are defining research alliances recently, as established the first Asian Aula CIMNE in order to submit projects under EU-H2020 Grant Call.

Mr. Manuel López is the director of CIMNE-SGP.



16th Ambassador Cup. Social Event. Mr. Sam Tan Chin Siong (Minister of State, Prime Minister's Office and Ministry of Manpower to Singapore), Mr Lopez, Fernando Serra (Ambassador of Brazil to Singapore) and Airbus Staff.

Selected RTD Projects

Cerebral Arterial Blood Flow Numerical Modeling
A*Star-BMRC and A*Star-SBIC — 18/07/2011 - 30/06/2012

Mechanistic and pathological study of the genesis, growth, and rupture of abdominal aortic aneurysms
NHG (Tan Tock Seng Hospital) and NTU
30/01/2012 - 10/07/2013

Semi-submersible vessel instantaneous airgap
Sembcorp Marine Ltd. — 01/04/2012 – 11/06/2013

Activities

Gastech 2015. Supporting Lattice Technology Ltd and Prof. Pål Bergan. Singapore — 27-30/10/2015

EU H2020 Workshop. Universiti Teknologi Malaysia.
Mr. Lopez Keynote Speaker.
Skudai, Johor (Malaysia) — 15/12/2014

National Workshop on EU H2020 and other Opportunities for Research and Innovation in Europe. MOSTI.
Mr. Lopez Lecturer.
Kuala Lumpur (Malaysia) — 28-29/10/2014

Meeting with the delegation of Foreign Affairs Committee of the Spanish Congress of Deputies to Singapore.
Singapore — 05/12/2014

www.cimne.com/singapore

CIMNE-USA (Washington DC, USA)

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

The corporation leads scientific research and development projects supported by government, foundations and industry sources. It also supports visiting scientists.

The research and development projects are conducted in basic R&D, sectorial-focused R&D and cross-cutting R&D areas.

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.



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. Dr. Varadaraju (Raju) Gandikota (*on the right side photo*) has recently been appointed CIMNE US Scientific Director. Ms. Francisca García-Sicilia coordinates the US activities.



Selected RTD Projects

WEATHERFORD INTERNATIONAL LTD.

On-going projects

1D transient solver for drill strings and wellbores, including cuttings transport.
01/10/2014 - 31/12/2015

Past-projects

- Drillbit mechanics - study of the behavior of the drilling bit. Bit-rock interaction.
- Cuttings transport - study on downhole extraction of material-Fluid mixtures (using PFEM).
- Cuttings transport - study on downhole extraction of material-Fluid mixtures (using Kratos CFD).
- BHA (Bottom Hole Assembly) dynamics/vibration without surrounding fluid.

OFFICE FOR NAVAL RESEARCH

WAM-V®: Advanced numerical simulation and performance evaluation of wave adaptive modular vessels (WAM-V) in spray generating conditions — 01/07/2012 - 30/06/2015

WORLD BANK

Central America Probabilistic Risk Assessment: Nicaragua and Costa Rica — 01/02/2008 - 30/07/2009

Central America Probabilistic Risk Assessment for Belize, El Salvador and Guatemala
01/12/2008 - 30/06/2010

Central America Probabilistic Risk Assessment for Honduras
01/03/2009 - 30/09/2010

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.

The activity of CIMNE in the region is coordinated by the Civil Engineer Javier Piazzese.

Since the beginning, 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.



Javier Piazzese (left) and Eugenio Oñate (right) during the 6th Aulas CIMNE General Meeting. April 2015, Argentina.

www.cimne.com/fcl

RTD Projects

BARBADOS: Consulting Services for Contract 3 of Component 1 of the Coastal Risk Assessment and Management Program in Barbados. Government of Barbados.
15/09/2014 - 15/06/2015

BID Argentina: Development of risks profile for disasters in Argentina. Inter-American Development Bank.
04/07/2014 - 04/07/2015

BID Chile: Profile of risks for Chile. Inter-American Development Bank — 05/02/2014 - 31/12/2015

BIODIGESTER HIVOS: Support to National Biodigester Project (Bolivia). HIVOS-Humanistisch Instituut voor Ontwikkelingssamenwerking — 01/12/2014 - 30/05/2015

COMP-DES-MAT: Advanced tools for computational design of engineering materials. FP7 - Ideas. European Commission — 01/02/2013 - 31/01/2018

Development of numerical models to study thermal processes cooking in aluminum pots. ESSEN SA, Argentina.
21/9/2015 - 21/12/2015

Dynamic studies of mechanical parts for truck trailers PATRONELLI SA, Argentina — 15/11/2015 - 17/2/2016

FIU: Disaster Risk and Emergency Management. The Florida International University — 03/11/2014 - 30/01/2015

Hydrodynamic study in Parana river. Universidad Nacional del Litoral, Argentina — 12/03/2015 - 28/05/2015

UNAL-COURSE: Work together to improve risk management in planning and decision-consciousness in the city of Manizales Phase 1. Universidad Nacional de Colombia.
01/12/2014 - 28/02/2015

The Aulas CIMNE are physical spaces for cooperation in education, research and technological development (RTD) activities created jointly by CIMNE and one or several universities. The thirty Aulas CIMNE promote educational and training activities at graduate and postgraduate level and development of RTD projects in cooperation with companies around the world.



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: Eduardo Martel
 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 IFRO – CIMNE (Brazil)



Instituto Federal de Educação, Ciência e Tecnologia de Rondônia
 Director: George Madson Dias
 Created on: July 2009
 Activity: Applications of numerical methods in civil engineering, electromechanical and environment.

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 UNC – CIMNE (Colombia)



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

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)

Instituto 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 Peru
 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 EUETIB – CIMNE (Spain)

Escuela Técnica de Ingeniería Industrial
 Directors: Gabriel Bugeda; 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
 Directors: Manuel Ibáñez; 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
 Created on: May 2010
 Activity: Applications of numerical methods in civil engineering.

AULA UVA – CIMNE (Spain)

Universidad de Valladolid
 Director: Antonio Foces
 Created on: April 2002
 Activity: Civil engineering projects, ports, marine, industrial, aerospace and architecture.

AULA INABIO – CIMNE (Venezuela)

Universidad Central de Venezuela
 Director: Miguel Cerrolaza
 Created on: February 2004
 Activity: Applications of numerical methods to problems related to Bioengineering.

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>

6th Aulas CIMNE General Meeting

April 2015, Instituto Tecnológico de Buenos Aires (ITBA), Argentina

The program included an open session in the morning that was attended by researchers and professionals interested in the subject. The afternoon working session, dedicated to the members of the Aulas CIMNE, was attended by members of 14 universities in the Aulas CIMNE network as well as researchers from CIMNE Barcelona.



Opening

Mr. Norberto Lerendegui, Director of the School of Engineering and Technology (ITBA), and Dr. Eugenio Oñate, Director of CIMNE.

Panel session on "Innovation and knowledge transfer"

- Dr. Ernesto Fernández Polcuch, Uruguay UNESCO (via teleco); Norberto Lerendegui, Director of the School of Engineering and Technology ITBA; Marcela Raviculé and Gerardo Bobrovsky, YPF SA Technology and Norberto Nigro, Research Center for Computational Methods (Argentina), presented their visions on innovation and knowledge impact in the community was of great interest to attendees.
- Dr. Eugenio Oñate (CIMNE) presented CIMNE's R&D and knowledge transfer activities, developed by CIMNE and CIMNE's spin-offs companies.

Working Session

- Ing. Javier Piazzese (CIMNE Latin America Foundation) presented the AIAC (International Association of Aulas CIMNE) and informed on Aulas CIMNE news, achieved results and new action plans.
- Dr. Carlos Sacco, Aula IAU-CIMNE (Argentina); Bio. Ing. Exequiel Fries, Aula UNER-CIMNE (Argentina); Dr. Sergio Gallegos, CIMNE ITESM (Mexico); and Dr. Salvador Botello, Aula CIMAT-CIMNE (Mexico) presented the activities undertaken by the Aulas CIMNE in the past months.
- Ing. Javier Piazzese and Dr. Sebastian D'hers presented two Aulas CIMNE, recently created: Aula IFRO-CIMNE (Brazil) and Aula ITBA- CIMNE, respectively.
- Two candidates to become new Aula CIMNE were presented: Universidad del Rosario (Colombia), Dr. René Meziat; and Universidad Michoacana de San Nicolás de Hidalgo (Mexico), Dr. Francisco Domínguez-Mota.



CIMNE has an important scientific structure divided into different Research and Technological Development (RTD) Areas and Groups that cover a wide spectrum of research fields.

The following table shows the different Research Lines (RL) and their corresponding Research and Technological Development (RTD) Areas and Groups. Principal investigators (PI) leading the different research lines of each group are also shown in the table below:

research

RESEARCH LINES (RL)	RTD AREAS AND GROUPS	
1. Algorithms for Multiphysics Problems	Civil and Mechanical Engineering Area FLUID MECHANICS GROUP PI's: R. Codina, S. Idelsohn, E. Oñate, R. Rossi and J. Baiges RL's: 1 and 2. GEOMECHANICS GROUP PI's: E. Alonso, E. Gens, S. Olivella, X. Sánchez-Vila RL: 3. INDUSTRIAL PROCESSES GROUP PI's: M. Chiumenti and C. Agelet de Saracibar RL's: 1 and 7. STRUCTURAL MECHANICS GROUP PI's: E. Oñate, M. Chiumenti, M. Cervera, X. Oliver and S. Oller RL's: 1, 5 and 6. Energy and Environment Area BUILDING, ENERGY AND ENVIRONMENTAL GROUP PI: J. Cipriano RL: 9. NATURE GROUP PI: P. Arnau RL: 9. RISK ASSESSMENT GROUP PI: A. Barbat RL: 6 and 9.	Biomedical Engineering Area BIOMECHANICS GROUP PI's: M. Arroyo, M. Cerrolaza, E. Soudah, R. Rossi, J. Pérez and S. Oller RL's: 1, 2, 6 and 8. Computational and Information Technologies Area INFORMATION AND COMMUNICATION TECHNOLOGY GROUP PI: J. Jiménez RL: 8. LARGE-SCALE SCIENTIFIC COMPUTING GROUP PI: S. Badia RL: 1. MATHEMATICAL AND COMPUTATIONAL MODELLING GROUP PI's: A. Huerta and P. Díez RL: 4. PRE AND POST-PROCESSING PI: A. Coll RL: 8.
2. Computational Fluid Dynamics		Transport Area AEROSPACE ENGINEERING GROUP PI's: J. Pons, E.Ortega and G. Bugada RL: 2 and 7. NAVAL AND MARINE ENGINEERING GROUP PI: J. Garcia RL: 2 and 7.
3. Computational Geomechanics		
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		

PI: Principal Investigator

RL: Research Line

RESEARCH LINES (RL) AND RESEARCH TOPICS

1. Algorithms for Multiphysics Problems

- FEM and particle-based methods for fluid-soil-structure interaction. NM for the oil and gas industry.
- Numerical methods for coupled thermal-mechanical problems for constructions and mechanical components.
- Aeroacoustics: Acoustic analogies in incompressible flows, direct numerical simulation of sound, aeroacoustics in time dependent domains, application to human voice simulation.
- FEM and particle methods for analysis of industrial forming processes (casting, mold filling, sheet metal stamping, 3D printing, friction stir welding, etc.).
- FEM for electro-magnetic-mechanical problems. Numerical methods for plasma physics and fusion technology.
- Numerical modeling thin objects in nano and bio-systems.
- Optical quality of observation sites: Numerical simulation of turbulence, estimation of optical parameters of turbulent atmospheres, application to telescope visibility.
- Reduced order models (ROM): Domain decomposition, fluid-structure interaction, thermally coupled flows.

PI: E. Oñate

PI's: M. Chiumenti and M. Cervera

PI's: R. Codina and J. Baiges

PI's: M. Chiumenti and C. Agelet

PI: S. Badia

PI: M. Arroyo

PI: R. Codina

PI's: R. Codina and S. Idelsohn

2. Computational Fluid Dynamics

- Stabilized finite element methods for problems involving waves, viscoelastic flows, compressible flows, shallow water flows, magneto-hydro-dynamics and approximation of eigenvalues.
- Fractional step schemes for incompressible flows.
- Weak imposition of boundary conditions.
- Meshless methods in CFD.
- FEM and particle methods for multifluids, flow in porous media and free surface flows.
- FEM and meshless methods for aerodynamics analysis and drag reduction in aeronautics.
- FEM and particle methods for ship hydrodynamics and aero/hydrodynamics analysis of marine structures (offshore platforms, wind tower structures, wave energy production, etc).
- FEM and particle methods for blood flow and air flow in lungs.

PI: R. Codina

PI: R. Codina

PI: R. Codina

PI's: S. Idelsohn and E. Oñate

PI's: S. Idelsohn, R. Codina and R. Rossi

PI's: J. Pons and E. Ortega

PI: J. Garcia

PI's: R. Rossi and E. Soudah

3. Computational Geomechanics

- Constitutive models and FEM for analysis of unsaturated soils and rocks.
- FEM for coupled problems in geotechnical engineering. Particle-based and discrete element methods for geomechanical problems.

PI: E. Alonso

PIs: A. Gens and S. Olivella

4. Mathematical and Computational Modelling

- Advanced NM for computational mechanics (X-FEM, G-FEM, meshless methods, etc). High-order solvers with high-fidelity geometrical resolution.
- Reduced-order modeling for fast and multiple queries, real time optimization and uncertainty quantification. Goal-oriented error assessment and mesh adaptivity.

PI: A. Huerta

PI: P. Diez

5. 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.
- Constitutive models for FEM analysis of composite and bio-materials. Parameter identification in constitutive models.
- Material models for discrete element methods (DEM)

PI: X. Oliver

PI: S. Oller

PI: E. Oñate

6. Computational Solid and Structural Mechanics

- FEM for non-linear analysis of solids and structures. Fracture analysis in solids.
- Rotation-free shell elements. Meshless and particle-based methods in solid mechanics. Multifracture analysis of solids with the DEM and coupled DEM-FEM procedures.
- FEM for dynamic and seismic analysis of structures.
- Computer modelling and numerical simulation of human body. Analysis and designs of implants.
- Numerical simulation and constitutive modelling of human body tissues.

PIs: M. Cervera and X. Oliver

PI: E. Oñate

PI: A. Barbat

PI: M. Cerrolaza

PI: S. Oller



7. Optimization

- Numerical methods for optimization of industrial forming processes. **PI:** M. Chiumenti
- Optimization algorithms for robust optimal design, shape optimization and material design in aeronautics. **PI:** G. Bueda
- Optimal design of ship hulls, wind energy structures and offshore structures. **PI:** J. Garcia

8. Computation and Information Technologies

- Decision support systems in engineering. Internet tools. Embedded ICT systems. App technology. Internet of Things. **PI:** J. Jiménez
- Parallel structured and unstructured mesh generation. Graphical visualization of big data sets. Development of the GiD pre-postprocessor, *gidhome.com*. **PI:** A. Coll
- Medical image processing and analysis: 3D/4D medical images processing to create computational models. **PI's:** E. Soudah and J. Pérez

9. Numerical Methods and Technologies for Energy and Environment

- Numerical methods for energy efficiency analysis and design of buildings and urban areas. **PI:** J. Cipriano
- Evaporation methods for fresh water production. Computational methods for analysis and preservation of biosphere in ocean and coastal areas. **PI:** P. Arnau
- Holistic risk prediction of structures under hazards. **PI:** A. Barbat

Fluid Mechanics Group

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*COMPUTATIONAL FLUID DYNAMICS*

- 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 Computational Fluid Dynamics. **PI's:** S. Idelsohn and E. Oñate
- FEM and particle methods for multifluids, flow in porous media and free surface flows. **PI's:** R. Codina, S. Idelsohn and R. Rossi

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. **PI's:** 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: Domain decomposition, fluid-structure interaction, thermally coupled flows. **PI's:** R. Codina and S. Idelsohn

Staff

Ramon Codina (**Group Leader**)
Joan Baiges
Camilo A. Bayona
Sergio Idelsohn

On-going RTD Projects

ELASTIC-HEAT - Desarrollo e innovación de equipos de intercambio de calor basados en fluidos viscoelásticos
PLAN ESTATAL (2013-2016) - MINECO
Coordinator: CIMNE — 01/09/2015 - 01/09/2016

EUNISON - Extensive UNified-domain SimulatiON of the Human Voice
FP7 (2007-2013) - FP7 - COOPERATION - EC
Coordinator: KTH — 01/03/2013 - 31/05/2016

SODDAT (2012) - Simulación numérica de la distorsión óptica debida a la turbulencia atmosférica
PLAN NAC. I+D (2008-2011) - MINECO
Coordinator: CIMNE — 01/01/2013 - 31/12/2015

SOLARNET - High-Resolution Solar Physics Network
FP7 (2007-2013) - FP7 - CAPACITIES - EC
Coordinator: IAC — 01/04/2013 - 31/03/2017

www.cimne.com/fluid-mechanics

Geomechanics Group

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

The research achievements of the Geomechanics Group focus on the development of innovative numerical methods for the analysis and design of underground structures (tunnels, foundations, geo-reservoirs, etc), earth and rockfill dams, new geo-materials and fluid-soil-structure interaction problems. The scientific contributions and software resulting from the research activity Geomechanics Group have particular relevance to the solution of multidisciplinary problems in the fields of civil, geological and mining engineering, among others.

Research Topics

COMPUTATIONAL GEOMECHANICS

- Constitutive models and numerical methods for analysis of unsaturated soils and rocks. **PI: E. Alonso**
 - > Particle Methods in Geomechanics
 - > Unsaturated Soil Mechanics
 - > Landslides
- FEM for coupled problems in geotechnical engineering. Particle-based and discrete element methods for geomechanical problems. **PI's: A. Gens and S Olivella**
- Bio-geo-chemical processes in artificial recharge practices. **PI: Xavier Sanchez-Vila**
- Reactive transport, emerging contaminants and associated risk. **PI: Xavier Sanchez-Vila**

On-going RTD Projects

PARTING - Métodos de Partículas en Geomecánica

PLAN ESTATAL (2013-2016) - Fomento I+D+i orientada a retos sociedad - Retos Investigación: Proyectos de I+D+i - MINECO
Coordinator: CIMNE — 01/01/2014 - 31/12/2017

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

H2020 (2014-2020) - Excellent Science - MSCA - Marie Skłodowska - Curie actions - EC
Coordinator: University of Strathclyde — 01/11/2015 - 31/10/2019

Staff

Eduardo Alonso (Group Leader)	Miguel Ángel Manica
Antonio Gens (Group Leader)	Miguel Ángel Marazuela
Clara Alvarado	Sajjad Mirsalehi
Mauricio Alvarado	Esteban Pérez
Gonzalo Aría	Núria M. Pinyol
Ramón Barboza	Ivan Puig
Carlos Casanovas	Enrique E. Romero
Jaume Clapés	Núria Sau
Agustín Cuadrado	Victor Serri
Enkhbayar Dandar	Mauricio Alberto Tapias
Panagiotis Firtinidis	Daniel Tarragó
Raúl Giménez	Erdem Toprak
Laura González	Saeed Tourchi
Christian A. Hoffmann	Michela Trabucchi
Alejandro Josa	María Teresa Yubero

www.cimne.com/geomechanics

Industrial Processes Group

The Industrial Processes Group is composed of a team of professionals specialized in the field of metal forming parts, 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).

Research Topics

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.)
PI's: M. Chiumenti and C. Agelet de Saracibar

OPTIMIZATION

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

Staff

Michele Chiumenti (**Group Leader**)
 Oscar Fruitós (**Group Leader**)
 Carlos Agelet de Saracibar
 Miguel Cervera
 Jesús Conde
 Narges Dialamishabankareh
 Alberto Ferriz
 Ivét Llonch
 Mercè Lopez
 Eudald Martínez
 Xavier Roca

On-going RTD Projects

CxMan - Computer Aided Technologies for Additive Manufacturing
 H2020 (2014-2020) - EC
Coordinator: SINTEF — 01/09/2015 - 31/08/2018

FLEXICAST - Robust, and FLEXible CAST iron manufacturing
 FP7 (2007-2013) - FP7 - COOPERATION - EC
Coordinator: UPC — 01/11/2012 - 31/10/2016

HYPERMEMBRANE - DEMO - Development of an Adaptable Structure for Architecture Application
 FP7 (2007-2013) - FP7 - CAPACITIES - EC
Coordinator: Eurocomercial de Nuevas Tecnologías, S.L.
 01/01/2014 - 31/07/2016

ICMEG - Integrative Computational Materials Engineering Expert Group
 FP7 (2007-2013) - FP7 - COOPERATION - EC
Coordinator: ACCESS e.V. — 01/10/2013 - 30/09/2016

www.cimne.com/industrial-processes

Structural Mechanics Group

The Structural Mechanics Group of CIMNE is specialized 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, design of new materials, simulation and optimization of industrial forming processes.

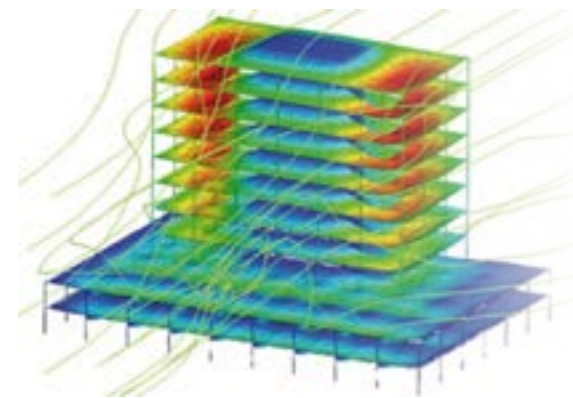
The research activities of the Structural Mechanics Group have spread over a range of multidisciplinary fields to which it has contributed relevant theories and methods of practical relevance. The research achievements of the Structural Mechanics Group can be found in the field of numerical methods for the analysis and design of structures, new materials, fluid-structure interaction problems and industrial manufacturing processes are internationally recognised.

The scientific contributions and software derived from the Structural Mechanics Group research activity are of particular relevance to the solution of multidisciplinary problems in the fields of civil, industrial, aerospace, marine and naval engineering, among others.

Research Topics

ALGORITHMS FOR MULTIPHYSICS PROBLEMS

- FEM and particle-based methods for fluid-soil-structure interaction. Numerical Methods for the oil and gas industry. **PI: E. Oñate**
- Numerical methods for coupled thermal-mechanical problems for constructions and mechanical components. **PI's: M. Chiumenti and M. Cervera**



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**
- Constitutive models for FEM analysis of composite and bio-materials. Parameter identification in constitutive models. **PI: S. Oller**
- Material models for discrete element methods (DEM). **PI: E. Oñate**

COMPUTATIONAL SOLID AND STRUCTURAL MECHANICS

- FEM for non-linear analysis of solids and structures. Fracture analysis in solids. **PI's: M. Cervera and 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 (Group Leader)	Ignasi De Pouplana	Salva Latorre	Arnau Pont
Andrés Adam	Daniel Di Capua	Bàrbara Llacay	Fernando Rastellini
Carlos Agelet De Saracibar	Alessandra Di Mariano	Oriol Lloberas	David Roca
Bashar Alfarah	Àlex Ferrer	Julio M. Martí	Carles Roig
Ferran Arrufat	Alessandro Franci	Xavier Martínez	Pavel Ryzhakov
Pablo A. Becker	Javier Gárate	Vicente Mataix	Fernando Salazar
Gabriel Bugada	José Manuel González	Juan Miquel	Anshuman Singh
Alberto Burgos	Lorenzo Gracia	Eric Miranda	Deniz Cagri
Juan Carlos Cante	Ceren Gurkan	Gabriel Molina	Ignacio Valero
Josep Maria Carbonell	Joaquín Alberto Hernández	Prashanth Nadukandi	Tomás Varona
Miguel Ángel Celigueta	Ilaria Iaconeta	Xavier Oliver	Daniel Yago
Miguel Cervera	Sergio R. Idelsohn	Sergio Oller	Francisco Zárate
Ramón Codina	Joel Jurado	Fermín Otero	
Jordi Cotela	Fabián Lajas	Gilbert Peffer	
Pooyan Dadvand	Antonia Larese	Jacques Periaux	

On-going RTD Projects

ACOMBO - Análisis Termo-Tenso-Deformacional Complejo de las Presas Bóveda. PLAN ESTATAL (2013-2016) - MINECO
Coordinator: JGICSA — 01/09/2015 - 31/08/2018

AIDA - Umbrales de emergencia para seguridad de presas PLAN ESTATAL (2013-2016) - MINECO
Coordinator: CIMNE — 01/01/2014 - 31/12/2016

BALAMED - Modelación numérica del conjunto carril-traviesa-balasto. PLAN NAC. I+D (2008-2011) - MINECO
Coordinator: CIMNE — 01/01/2013 - 31/12/2015

POLILAB - Mejora de la seguridad hidrológica de presas PLAN NAC. I+D (2008-2011) - INNPACTO - MINECO
Coordinator: JGICSA — 01/09/2012 - 31/12/2015

CxMan - Computer Aided Technologies for Additive Manufacturing H2020 (2014-2020) - EC
Coordinator: SINTEF — 01/09/2015 - 31/08/2018

COMETAD - Técnicas computacionales y experimentales para análisis y diseño de polímeros retardantes al fuego PLAN ESTATAL (2013-2016) - MINECO
Coordinator: CIMNE — 01/01/2015 - 31/12/2017

COMFUS - Computational Methods for Fusion Technology FP7 (2007-2013) - FP7 - IDEAS - EC
Coordinator: CIMNE — 01/01/2011 - 31/12/2015

COMP-DES-MAT - Advanced tools for computational design of engineering materials FP7 (2007-2013) - FP7 - IDEAS - EC
Coordinator: CIMNE — 01/02/2013 - 31/01/2018

COMP-MAT-DYN - Diseño computacional de materiales resistentes a acciones dinámicas en ingeniería estructural PLAN ESTATAL (2013-2016) - MINECO
Coordinator: CIMNE — 01/01/2015 - 31/12/2017

DIABLO - Código de diseño óptimo de aliviaderos formados por bloques en forma de cuña
PLAN ESTATAL (2013-2016) - MINECO
Coordinator: PREHORQUI — 01/09/2014 - 31/12/2017

DSS4RA - Técnicas de Inteligencia Artificial para el manejo rutinario de la Artritis Reumatoide
PLAN ESTATAL (2013-2016)
Coordinator: Hospital de la Princesa
01/01/2015 - 31/12/2017

EACY - Marco computacional de alta precisión para localización de deformaciones y mecanismos de fallo
PLAN ESTATAL (2013-2016) - MINECO
Coordinator: CIMNE — 01/01/2014 - 31/12/2016

ECOVENT - Nuevo sistema de ventilación para túneles
PLAN ESTATAL (2013-2016) - MINECO
Coordinator: OSSA — 01/09/2015 - 31/08/2017

FLEXICAST - Robust, and FLEXible CAST iron manufacturing
FP7 (2007-2013) - FP7 - COOPERATION - EC
Coordinator: UPC — 01/11/2012 - 31/10/2016

FLOODSAFE - Simulation software for the study and mitigation of the effect of floods on constructions and landscapes H2020 (2014-2020) - EC
Coordinator: CIMNE — 01/07/2015 - 30/06/2016

FORECAST - Assessment and Initial Steps for the Exploitation of a fast Simulation Software for Casting Manufacturing Operations
H2020 (2014-2020) - EC
Coordinator: CIMNE — 01/05/2015 - 30/04/2016

FORTISSIMO (X-Sheaks) - HPC-enabled System for enhanced seakeeping and station-keeping design
FP7 (2007-2013) - FP7 - COOPERATION - EC
Coordinator: COMPASS Ingeniería y Sistemas, S.A.
01/07/2015 - 31/12/2016

FORTISSIMO (Castincloud) - Sustainable CLOUD Services for bringing High Performance CASTING Simulations to the SMEs
FP7 (2007-2013) - FP7 - COOPERATION - EC
Coordinator: QUANTECH — 01/10/2014 - 31/12/2016

GRAIN 2 - Greener Aeronautics International Networking
FP7 (2007-2013) - FP7 - COOPERATION - EC
Coordinator: CIMNE — 01/10/2013 - 31/05/2016

HYPERMEMBRANE-DEMO - Development of an adaptable structure for architecture application
FP7 (2007-2013) - FP7 - CAPACITIES - EC
Coordinator: Eurocomercial de Nuevas Tecnologías, S.L.
01/01/2014 - 31/07/2016

iCOMPLEX - Software seguridad de infraestructuras críticas. PLAN NAC. I+D (2008-2011) - INNPACTO - MINECO
Coordinator: DACARTEC — 01/09/2012 - 31/12/2015

LAYERS - Learning Layers - Scaling up Technologies for Informal Learning in SME Clusters
FP7 (2007-2013) - FP7 - COOPERATION - EC
Coordinator: CIMNE — 01/11/2012 - 31/10/2016

MMEX - Multimedia Mobile Experience
PLAN NAC. I+D (2008-2011) - NNPACTO - MINECO
Coordinator: BUILDAIR — 01/10/2012 - 31/03/2015

MODFUEL - Modelling and simulation of Fuel Cells
PLAN ESTATAL (2013-2016) - MINECO
Coordinator: CIMNE — 01/04/2015 - 01/04/2016

MUMOLADE - Multiscale Modelling of Landslides and Debris Flows. FP7 (2007-2013) - FP7 - PEOPLE - EC
Coordinator: BOKU — 01/01/2012 - 31/12/2015

OMMC - Optimización Multi-escala y Multi-objetivo de Estructuras de Laminados Compuestos
PLAN ESTATAL (2013-2016) - MINECO
Coordinator: CIMNE — 01/01/2015 - 31/12/2017

PARAPLANE - Development of a New Steerable Parachute System for Rescue of Small and Medium Size Airplanes
FP7 (2007-2013) - FP7 - CAPACITIES - EC
Coordinator: CIMSA — 01/12/2012 - 31/05/2015

PARFLOW - Métodos computacionales para análisis de flujos ambientales de partículas
PLAN ESTATAL (2013-2016) - MINECO
Coordinator: CIMNE — 01/01/2014 - 31/12/2016

RES-SAFE - Seguridad y resiliencia estructural bajo desastres naturales de origen geológico
PLAN ESTATAL (2013-2016) - MINECO
Coordinator: CIMNE — 01/09/2015 - 31/08/2017

SAFECON - Computational Methods for Predicting the security of constructions to Water Hazards accounting for fluid-soil-structure interactions
FP7 (2007-2013) - FP7 - IDEAS - EC
Coordinator: CIMNE — 01/01/2011 - 31/12/2015

SGR 2014 - Anàlisi numèrica i computació científica Ajuts de suport a la recerca - SGR -AGAUR
Coordinator: UPC — 01/01/2014 - 31/12/2016

SGR 2014 - Mètodes Numèrics en Enginyeria Ajuts de suport a la recerca - SGR -AGAUR
Coordinator: CIMNE — 01/01/2014 - 31/12/2016

SimPhoNy - Simulation framework for multi-scale phenomena in micro and nanosystems
FP7 (2007-2013) - FP7 - COOPERATION - EC
Coordinator: Fraunhofer — 01/01/2014 - 31/12/2016

TCAiNMaND - Tri Continental Alliance in Numerical Methods applied to Natural Disasters
FP7 (2007-2013) - FP7 - PEOPLE - EC
Coordinator: CIMNE — 01/01/2014 - 31/12/2017

T-MAPPP - Training in Multiscale Analysis of multi-Phase Particulate Processes
FP7 (2007-2013) - FP7 - PEOPLE - EC
Coordinator: Univ. of Edimburgh — 01/03/2014 - 28/02/2018

ULITES - Ultra-lightweight structures with integrated photovoltaic solar cells: design, analysis and application to an emergency shelter prototype
FP7 (2007-2013) - FP7 - CAPACITIES - EC
Coordinator: BUILDAIR — 07/01/2013 - 06/01/2015

UMRIDA - unCertainty quAntification Robust DesIgn Aeronautics
FP7 (2007-2013) - FP7 - COOPERATION - EC
Coordinator: NUMECA — 01/10/2013 - 30/09/2016

VELaSSCo - Visualization for Extremely Large-Scale Scientific Computing
FP7 (2007-2013) - FP7 - COOPERATION - EC
Coordinator: CIMNE — 01/01/2014 - 31/12/2016

VOLADAPT - Voladura mediante técnicas predictivas y adaptativas minimizando emisiones
PLAN ESTATAL (2013-2016) - MINECO
Coordinator: OSSA — 01/02/2014 - 31/12/2016

WAM-V® - Advanced Numerical Simulation and Performance Evaluation Of Wave Adaptive Modular Vessels in Spray Generating Conditions
ONR BAA - ONR
Coordinator: CIMNE — 01/07/2012 - 30/06/2015

Building, Energy and Environmental Group

The Building, Energy and Environmental Group (BEE Group) is an autonomous department of CIMNE involving researchers from different disciplines (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 CREA building of the University of Lleida.

BEE Group meets the challenge of employing knowledge and experience to help users to get the best possible use out of the energy that they consume. The group collaborates with leading research centers and builds bridges between companies, users and researchers.

Research Topics

NUMERICAL METHODS AND TECHNOLOGIES FOR ENERGY AND ENVIRONMENT

- Numerical methods for energy efficiency analysis and design of buildings and urban areas. PI: J. Cipriano

Staff

Jordi Cipriano (Group Leader)
 Jordi Carbonell
 Javier Cipriano
 Xavier Cubillas
 Stoyan Danov
 Meredith Davis
 Jose Santos
 Jaime E. Martí
 Gerard J. Mor
 Daniel Pérez
 Fabio Renda

www.beegroup-cimne.com

On-going RTD Projects

AiDA - Affirmative Integrated Energy Design Action
 CIP (2007-2013) - CIP - IEE-Intelligent Energy Europe - EC
 Coordinator: TU WIEN — 01/04/2012 - 31/03/2015

EMPOWERING - Empowering households to save energy by informative billing
 CIP (2007-2013) - CIP - IEE - Intelligent Energy Europe - EC
 Coordinator: CIMNE — 01/04/2013 - 31/03/2016

ENCERTICUS - Energy Certification, Technology, Information and Communication for User Benefit
 MED Programme 2007-2013 - EC
 Coordinator: CIMNE — 01/03/2013 - 30/06/2015

PARANAT - Análisis paramétrico de sistemas de ventilación natural en edificios
 PLAN NAC. I+D (2008-2011) - MICINN
 Coordinator: CIMNE — 01/01/2012 - 30/06/2015

ZEBRA 2020 - Nearly Zero-Energy Building Strategy 2020
 CIP (2007-2013) - IEE - Intelligent Energy Europe - EC
 Coordinator: Technische Universität Wien
 01/04/2014 - 30/09/2016

Nature Group

This environmental department was created in 2008 in response to a growing need for scientific investigations addressing contemporary environmental issues. Since then, the group has coordinated and actively participated in national and international research projects to understand and predict the behavior of the natural environment and its resources.

The main activity of the Nature Group is to advance knowledge and technology to approach contemporary environmental issues, mainly in water desalination, energy storage, climate adaptation and areas related with convergence technology as risk events studies.

The group develops advance knowledge and technology in global environmental research by bringing together and managing skilled scientists and engineers to develop strategic and applied environmental solutions.

Research Topics

NUMERICAL METHODS AND TECHNOLOGIES FOR ENERGY AND ENVIRONMENT

- Evaporation methods for fresh water production. Computational methods for analysis and preservation of biosphere in ocean and coastal areas. PI: P. Arnau

Staff

Pedro A. Arnau (Group Leader)
 Naeria Navarro
 Javier Soraluze



www.cimne.com/nature

On-going RTD Projects

Ecorisk - Acciones correctivas para mitigar el riesgo sistémico por pérdida de servicios de los ecosistemas costeros
 PLAN ESTATAL (2013-2016) - MINECO
 Coordinator: CIMNE — 01/01/2015 - 31/12/2015

IPIDO - Implementación de un prototipo pre-industrial de desalinización en un entorno operacional
 PLAN ESTATAL (2013-2016) - MINECO
 Coordinator: FWN — 01/02/2015 - 31/07/2017

MMSC - Validación del sistema desalinizador Modular Multi-Stage Core
 RIS3CAT (2014-2020) - AGAUR
 Coordinator: CIMNE — 01/09/2014 - 29/02/2016

NEREIDAS - Environmental restoration techniques for diminishing the environmental impacts of ports
 TEN-T Programme 2007-2013 - EC
 Coordinator: Melilla Port Authority
 01/08/2013 - 31/12/2015

Risk Assessment Group

The Risk Assessment Group has made important contributions to seismic vulnerability and risk studies in Spain, Europe and Latin America. This group has participated in projects developed for several countries around the world, some of them related to the assessment and management of the seismic risk and others related to the disaster risk due to different natural hazards.

In this sense, the developments performed by its researchers on the vulnerability and risk framework and on the holistic risk approach, as well as on the development and use of risk indicators and indices or on the development of urban risk scenarios are well known in the scientific community. More recently contributions have been made in the fields of the probabilistic modelling of hazard and risk, the economic evaluations for risk transfer and financial protection, or the management of uncertainties by means of Monte Carlo tests, among others.

Research Topics

COMPUTATIONAL SOLID AND STRUCTURAL MECHANICS

- FEM for dynamic and seismic analysis of structures.

PI: A. Barbat

NUMERICAL METHODS AND TECHNOLOGIES FOR ENERGY AND ENVIRONMENT

- Holistic risk prediction of structures under hazards.

PI: A. Barbat

Staff

Alex Barbat (Group Leader)

M. Lilibiana Carreño

Mario A. Salgado

www.cimne.com/risk-assessment

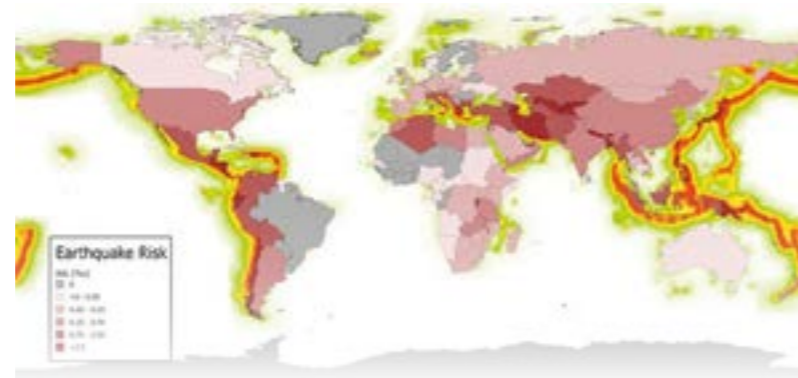
On-going RTD Projects

GAR15 - Global Risk Update

UNISDR

Coordinator: CIMNE

23/06/2014 – 31/03/2016



Biomechanics Group

The Biomechanics Group is focused in the development of numerical techniques, new methodologies and edge-front strategies in computational biomechanics. It is also devoted to the development of numerical methods for modelling and simulation of biomechanical and biomedical problems.

The group is oriented towards the analysis and design in biomechanics, including topics such as:

- › Bone simulation and modelling; simulation of the mechanics of cardiovascular system.
- › Platform for the virtual modelling and representation of the human body.
- › Low contact and dynamic compression plates for fractures.
- › Boundary elements in biomechanics.
- › Study of heart and urology system mechanics.
- › Software development in biomechanics and bioengineering.

Research Topics

ALGORITHMS FOR MULTIPHYSICS PROBLEMS

- Numerical modelling thin objects in nano and bio-systems. PI: M. Arroyo

COMPUTATIONAL FLUID DYNAMICS

- FEM and particle methods for blood flow and air flow in lungs. PI's: R. Rossi and E. Soudah

COMPUTATIONAL SOLID AND STRUCTURAL MECHANICS

- Computer modelling and numerical simulation of human body. Analysis and designs of implants. PI: M. Cerrolaza
- Numerical simulation and constitutive modelling of human body tissues. PI: S. Oller

COMPUTATION AND INFORMATION TECHNOLOGIES

- Medical image processing and analysis: 3D/4D medical images processing to create computational models.

PI's: E. Soudah and J. Pérez

Staff

Miguel E. Cerrolaza (Group Leader)

Eduardo Soudah (Group Leader)

Ester Comellas

Sergio Oller

Jorge S. Pérez

Riccardo Rossi

Javiera Valdivia

On-going RTD Projects

DSS4RA - Support System Decisions based on Artificial Intelligence techniques for routine management of Rheumatoid Arthritis

PLAN ESTATAL (2013-2016) - ISCIII

Coordinator: Hospital de la Princesa

01/01/2015 - 31/12/2017

SELFCARE - Decision Support System for metabolic syndrome related diseases

PLAN ESTATAL (2013-2016) - MINECO

Coordinator: CIMNE — 01/01/2015 - 31/12/2015

TOTAL.KNEE - New generation of knee prostheses using advanced computational biomechanics

FP7 (2007-2013) - FP7 - PEOPLE - EC

Coordinator: CIMNE — 01/04/2012 - 31/03/2016

WITH ME - The European Platform to Promote Healthy Lifestyle and improve care

FP7 (2007-2013) - FP7 - ARTEMIS - JU - COOPERATION - EC

Coordinator: ATOS — 01/06/2013 - 30/06/2016

www.cimne.com/biomechanics

Information and Communication Technology Group

The Information and Communication Technology Group is an R&D group of CIMNE expert in the integration of new Internet technologies and Wireless Sensor Networks with numerical methods.

It is also dedicated to improving simulation tools, neural networks and geographical information systems in order to develop Decision Support Systems (DSS) and prediction systems in multiple areas of engineering.

Research Topics

COMPUTATION AND INFORMATION TECHNOLOGIES

PI: J. Jiménez

- Decision support systems in engineering
- Internet tools
- Embedded ICT systems
- App technology
- Internet of things

Staff

Jordi Jiménez (Group Leader)

Francesc Campà

Alexis Cid

Pablo Franzolini

Andreu Marí

José Luis Oñate

Ángel Diego Priegue

Fabio Renda

Andreu Tarracó

Alberto Tena

Javier Tous

Sergio Valero

Claudio Zinggerling

On-going RTD Projects

GAINN4MOS - Sustainable LNG Operations for Ports and Shipping

CEF Programme 2014-2020 - INEA

Coordinator: Valencia Port — 01/01/2015 - 30/09/2019

GAINN4SHIP INNOVATION - LNG Technologies and Innovation for Maritime Transport

CEF Programme 2014-2020 - INEA

Coordinator: Valencia Port — 01/01/2015 - 31/12/2018

LAYERS - Learning Layers - Scaling up Technologies for Informal Learning in SME Clusters

FP7 (2007-2013) - FP7 - COOPERATION - EC

Coordinator: CIMNE — 01/11/2012 - 31/10/2016

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

PLAN ESTATAL (2013-2016) - MINECO

Coordinator: COPASA

01/10/2015 - 30/09/2017

MONALISA 2.0

TEN-T Programme 2007-2013 - EC

Coordinator: Swedish Maritime Administration

01/01/2012 - 31/12/2015

NEREIDAS - Environmental restoration techniques for diminishing the environmental impacts of ports

TEN-T Programme 2007-2013 - EC

Coordinator: Melilla Port Authority

01/08/2013 - 31/12/2015

RCMS - Rethinking Container Management Systems

H2020 (2014-2020) - Societal Challenges - EC

Coordinator: Circle — 01/05/2015 - 31/01/2017

SELF CARE - Decision Support System for metabolic syndrome related diseases

PLAN ESTATAL (2013-2016) - MINECO

Coordinator: CIMNE — 01/01/2015 - 31/12/2015

STM Validation Project

CEF Programme 2014-2020 - INEA

Coordinator: Swedish Maritime Administration

01/01/2015 - 31/12/2018

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

H2020 (2014-2020) - Excellent Science - EC

Coordinator: University of Strathclyde

01/11/2015 - 31/10/2019

TrainMos II - Training Motorways of the Sea 2

TEN-T Programme 2007-2013 - EC

Coordinator: University of Strathclyde

15/08/2014 - 31/12/2015

ULISES - Desarrollo de una Plataforma Autónoma para Vigilancia y Defensa en Entornos Offshore

PLAN ESTATAL (2013-2016) - MINECO

Coordinator: Industrias Ferri

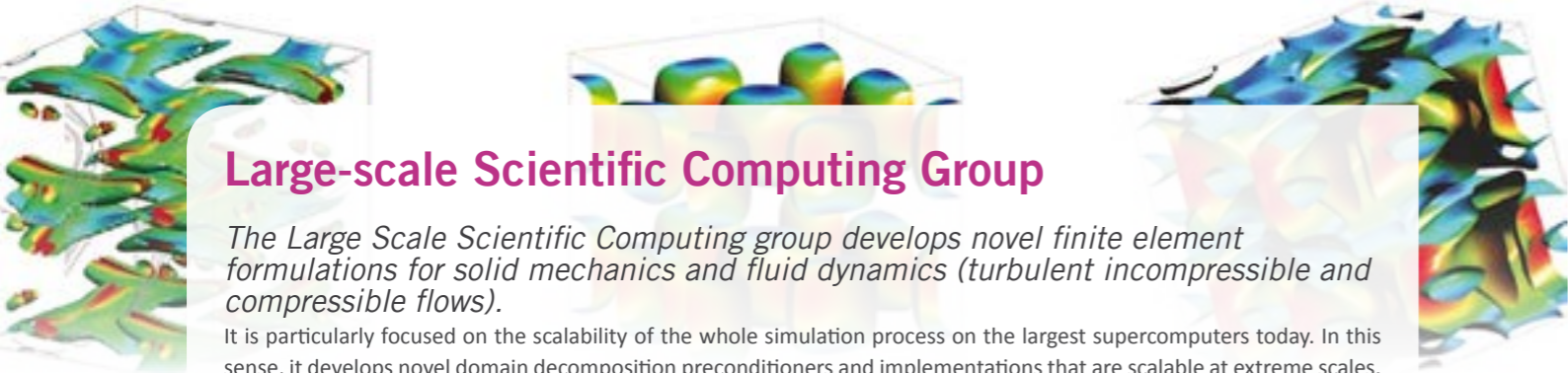
28/01/2014 - 28/12/2016

WiderMoS - Wide Interoperability and new governance models for freight Exchange linking Regions through Multi-modal maritime based cOrridorS

TEN-T Programme 2007-2013 - EC

Coordinator: La Spezia Port Authority

01/06/2013 - 31/12/2015



Large-scale Scientific Computing Group

The Large Scale Scientific Computing group develops novel finite element formulations for solid mechanics and fluid dynamics (turbulent incompressible and compressible flows).

It is particularly focused on the scalability of the whole simulation process on the largest supercomputers today. In this sense, it develops novel domain decomposition preconditioners and implementations that are scalable at extreme scales. Recently, it is extending the linear solver framework to deal with nonlinear and space-time preconditioning. Recent efforts are being put on scalable solvers for embedded boundary methods, in order to eliminate the non-scalable body-fitted meshing step and the extension of our schemes to highly heterogeneous systems. The group's research has applied to magnetohydrodynamics applications in fusion reaction and now it is facing the challenging simulation of additive manufacturing (3D printing) processes.

Research Topics

ALGORITHMS FOR MULTIPHYSICS PROBLEMS

PI: S. Badia

- FEM for electro-magnetic-mechanical problems
- Numerical methods for plasma physics and fusion technology

Staff

Santiago Badia (Group Leader)

Jesús Bonilla

Josep Oriol Colomé

Alba Hierro

Alberto Francisco Martín

Hieu Nguyen

Marc Olm

Javier Príncipe

Víctor Sande

Francesc Verdugo

On-going RTD Projects

COMFUS - Computational Methods for Fusion Technology

FP7 (2007-2013) - FP7 - IDEAS - EC

Coordinator: CIMNE — 01/01/2011 - 31/12/2015

EFES - Algoritmos de elementos finitos para exaescala y su implementación en código libre

PLAN ESTATAL (2013-2016) - MINECO

Coordinator: CIMNE — 01/01/2015 - 31/12/2018

EUROFUSION

H2020 (2014-2020) - EC

Coordinator: MPG — 01/01/2014 - 31/12/2018

EXACO2 - Exascale computational science for CO2 sequestration modelling

PLAN ESTATAL (2013-2016) - MINECO

Coordinator: CIMNE — 01/07/2015 - 30/06/2016

FEXFEM - Open source extreme scale finite element software

H2020 (2014-2020) - EC

Coordinator: CIMNE — 01/01/2015 - 31/08/2016

FORTISSIMO (Superconducting) - Multi-physics simulation of high temperature superconducting devices

FP7 (2007-2013) - FP7 - COOPERATION - EC

Coordinator: OXO — 01/10/2014 - 31/12/2016

FUSIM - Herramientas computacionales para interacción solidometal líquido

PLAN NAC. I+D (2008-2011) - MICINN

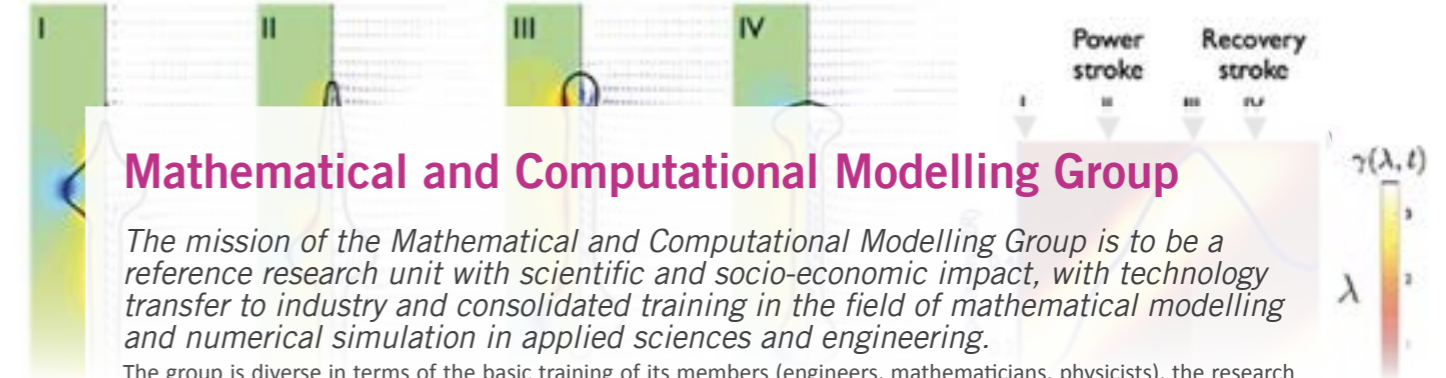
Coordinator: CIMNE — 01/01/2012 - 28/02/2015

NUMEXAS - NUMerical methods and tools for key EXAScale computing challenges in engineering and applied sciences

FP7 (2007-2013) - FP7 - COOPERATION - EC

Coordinator: CIMNE — 01/10/2013 - 30/09/2016

www.cimne.com/large-scale



Mathematical and Computational Modelling Group

The mission of the Mathematical and Computational Modelling Group is to be a reference research unit with scientific and socio-economic impact, with technology transfer to industry and consolidated training in the field of mathematical modelling and numerical simulation in applied sciences and engineering.

The group is diverse in terms of the basic training of its members (engineers, mathematicians, physicists), the research topics and funding sources (industrial projects, cutting-edge research projects, international consortia), but group members have a powerful common denominator in research and training: mathematical modelling, numerical methods, and interest in their applicability.

Research Topics

MATHEMATICAL AND COMPUTATIONAL MODELLING

- Advanced NM for computational mechanics (X-FEM, G-FEM, meshless methods, etc)

PI: A. Huerta

> High-order solvers with high-fidelity geometrical resolution.

- Reduced-order modelling for fast and multiple queries, real time optimization and uncertainty quantification

PI: P. Díez

> Goal-oriented error assessment and mesh adaptivity.

Staff

Antonio Huerta (Group Leader)

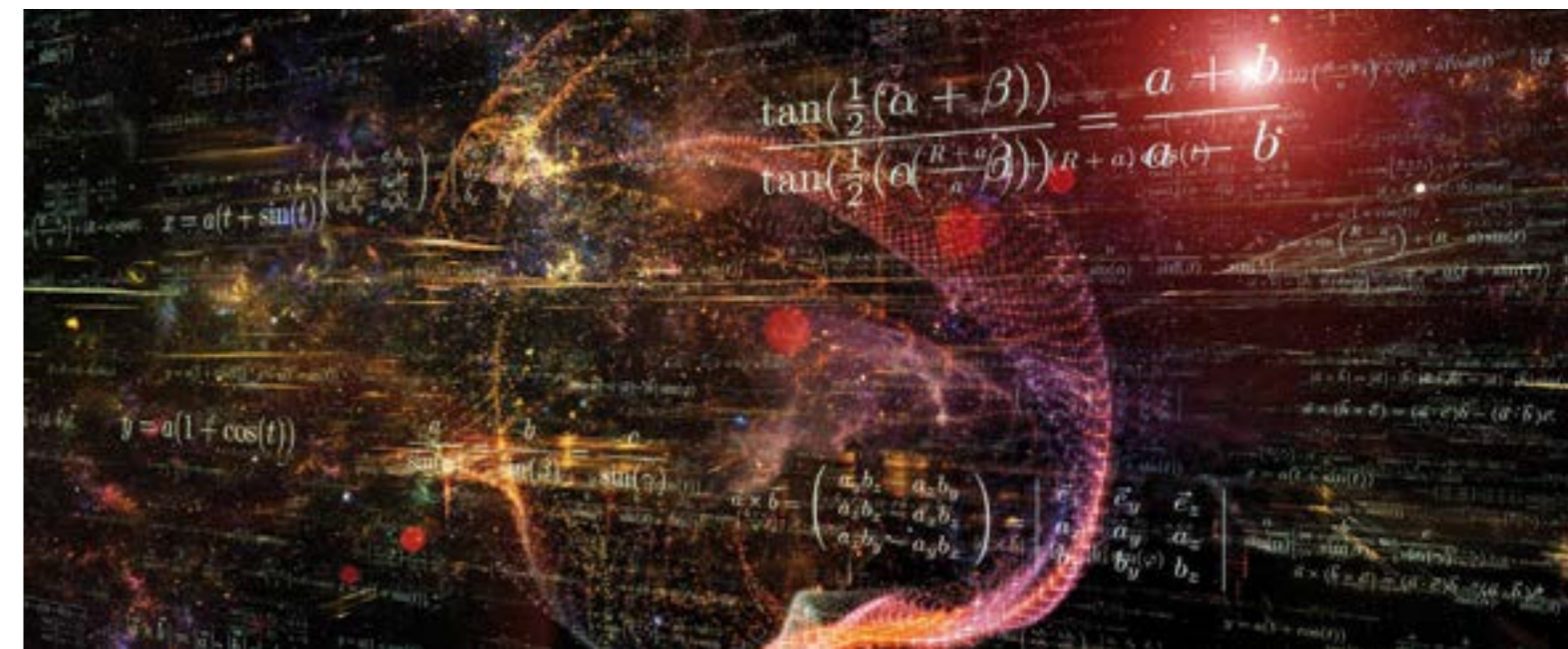
Edwin S. Alférez

Marino Arroyo

Pedro Díez

Antonio Rodríguez-Ferran

www.cimne.com/mathematical



Pre and Postprocessing Group

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.

These include:

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

The main commercial product of the group is the software GiD (*gidhome.com*), which is a universal pre and postprocessor 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.

Research Topics

COMPUTATION AND INFORMATION TECHNOLOGIES

PI. A. Coll

- Parallel structured and unstructured mesh generation
- Graphical visualization of big data sets
- Development of the GiD pre-postprocessor.

Staff

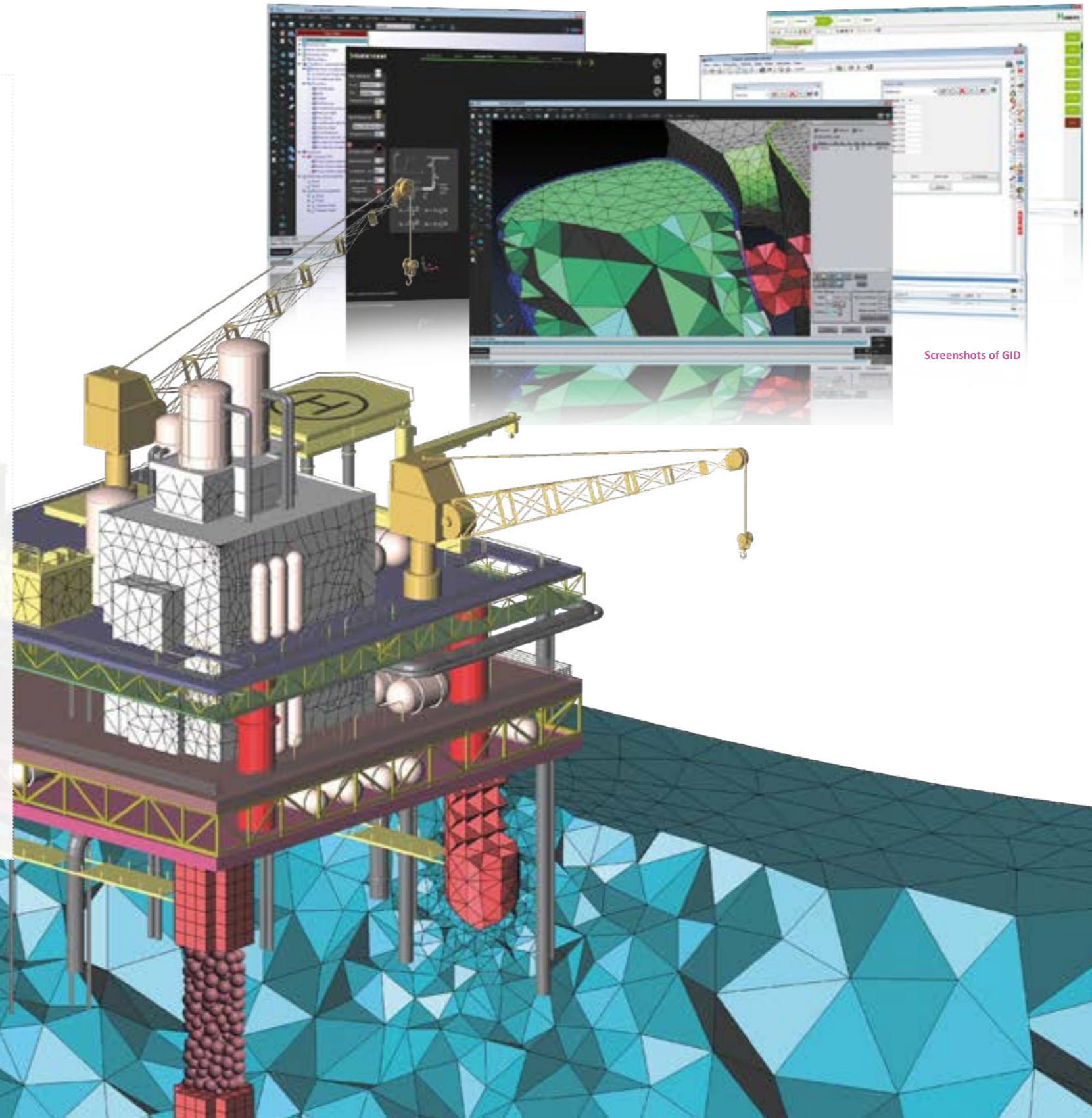
Abel Coll (**Group Leader**)
 Enrique Escolano
 Javier Gárate
 Adrià Melendo
 Anna Monròs
 Miguel A. Pasenau
 Jorge S. Pérez

On-going RTD Projects

NUMEXAS - NUMerical methods and tools for key EXAScale computing challenges in engineering and applied sciences
 FP7 (2007-2013) - FP7 - COOPERATION - EC
 Coordinator: CIMNE — 01/10/2013 - 30/09/2016

VELaSSCo - Visualization for Extremely Large-Scale Scientific Computing
 FP7 (2007-2013) - FP7 - COOPERATION - EC
 Coordinator: CIMNE — 01/01/2014 - 31/12/2016

www.cimne.com/pre-post



Screenshots of GiD

Aerospace Engineering Group

The Aerospace Engineering Group deals with the development of new and amazing projects in the aeronautical field, 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 or IT technology applied to sensing and data management.

Research Topics

COMPUTATIONAL FLUID DYNAMICS

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

OPTIMIZATION

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

Staff

Jordi Pons (Group Leader)
Martí Coma
Pedro Díez
Roberto Flores
Àlex Jarauta
Enrique Ortega

On-going RTD Projects

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

H2020 (2014-2020) - Societal Challenges - SC4 - EC

Coordinator: CIMNE

01/12/2014 - 30/11/2017

GRAIN 2 - Greener Aeronautics International Networking

FP7 (2007-2013) - FP7 - COOPERATION - EC

Coordinator: CIMNE

01/10/2013 - 31/05/2016

PARAPLANE - Development of a New Steerable Parachute System for Rescue of Small and Medium Size Airplanes

FP7 (2007-2013) - FP7 - CAPACITIES - EC

Coordinator: CIMSA — 01/12/2012 - 31/05/2015

UMRIDA - Uncertainty Quantification Robust Design Aeronautics

FP7 (2007-2013) - FP7 - COOPERATION - EC

Coordinator: NUMECA — 01/10/2013 - 30/09/2016

www.cimne.com/aero

Naval and Marine Engineering Group

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

The main activities in these fields are related to the development and application of computational methods and computer aided design and verification tools on the following topics:

Hydrodynamic analysis of vessels. Optimum shape design methods for ships. Ship structures. Composite materials and fluid-structure interaction effects. Offshore structures. Fluid-structure interaction. Environmental problems in naval and marine engineering. Decision support systems in naval and marine engineering. Near-time simulation (operational) tools for ocean waves. GPU computing. Offshore wind turbines. Design of tidal turbines.

Research Topics

COMPUTATIONAL FLUID DYNAMICS

- FEM and particle methods for ship hydrodynamics and aero/hydrodynamics analysis of marine structures (offshore platforms, wind tower structures, wave energy production, etc). **PI: J. Garcia**

OPTIMIZATION

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

Staff

Julio García (Group Leader)
Jonathan Colom
Joel Jurado
Immaculada Ortigosa
Borja Serván

On-going RTD Projects

FORTISSIMO (X-Sheaks) - HPC - enabled System for enhanced Seakeeping and Station-Keeping design

FP7 (2007-2013) - FP7 - COOPERATION - EC

Coordinator: COMPASS Ingeniería y Sistemas, SA

01/07/2015 - 31/12/2016

GAINN4MOS - Sustainable LNG Operations for Ports and Shipping — CEF Programme 2014-2020 - INEA

Coordinator: Valencia Port — 01/01/2015 - 30/09/2019

GAINN4SHIP Innovation - LNG Technologies and Innovation for Maritime Transport

CEF Programme 2014-2020 - INEA

Coordinator: Valencia Port — 01/01/2015 - 31/12/2018

MONALISA 2.0 — TEN-T Programme 2007-2013 - EC

Coordinator: Swedish Maritime Administration

01/01/2012 - 31/12/2015

STM Validation Project - STM Validation Project

CEF Programme 2014-2020 - INEA

Coordinator: Swedish Maritime Administration

01/01/2015 - 31/12/2018

WAM-V® - Advanced Numerical Simulation and Performance Evaluation of Wave Adaptive Modular Vessels in Spray Generating Conditions

Coordinator: CIMNE — 01/07/2012 - 30/06/2015

WiderMoS - Wide Interoperability and new governance models for freight Exchange linking Regions through Multi-modal maritime based corridors

TEN-T Programme 2007-2013 - EC

Coordinator: La Spezia Port Authority

01/06/2013 - 31/12/2015

X-SHEAKS - Cálculo acoplado X-IVAS FEM-BEM. Análisis del comportamiento en la mar de aerogeneradores flotantes

PLAN ESTATAL (2013-2016) - MINECO

Coordinator: CIMNE

01/01/2015 - 31/12/2016

www.cimne.com/naval-marine



CIMNE is ranked in the 18th position on a list of 528 research centers in Spain in terms of production and scientific activities.

In the world ranking, CIMNE is in the 395th position in a list of 7,353 research centers worldwide.

In terms of number of papers and citations for each academic domain, CIMNE is positioned at number 98 in the world. This classification is based on the database of Google Scholar Citations (GSC).

In January 2016, *Webometrics* has published a **list of the most cited Spanish scientists**. The study, based on citations from *Google Scholar*, includes **29 researchers of CIMNE among the 10,000 most cited scientists of Spain**.

Also, we note the presence of **eight CIMNE scientists in the top 1,000 list**: **Prof. Eugenio Oñate** has the 96th position in the list with an h-index of 60 and 13,276 citations. **Prof. Antonio Gens**, the 239th position; **Prof. Eduardo Alonso**, the 430th position; **Prof. Antonio Huerta**, the 513th position; **Prof. Javier Oliver**, the 619th position; **Prof. Ramón Codina**, the 63th position; **Prof. Sergio Idelsohn**, the 687th position; and **Prof. Alex Barbat**, the 922th position.

Information as in March 15, 2015

www.cimne.com/research-rankings

29 RESEARCHERS OF CIMNE, AMONG THE 10,000 MOST CITED SCIENTISTS OF SPAIN

RANK	NAME	INSTITUTION	H-INDEX	CITATIONS
96	Eugenio Oñate	CIMNE ⁽¹⁾ , UPC ⁽²⁾	60	13,276
239	Antonio Gens	CIMNE ⁽¹⁾ , UPC ⁽²⁾	49	10,915
430	Eduardo Alonso	CIMNE ⁽¹⁾ , UPC ⁽²⁾	43	8,711
513	Antonio Huerta	CIMNE ⁽¹⁾ , UPC ⁽²⁾	41	7,554
619	Javier Oliver	CIMNE ⁽¹⁾ , UPC ⁽²⁾	39	7,094
632	Ramón Codina	CIMNE ⁽¹⁾ , UPC ⁽²⁾	39	5,796
687	Sergio Idelsohn	CIMNE ⁽¹⁾ , UPC ⁽²⁾	38	5,877
922	Álex H. Barbat	CIMNE ⁽¹⁾ , UPC ⁽²⁾	35	3,957
1022	Miguel Cervera	CIMNE ⁽¹⁾ , UPC ⁽²⁾	34	3,457
1409	Sergio Oller	CIMNE ⁽¹⁾ , UPC ⁽²⁾	30	4,125
2487	Sebastià Olivella	CIMNE ⁽¹⁾ , UPC ⁽²⁾	24	3,061
2802	Marino Arroyo	CIMNE ⁽¹⁾ , UPC ⁽²⁾	23	2,226
3013	Enrique Romero	CIMNE ⁽¹⁾ , UPC ⁽²⁾	22	2,783
3741	Melba Navarro	CIMNE ⁽¹⁾ , UPC ⁽²⁾	20	1,615
3910	Carlos Agelet de Saracibar	CIMNE ⁽¹⁾ , UPC ⁽²⁾	20	1,195
4221	Pedro Díez	CIMNE ⁽¹⁾ , UPC ⁽²⁾	19	1,195
4460	Santiago Badia	CIMNE ⁽¹⁾ , UPC ⁽²⁾	18	1,511
4601	Michele Chiumenti	CIMNE ⁽¹⁾ , UPC ⁽²⁾	18	1,157
4703	Miguel Cerrolaza	CIMNE ⁽¹⁾ , UPC ⁽²⁾	18	1,021
4835	Antonio Rodríguez	CIMNE ⁽¹⁾ , UPC ⁽²⁾	17	2,560
5651	Riccardo Rossi	CIMNE ⁽¹⁾ , UPC ⁽²⁾	16	910
5762	José Sarrate	CIMNE ⁽¹⁾ , UPC ⁽²⁾	16	793
6202	Gabriel Bugada	CIMNE ⁽¹⁾ , UPC ⁽²⁾	15	857
7375	M. Liliana Carreño	CIMNE ⁽¹⁾ , UPC ⁽²⁾	13	861
8333	Julio García	CIMNE ⁽¹⁾ , UPC ⁽²⁾	12	597
8426	Javier Príncipe	CIMNE ⁽¹⁾ , UPC ⁽²⁾	12	546
8626	Cecilia Soriano	CIMNE ⁽¹⁾ , UPC ⁽²⁾	12	472
8673	Cristina Marulanda	CIMNE ⁽¹⁾ , UPC ⁽²⁾	12	457
9428	J. Carlos Cante	CIMNE ⁽¹⁾ , UPC ⁽²⁾	11	447

⁽¹⁾ International Center for Numerical Methods in Engineering

⁽²⁾ Universitat Politècnica de Catalunya · BarcelonaTech
info

Source: Webometrics.

Information as in March 15, 2015

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 www.cimne.com. Most publications can be freely downloaded from the web. We list below the publications of CIMNE in 2015.



NUMBER OF CIMNE PUBLICATIONS

Edited books	82
Text books	45
Research reports	414
Technical reports	642
Monographs	235
Papers in journals (since 2009)	460

Books

Chaves E.W.V. **Mecánica del Medio Continuo. Problemas resueltos**, CIMNE, L144, 592pp, 2015. ISBN: 978-84-943307-5-9.

Journals

Archives of Computational Methods in Engineering. Editors: Kleiber M., Oñate E. Springer, 2015.

Revista internacional de Métodos Numéricos para Cálculo y Diseño en Ingeniería. Editors: Oñate E., Idelsohn S.R., Elsevier, 2015.

Monographs

Aguir R. **Espectros de control para ciudad de Quito-Ecuador**, MIS72, 122pp., 2015.

Baumgärtner D., Wolf J., Rossi R., Wüchner R. **Contribution to the fluid-structure interaction analysis of ultra-light-weight structures using an embedded approach**, M152, 386pp., January 2015.

Bernal G.A., Cardona O.D. **Calibración de funciones de atenuación basadas en espectro de fuente radiado y su aplicación en Colombia**, IS71, 114pp., June 2015.

Casacuberta J., Soudah E., Gámez-Montero P.J., Raush G., Castilla R., Pérez J.S. **Hemodynamics in the theoric aorta using opeafoam: 4D PCMRI versus CFD**, M154, 126pp., March 2015.

De Pouplana I., Oñate E. **An isotropic damage model for geomaterials in the Kratos framework**, M153, 127pp., March 2015.

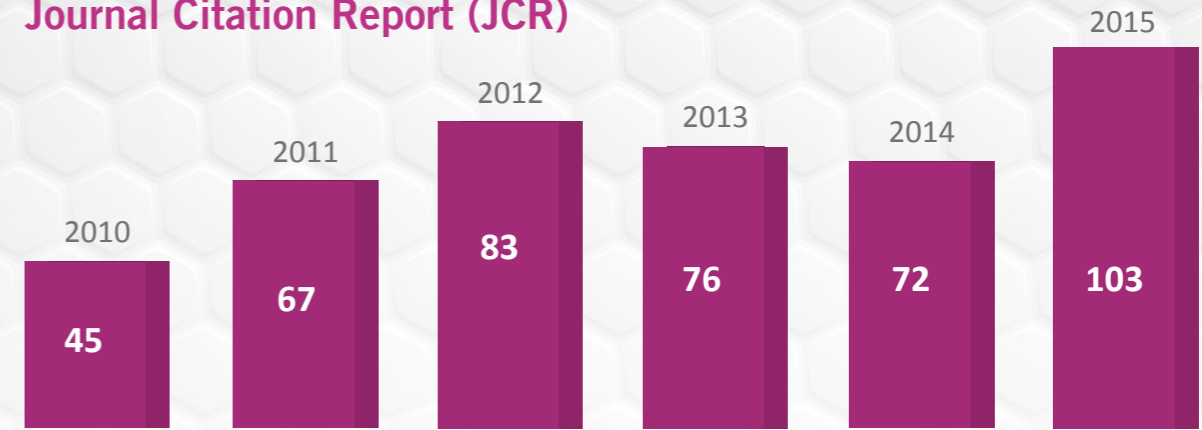
Franci A., Oñate E., Carbonell J.M. **Unified Lagrangian Formulation for Fluid and Solid Mechanics, Fluid-Structure Interaction and Coupled Thermal Problems using the PFEM**, M155, 250pp., May 2015.

Rodríguez Prieto J.M., Cante J.C., Oliver X. **On the numerical modelling of machining processes via the Particle Finite Element Method (PFEM)**, M156, June 2015.

Salgado-Gálvez M.A., Cardona O.D., Carreño M.L., Barbat A.H. **Probabilistic seismic hazard and risk assessment in Spain**, IS69, 215 pp., 2015.

Vielma J.C., Cando M.A. **Evaluación de la vulnerabilidad sísmica de estructuras de acero residenciales del Ecuador**, IS70, 228 pp., 2015.

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



75% of the papers have been published in Q1 Journals

Research reports

Carbonell J.M., Abedrabbo N., Celigueta M.A., Oñate E. **A 3D Beam element for analysis of the drill string mechanics in boreholes**, PI411, October 2015.

Oñate E. **Improving an input of material model in the D-Dempack package programme in the Kratos application for granular non-cohesive materials**, PI412, December 2015.

Oñate E., Miquel J., Nadukandi P. **Accurate stabilized finite formulation for the convection-diffusion-reaction equation. Part II: The multi-dimensional problem**, PI409, January 2015.

Zárate F., Oñate E. **A three dimensional FEM-DE technique for predicting the evolution of fracture in geomaterials and concrete**, PI410, January 2015.



Number of cites of CIMNE scientists recorded by Google Scholar (information at December 2015)

PUBLICATIONS IN SCIENTIFIC JOURNALS

This is the list of 103 papers in scientific journals published by CIMNE researchers in 2015.



Abdollahi A., Millán D., Peco C., Arroyo M., Arias I. Revisiting pyramid compression to quantify flexoelectricity: A three-dimensional simulation study, *Physical Review B - Condensed Matter and Materials Physics*, vol.91(10), 104103, 2015.

Abdollahi A., Peco C., Millán D., Arroyo M., Catalan G., Arias I. Fracture toughening and toughness asymmetry induced by flexoelectricity, *Physical Review B-Condensed Matter and Materials Physics*, vol.92(9), 94101, 2015.

Aguado J.V., Huerta A., Chinesta F., Cueto E. Real-time monitoring of thermal processes by reduced-order modeling, *International Journal for Numerical Methods in Engineering*, vol.102(5), 991-1017, 2015.

Alonso E.E., Pinyol N.M. Slope stability in slightly fissured claystones and marls, *Landslides*, vol.12(4), 643-656, 2015.

Alonso E.E., Sauter S., Ramon A. Pile groups under deep expansion: A case history, *Canadian Geotechnical Journal*, vol.52(8), 1111-1121, 2015.

Alonso E.E., Yerro A., Pinyol N.M. The material point method for unsaturated soils, *Géotechnique*, vol.65(3), 201-217, 2015.

Ávila M., Codina R., Príncipe J. Finite element dynamical subgrid-scale model for low Mach number flows with radiative heat transfer, *International Journal of Numerical Methods for Heat and Fluid Flow*, vol.25(6), 1361-1384, 2015.

Badia S., Codina R., Colomé O., Príncipe J. Assessment of variational multiscale models for the large eddy simulation of turbulent

incompressible flows, *Computer Methods in Applied Mechanics and Engineering*, vol.285, 32-63, 2015.

Badia S., Codina R., Espinoza H. On some time marching schemes for the stabilized finite element approximation of the mixed wave equation, *Computer Methods in Applied Mechanics and Engineering*, vol.296, 295-326, 2015.

Badia S., Codina R., Planas R. Analysis of an unconditionally convergent stabilized finite element formulation for incompressible magnetohydrodynamics, *Archives of Computational Methods in Engineering*, vol.22(4), 621-636, 2015.

Badia S., Hierro A. On discrete maximum principles for discontinuous Galerkin methods, *Computer Methods in Applied Mechanics and Engineering*, vol.286, 107-122, 2015.

Badia S., Martín A.F., Príncipe J. On the scalability of inexact balancing domain decomposition by constraints with overlapped coarse/fine corrections, *Parallel Computing*, vol.50, 1-24, 2015.

Baetu S.A., Barbat A.H., Ciongradi I.P. Seismic damage evaluation of reinforced concrete slit walls, *Engineering Computations*, vol.32(2), 424-451, 2015.

Baetu S.A., Barbat A.H., Ciongradi I.P., Baetu G. Seismic damage evaluation of reinforced concrete buildings with slit walls, *Engineering Computations*, vol.32(6), 1661-1690, 2015.

Baiges J., Codina R. Variational Multi-scale based dissipation models for the estimation of atmospheric seeing, *Computers & Fluids*, vol.107, 141-154, 2015.

Baiges J., Codina R., Idelsohn S. Reduced-order subscales for POD models, *Computer Methods in Applied Mechanics and Engineering*, vol.291, 173-196, 2015.

Barbu L.G., Oller S., Martínez X., Barbat A. H. High cycle fatigue simulation: A new stepwise load-advancing strategy, *Engineering Structures*, vol.97, 118-129, 2015.

Barbu L.G., Martínez X., Oller S., Barbat A.H. Validation on large scale tests of a new hardening-softening law for the Barcelona plastic damage model, *International Journal of Fatigue*, vol.81, 213-226, 2015.

Becker P., Idelsohn S.R., Oñate E. A unified monolithic approach for multifluid flows and fluid-structure interaction using the Particle Finite Element Method with fixed mesh, *Computational Mechanics*, vol.55(6), 1091-1104, 2015.

Benedetti L., Cervera M., Chiumenti M. Stress-accurate Mixed FEM for soil failure under shallow foundations involving strain localization in plasticity, *Computers and Geotechnics*, vol.64, 32-47, 2015.

Benkemoun N., Gelet R., Roubin E., Colliat J.-B. Poroelastic two-phase material modeling: Theoretical formulation and embedded finite element method implementation, *International Journal for Numerical and Analytical Methods in Geomechanics*, vol.39(12), 1255-1275, 2015.

Bregoli F., Medina V., Chevalier G., Hürlimann M., Bateman A. Debris-flow susceptibility assessment at regional scale: Validation on an alpine environment, *Landslides*, vol.12(3), 437-454, 2015.

Casares L., Vincent R., Zalvidea D., Campillo N., Navajas D., Arroyo M., Trepát X. Hydraulic fracture during epithelial stretching, *Nature Materials*, vol.14(3), 343-351, 2015.

Castillo E., Baiges J., Codina R. Approximation of the two-fluid flow problem for viscoelastic fluids using the level set method and pressure enriched finite element shape functions, *Journal of Non-Newtonian Fluid Mechanics*, vol.225, 37-53, 2015.

Castillo E., Codina R. First, second and third order fractional step methods for the three-field viscoelastic flow problem, *Journal of Computational Physics*, vol.296, 113-137, 2015.

Cerrolaza M., Carrero W., Cedeño J., Valencia L. Finite element analysis of a device for alveolar osteogenic distraction in human mandible, *J. Biomed Engineering: Applic., Basis & Comm.*, vol.27(4), 315-328, 2015.

Cervera M., Chiumenti M., Benedetti L., Codina R. Mixed stabilized finite element methods in nonlinear solid mechanics: Part III: Compressible and incompressible plasticity, *Computer Methods in Applied Mechanics and Engineering*, vol.285, 752-775, 2015.

Cervera M., Wu J.-Y. On the conformity of strong, regularized, embedded and smeared discontinuity approaches for the modeling of localized failure in solids, *International Journal of Solids and Structures*, vol.71, 19-38, 2015.

Chevalier G.G., Medina V., Hürlimann M., Bateman A. Morpho-fluvial analysis of headwater catchments: an example from the Central-Eastern Pyrenees, *Environmental Earth Sciences*, vol.73(10), 6495-6509, 2015.

Chiumenti M., Cervera M., Codina R. A mixed three-field FE formulation for stress accurate analysis including the incompressible limit, *Computer Methods in Applied Mechanics and Engineering*, vol.283, 1095-1116, 2015.

Ciantia, M.O., Arroyo, M., Butlanska, J., Gens, A. DEM modelling of cone penetration tests in a double-porosity crushable granular material, *Computers and Geotechnics*, vol.73, 109-127, 2015.

Ciantia, M.O., Arroyo, M., Calvetti, F., Gens, A. An approach to enhance efficiency of DEM modelling of soils with crushable grains, *Géotechnique*, vol.65(2), 91-110, 2015.

Ciervo F., Papa M.N., Medina V., Bateman A. Simulation of flash floods in ungauged basins using post-event surveys and numerical modelling, *Journal of Flood Risk Management*, vol.8(4), 343-355, 2015.

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Codina R., Baiges J. Weak imposition of essential boundary conditions in the finite element approximation of elliptic problems with non-matching meshes, *International Journal for Numerical Methods in Engineering*, vol.104(7), 624-654, 2015.

Codina R., Príncipe J., Muñoz C., Baiges J. Numerical modelling of chlorine concentration in water storage tanks, *International Journal for Numerical Methods in Fluids*, vol.79(2), 84-107, 2015.



Colomé O., Badia S., Codina R., Príncipe J. Assessment of variational multiscale models for the large eddy simulation of turbulent incompressible flows, *Computer Methods in Applied Mechanics and Engineering*, vol.285, 32-63, 2015.

Comellas E., Iván Valdez S., Oller S., Botello S. Optimization method for the determination of material parameters in damaged composite structures, *Composite Structures*, vol.122, 417-424, 2015.

Costarelli S.D., Garelli L., Cruchaga M.A., Storti M.A., Ausensi R., Idelsohn S.R. An embedded strategy for the analysis of fluid structure interaction problems: Numerical implementation on GPU hardware and experimental validation, *Computer Methods in Applied Mechanics and Engineering*, vol.300, 106-128, 2015.

Cusidó J.A., Cremades L.V., Soriano C., Devant M. Incorporation of paper sludge in clay brick formulation: Ten years of industrial experience, *Applied Clay Science*, vol.108, 191-198, 2015.

Dal Sasso S.F., Sole A., Pinzón A.B., Medina V., Mirauda D., Volpe Plantamura A., Giosa L., Guariglia A. Analysis of river bed dynamic evolution following a landslide dam, *Houille Blanche*, vol.6, 88-95, 2015.

Dávalos C., Cante J., Hernández J.A., Oliver J. On the numerical modeling of granular material flows via the Particle Finite Element Method (PFEM), *International Journal of Solids and Structures*, vol.71, 99-125, 2015.

Dialami N., Chiumenti M., Cervera M., Agelet de Saracibar C., Ponthot J.P. Material flow visualization in Friction

Stir Welding via particle tracing, *International Journal of Material Forming*, vol.8(2), 167-181, 2015.

Feng C., Li S-h., Oñate E. 2D particle contact-based meshfree method in CDEM and its application in geotechnical problems, *Engineering Computations*, vol.32(4), 1080-1103, 2015.

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& innovation technology transfer

CIMNE PRODUCTS

We describe below the products developed and marketed by CIMNE in collaboration with companies.

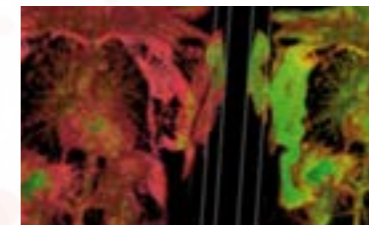
PRE AND POST PROCESSING SOFTWARE

GID



A universal and adaptive pre and postprocessor for computer simulation in engineering and applied science. *Developed & marketed by CIMNE since 1998.* gidhome.com

DIPPO



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

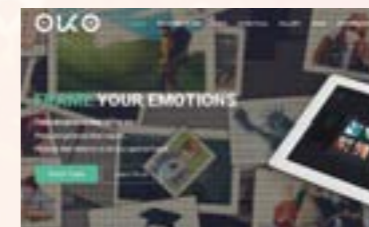
ENGINEERING SYSTEMS AND HARDWARE

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

OKO



Interactive frame for displaying images and videos. *Developed by CIMNE. Marketed by Tecnologías Avanzadas para el Ocio, SL since 2016.* 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

FRAKTALIS



Fully customizable web application that creates virtual communities where users can communicate and share. *Developed and marketed by CIMNE since 2009.*
fraktalis.com

LHINGS



Cloud platform to provide access and links to all kind of things and let users management, share and interaction with them. *Developed and marketed by Lyncos SL in cooperation with CIMNE.* 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

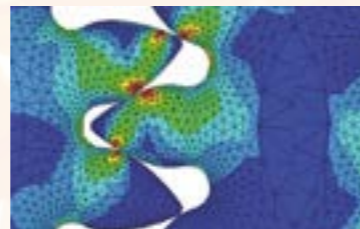
EDUCATIONAL SOFT.

EDUCATIONAL SOFTWARE



Educational software for interactive learning about structural design and finite element method. *Developed and marketed by CIMNE.*
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

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

ROBOCOPT - RMOP



Interpolated platform for robust multi-objective optimization in engineering. *Developed by CIMNE.*
tts.cimne.com/RMOP

GIS+



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

DECISION SUPPORT SYSTEMS

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

FLOOD



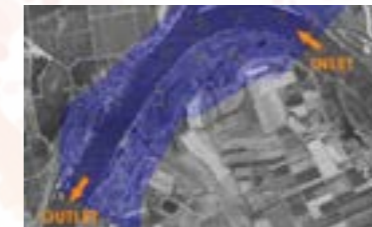
Artificial neuronal network package. *Developed by CIMNE.*
cimne.com/flood

ROEM



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

RAMFLOOD



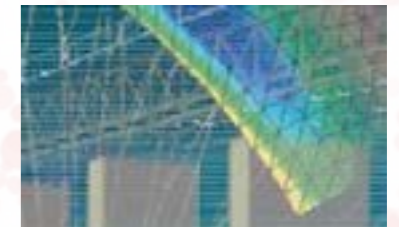
Decision support system (DSS) for risk assessment and managing of floods. *Developed by CIMNE and Flumen.*
www2.cimne.com/ramflood

E-TESTING



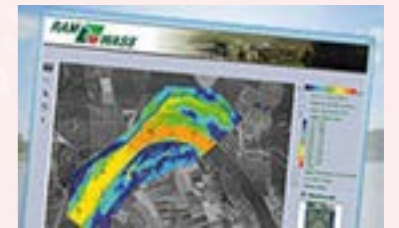
Web-based platform for e-management of experimental tests. *Developed by CIMNE and Applus.*

WSNP



An integrated platform for e-monitoring using wireless sensor network technology. *Developed by CIMNE.*
www2.cimne.com/wsnp

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

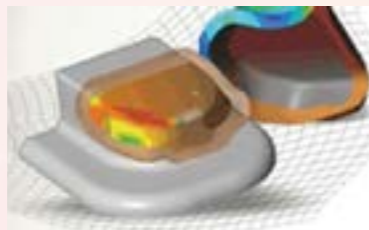
SIMULATION SOFTWARE FOR MANUFACTURING PROCESSES

WELDPACK



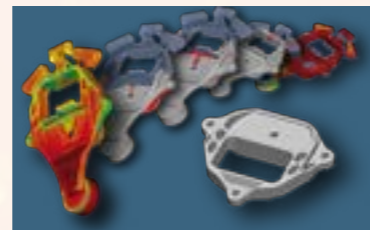
Welding processes software.
Developed by CIMNE.

STAMPACK



Software for sheet metal forming processes. Developed by Quantech ATZ, SA and CIMNE. Marketed by Quantech ATZ, SA since 1999. stampack.com

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.

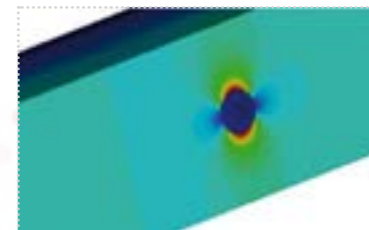
SIMULATION SOFTWARE FOR MULTIPHYSICS

KRATOS



Object-oriented software platform for the development and application of finite element codes for multidisciplinary applications. Developed by CIMNE. cimne.com/kratos

ERMES



Computational electromagnetics using advanced finite element methods.
Developed by CIMNE.
tts.cimne.com/ermes

PFIRE



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

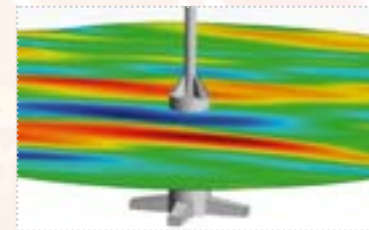
SIMULATION SOFTWARE FOR FLUID DYNAMICS

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

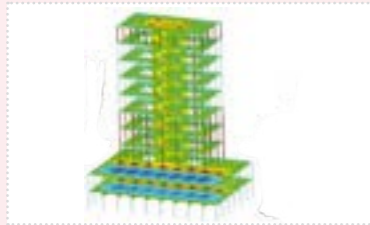
SEAFEM



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

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

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

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

BIOMECHANICS & HEALTH

HEALTH APP

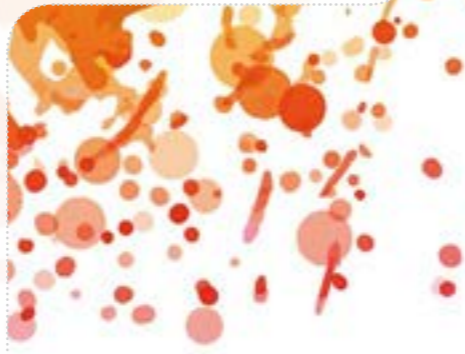


App to control eating disorders. *Developed by HealthApp in cooperation with CIMNE. Marketed by HealthApp SL since 2014.*
bcnhealthapp.com

BODYGID



Multiscale representation and analysis of the human body. *Developed by CIMNE.*
cimne.com/bodygid



Spin-off Companies

[Companies promoted by CIMNE since 2001]



SOLUCIONES INTEGRALES DE FORMACIÓN Y GESTIÓN STRUCTURALIA, SA
Created in 2001

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

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.

CIMNE TECNOLOGÍA, SA

Created in 2011

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.



BUILD AIR INGENIERÍA Y ARQUITECTURA, SA
Created in 2001

buildair.com

Development and marketing of inflatable structures for a wide range of applications in engineering and architecture. CIMNE Tecnología SA owns 5% of BUILD AIR.



BIOMECHANICS DEVELOPMENTS, SL
Created in 2015

bd-biomechanics.com

Biomechanics Developments is specialized on the development of software solutions and services in the biomedical field. CIMNE Tecnología SA owns 50% of Biomechanics Developments.



INLOC ROBOTICS, SL
Created in 2014

inlocrobotics.com

The main objective of INLOC Robotics is to develop positioning and navigation solutions for mobile robots in buried environments. CIMNE Tecnología owns 5% of INLOC Robotics since October 2015.



COMPUTATIONAL AND INFORMATION TECHNOLOGIES, SA
Created in 2012

citechsa.com

Development and application of computational methods and information technology systems in engineering and applied sciences. 100% owned by CIMNE Tecnología SA.



RSM GASSÓ CIMNE ENERGY, SL
Created in 2012

inergybcn.com

Inergy offers solutions focusing on the combination of advanced engineering energy services and pioneered own proprietary products. 50% owned by Servicios Energéticos Avanzados, SL, which is 100% owned by CIMNE Tecnología, SA.



PNEUMATIC STRUCTURES TECHNOLOGIES, SL
Created in 2015

ps-technologies.com

Solutions development for pneumatic structures applicable to a wide range of engineering problems. 10% owned by CIMNE Tecnología SA.



FRESH WATER NATURE, SL
Created in 2013

The company is specialized in the development of solutions for obtaining fresh water from desalination of sea water and the distillation of waste water. The company is 100% owned by CIMNE Tecnología SA.



LYNCOS TECHNOLOGIES, SL
Created in 2012

lhings.com

Development, application and marketing of information and communication technologies and devices for a wide range of applications in the Internet of Things sector. CIMNE Tecnología SA owns 15% of Lyncos Technologies, SL.



QUANTECH ATZ
Created in 1996

quantech.es

Development and marketing of simulation software production processes. CIMNE Tecnología SA joined the company in 2015, with a share of 3,5%.



HEALTHAPP, SL
Created in 2013

bcnhealthapp.com

It is focused on improving the links between therapists and patients by providing trustful information to the patients and their relatives about the therapy and its process. 15% owned by CIMNE Tecnología SA.



PORTABLE MULTIMEDIA SOLUTIONS, SL
Created in 2013

portablemultimediasolutions.com
Development and marketing of mobile pavilions incorporating multimedia technology for the leisure, sport and events sectors. The company is 20% owned by CIMNE Tecnología SA.



TECNOLOGÍAS AVANZADAS PARA EL OCIO, SL
Created in 2012

beaching.com

Development and marketing of information systems for leisure sectors such as tourism and music. 100% owned by CIMNE Tecnología SA.



Drs. Daniel Di Capua and Pedro Arnau at the Unesco Chair Working Group Meeting

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.

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.

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.

alliances



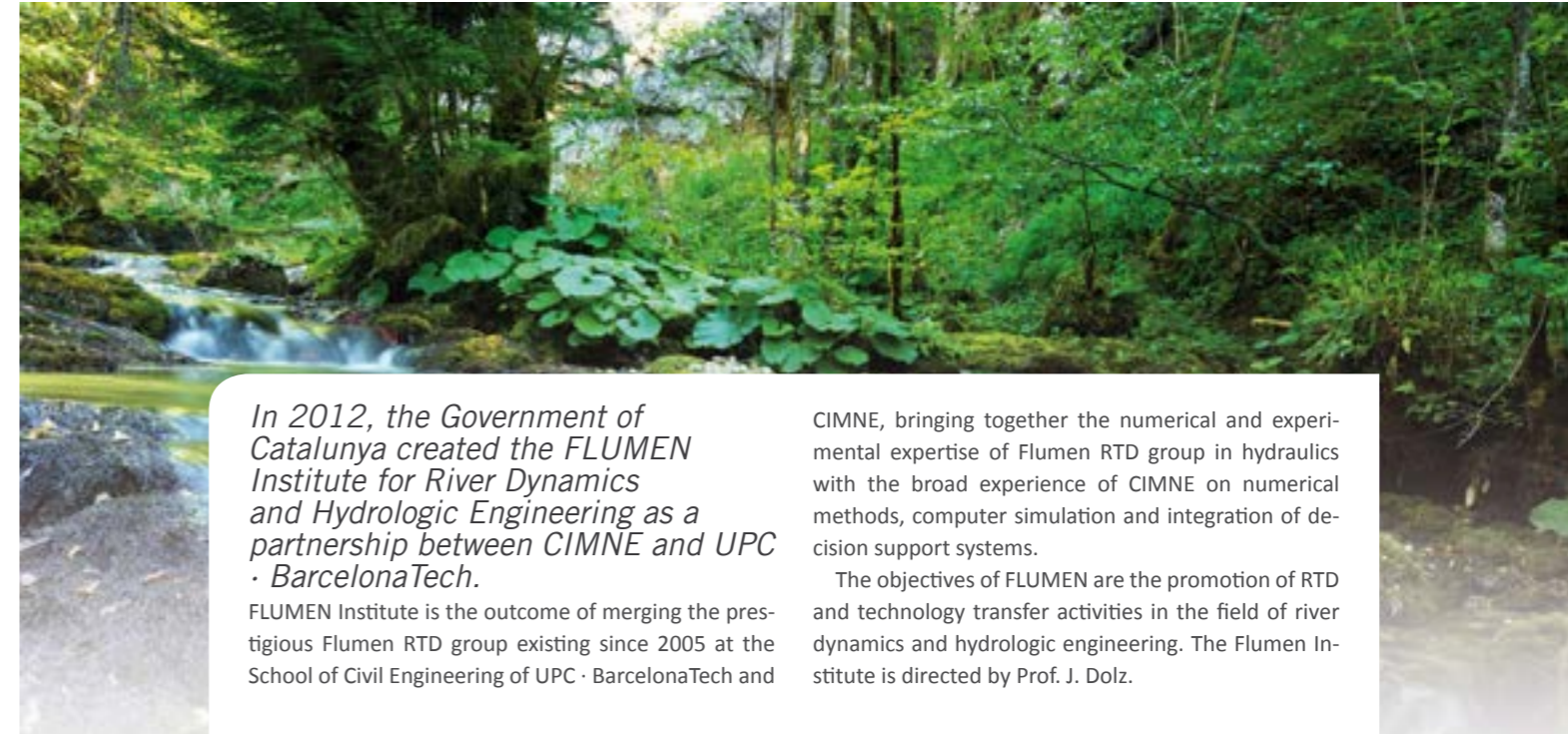
UNESCO Chairs Working Group Meeting, Barcelona, 29th September 2015.



cimne.com/unesco



New premises of Flumen Institute at UPC Campus Nord (B0 building)



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.



New premises

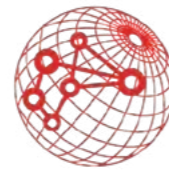
The new building that will host the Flumen Institute **was completed by the end of 2015**. Researchers will be moving to the new facilities during the first months of 2016. This new building, located at the North Campus of UPC · BarcelonaTech is **equipped with modern experimental facilities for model 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.

Members



www.flumen.upc.edu

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 view

To promote a common project and create a network of experts from around the world, which result 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, industry technology transfer, among others.

aiac.cimne.com

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 Mécanica 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.



In July 2015, the **12th SEMNI congress (CMN 2015)** was held in Lisbon (Portugal). The event was a forum for the discussion of relevant scientific and technical developments in computational mechanics, numerical methods and engineering applications.

www.semni.org



European Community on Computational Methods in Applied Sciences

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**. The main objective of this conference is to provide a forum for presentation and discussion of state-of-the-art in scientific computing applied to engineering sciences. Emphasis is also given to basic methodologies, scientific development and industrial applications. It also includes invited lectures, invited 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 take place in Crete (Greece) in 2016.

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

www.eccomas.org



International Association for Computational Mechanics

The International Association for Computational Mechanics (IACM) was founded in 1981 and, since 1994, the IACM Secretariat is located at CIMNE.

The goal of IACM is the **promotion of advances in computational mechanics** in the 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 Korean Society for Computational Mechanics (KSCM) will organize jointly the **12th World Congress on Computational Mechanics (WCCM XII)** and **6th Asia-Pacific Congress on Computational Mechanics (APCOM VI)** in Seoul, Republic of Korea, from 24 to 29 July, 2016. In words of Sung-Kie Youn, Chair of WCCM-APCOM 2016, "this congress is a forum to communicate and share new ideas and methods that will foster the development across all aspects of computational methods and their applications in mechanics, engineering and applied sciences".

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



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 Center of ERCOFTAC in Spain.** CIMNE, acting as Pilot Center, has organized a number of activities, including, among others, the 8th European Tur-



bulence 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 of these projects.

www.ercoftac.org



ARTIC

Catalan Institute for Applied Research
Technology Innovation and Creativity



The Catalan Institute of Applied Research, Technology Innovation and Creativity (ARTIC) was created in 2013 as an association of CIMNE, Barcelona Media and Fundació CTM Centre Tecnològic.

ARTIC generates, captures and transfers scientific and technological knowledge, with the goal of **improving the competitiveness of companies, institutions and administrations** and enhancing the quality of life of citizens through research and innovation.

Each member of the alliance provides the organization with a distinctive skill, enabling ARTIC to make new contributions to the following fields: content creation, social media analysis, security, culture and tourism, energy, environmental technology, numerical simulation, civil engineering and aeronautics, among others.

Members



www.articalliance.com



dissemination

POST-GRADUATE STUDIES
COURSES
SEMINARS
COFFE TALKS
CONFERENCES

CIMNE regularly organises seminars, courses and post-graduate studies related to the theory and application of numerical methods in engineering. This academic training is addressed to university graduates and professionals from schools of engineering and applied sciences universities.

CIMNE has also developed a web environment for distance learning education via Internet. The Virtual Center for continuous education of CIMNE allows the interaction between students and educators in courses via Internet.

POST-GRADUATE STUDIES

Master Degrees

Master on Numerical Methods in Engineering
Duration: 2 academic years, 120 ECTS
cimne.com/mumni

Master of Science on Computational Mechanics
Duration: 2 academic years, 120 ECTS
cimne.com/mcm

Master course on Numerical Methods for Analysis and Design in Engineering
(Last edition: September 2014-June 2015; replaced by the Master on Numerical Methods in Engineering)

Doctoral Degrees

Simulation in Engineering and Entrepreneurship Development- SEED
Duration: PhD studies, 3-4 years period
www.cimne.com/emjd-seed

COURSES

COMPLAS Course — Barcelona, 31/08/15-01/09/2015
It is the pre-conference course to participants interested in acquiring a detailed and in-depth description of the application of finite element techniques to a range of plasticity problems, particularly those involving finite strains.
congress.cimne.com/complas2015/course

CODE_BRIGHT Short Course 2015 — Barcelona 10/06/2015-12/06/2015
CODE_BRIGHT is a general-purpose finite element program developed by the Department of Geotechnical Engineering and Geosciences of the Universitat Politècnica de Catalunya · BarcelonaTech (DIT-UPC) for the analysis of coupled thermo-hydro-mechanical (THM) phenomena in geological media.

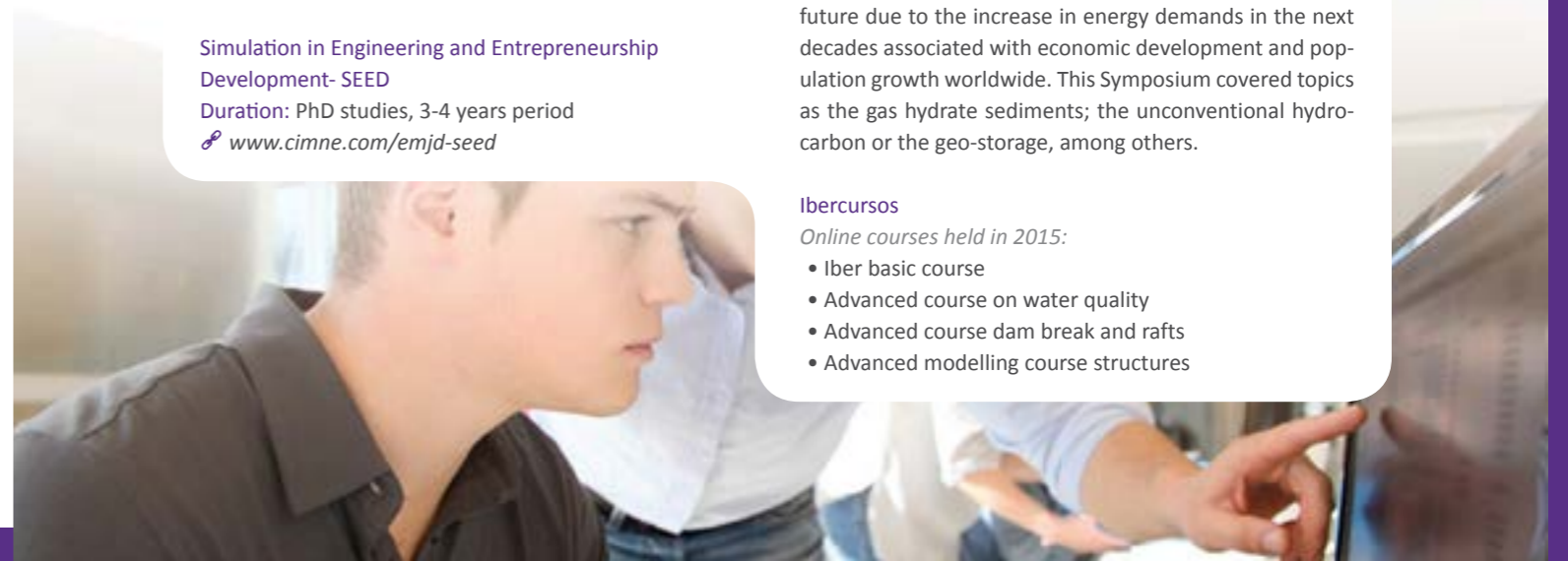
7th ALERT Olek Zienkiewicz Course. *Unsaturated Soil Mechanics: From Fundamentals to Applications*
Barcelona, 25/05/2015-29/05/2015
One important step in the historical development of the Unsaturated Soil Mechanics has been the formulation of the first elastoplastic model for unsaturated soils, presented in *Géotechnique* by Alonso, Gens & Josa (1990), and currently known as the Barcelona Basic Model. This course commemorated this work in its 25th anniversary.

SEG 2015. *International Symposium on Energy Geomechanics* — Barcelona, 02/06/2015-04/06/2015
Geotechnical engineering is at the core of the energy challenge because it will play a fundamental role in the near future due to the increase in energy demands in the next decades associated with economic development and population growth worldwide. This Symposium covered topics as the gas hydrate sediments; the unconventional hydrocarbon or the geo-storage, among others.

Ibercursos

Online courses held in 2015:

- Iber basic course
- Advanced course on water quality
- Advanced course dam break and rafts
- Advanced modelling course structures



SEMINARS IN 2015

Goal-Oriented Adaptivity using Unconventional Error Representations for Wave Propagation Problems
Prof. Dr. David Pardo, UPV/EHU and BCAM — 20/03/15

Multiphase flow. Modelling and simulation according to industrial needs
Prof. Norberto Nigro, UNL (Argentina) — 02/06/2015

Numerical Modelling & Simulation in Oil & Gas – A Perspective
Dr. Raju Gandikota, MindMesh Inc. (USA) — 04/06/2015

Phononics: Structural Dynamics at the Material Level
Prof. Mahmoud I. Hussein, University of Colorado Boulder (USA) — 11/06/2015

Two-Phase Flow in Fuel Cell Microchannels and Catalyst Layers
Prof. Ned Djilali, FCAE University of Victoria — 17/06/2015

PEM Fuel Cells: Degradation, Contamination and Characterization
Nada Zamel, Fraunhofer ISE, Germany — 23/09/2015

Error assessment and monitoring of Reduced Order Models: controlling the quality of Reduced Basis and PGD solutions
Pedro Díez, CIMNE — 30/09/2015

Evaluación probabilista del riesgo sísmico
Alex Barbat, CIMNE — 14/10/2015

Structural finite elements for the analysis of composite laminated beams and shells
Daniel di Capua, CIMNE — 28/10/2015

High-fidelity numerical simulation of additive manufacturing processes
Michele Chiumenti, CIMNE — 11/11/2015

On some mathematical aspects of the finite element approximation of Darcy's problem
Ramon Codina, CIMNE — 25/11/2015

Advances in Embedded Methods for CFD problems
Riccardo Rossi, CIMNE — 09/12/2015

www.cimne.com/seminars

CIMNE Coffee Talks are short seminars organized by CIMNE researchers to foster the knowledge transfer in a relaxed atmosphere. Each talk opens with a welcome coffee and ends up with an open discussion on the content of the talk.

COFFEE TALKS IN 2015

Computational Models for the Analysis of Historical Masonry Structures
Luca Pela, UPC · BarcelonaTech - Department of Construction Engineering — 14/01/2015

Debris Flow Research and Lagrange-Euler Method: State-of-the-art
Duan Wenjie, CIMNE — 18/03/2015

Some "evil" challenges for experts in Numerical Modelling
Fernando Salazar and **Javier San Mauro**, CIMNE Madrid 22/04/2015

Multiscale computational modelling material failure for concrete structures
Manuel Caicedo, CIMNE — 29/04/2015

Computational homogenization for multiscale analysis of Masonry structures
Massimo Petracca, CIMNE — 27/05/2015

Demystifying the Internet of Things
Agustín Navarro, Lyncos — 03/06/2015

The challenges and needs of Numerical Modelling in Earth Sciences
Adelina Geyer Traver, Institute of Earth Sciences "Jaume Almera" (CSIC) — 17/06/2015

A new enrichment technique
Ernesto Ortega, CIMAT (México) — 01/07/2015

VexCL - GPGPU without the agonizing pain
Denis Demidov, Supercomputer Center of Russian Academy of Sciences — 16/09/2015

Some FEM DEM formulations to simulate multi fractures in solid
Feng Chun, Institute of Mechanics, Chinese Academy of Sciences (China) — 21/10/2015

Discrete Volume Analysis
Víctor E. Cardoso, CIMAT (México) — 10/11/2015

Computational intelligence techniques applied to the habitability assessment for buildings affected by earthquakes
Liliana Carreño, CIMNE — 18/11/2015

VELaSSCo - Visual analysis for Extremely Large-Scale Scientific Computing
Miguel A. Pasenau, CIMNE — 02/12/2015

www.cimne.com/coffee-talks



Since 1987 CIMNE has organised 176 conferences on different topics of numerical methods and their applications in engineering and applied sciences.

2015

CONFERENCES

CONFERENCES IN 2015



1st Pan-American Congress on Computational Mechanics - PANACM 2015
27-29 April 2015, Buenos Aires, Argentina

International Conference on Adaptive Modelling and Simulation
7-10 June 2015, Nantes, France



VI International Conference on Coupled Problems in Science and Engineering - COUPLED PROBLEMS 2015
18-20 May, 2015, Venice, Italy



VI International Conference on Computational Methods in Marine Engineering - MARINE 2015
15-17 June 2015, Rome, Italy



III International Conference on Isogeometric Analysis - IGA 2015 — 1-3 June 2015, Trondheim, Norway



MEMSWAVE 2015
29 June-1 July 2015, Barcelona, Spain



ECCOMAS Thematic Conference on Multibody Dynamics
29 June-2 July, Barcelona, Spain



VII International Conference on Textile Composites and Inflatable Structures - STRUCTURAL MEMBRANES 2015
19-21 October, 2015, Barcelona, Spain



XIII International Conference on Computational Plasticity - COMPLAS XIII
1-3 September, 2015, Barcelona, Spain



IV International Conference on Particle-based Methods - PARTICLES 2015
28-30 September, 2015, Barcelona, Spain



VI International Conference on Computational Bioengineering - ICCB 2015
14-16 September 2015, Barcelona, Spain

<http://congress.cimne.com>

2016-17

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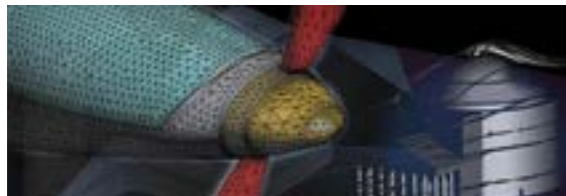
UPCOMING CONFERENCES



Second International Workshop on Software Solutions for Integrated Computational Materials Engineering - ICME 2016
12-15 April, 2016, Barcelona, Spain



Second International Conference on Concrete Sustainability - ICCS16
13-15 June 2016, Madrid, Spain



GID Convention 2016
1-3 June 2016, Barcelona, Spain



8th European Workshop on Structural Health Monitoring
5-8 July 2016, Bilbao, Spain



IGA School 2016
10-12 June 2016, Crete, Greece



VII International Conference on Computational Methods in Marine Engineering - MARINE 2017
15-17 May, 2017, Nantes, France



VII International Conference on Coupled Problems in Science and Engineering - COUPLED PROBLEMS 2017
12-14 June 2017, Rhodes Island, Greece



V International Conference on Particle-based Methods - PARTICLES 2017
26-28 September 2017, Hannover, Germany



Congress on Numerical Methods in Engineering - CMN 2017
3-5 July 2017, València, Spain



International Conference on Textile Composites and Inflatable Structures - STRUCTURAL MEMBRANES 2017
9-11 October 2017, Munich, Germany



XIV International Conference on Computational Plasticity - COMPLAS 2017
5-7 September 2017, Barcelona, Spain

<http://congress.cimne.com>



Chronology of the prizes awarded to CIMNE

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

AINE 2010 AWARD

CIMNE was distinguished with the 2010 AINE Award to the most innovative organization related to the naval sector with the award promoted by the *Asociación de Ingenieros Navales de España*.

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".

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/post-processor 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.



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 organisation of training activities and the promotion of science and technology at an international level.

SPECIAL MENTION TO THE CIUTAT DE BARCELONA AWARD 1999

The city of Barcelona awarded CIMNE a Special Mention to the Ciutat de Barcelona Award 1999 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.

IST AWARD TO THE BEST PRODUCT OF THE INFORMATION SOCIETY TECHNOLOGIES PROGRAMME OF EUROPEAN COMMISSION (EC)

In November 2001 the EC granted the IST Award to the pre/post processor system GiD developed at CIMNE.

Awards and honours to CIMNE Scientists in 2015

SANTIAGO BADIA

2015 MEDAL TO YOUNG RESEARCHERS

Dr. Badia was rewarded by the Real Academia de Ingeniería Española for the development of medical devices, especially for his research on new solutions for engineering tissues based on the fast production of fractals surfaces.

SCIENTIFIC SPEAKER AT THE ANNUAL MEETING OF THE NEW CHAMPIONS 2015 BY THE WORLD ECONOMIC FORUM



Dr. Badia presented a talk entitled "Supercomputing for nuclear fusion" within the framework of the "New energy sources with the European Research Council".

PROOF OF CONCEPT (FEXFEM). On a free open source extreme scale finite element software.
Institution: European Research Council.

EUGENIO OÑATE



PROOF OF CONCEPT (FLOODSAFE). Assessment and initial steps for the exploitation of a simulation software for the study and mitigation of the effect of floods on constructions and landscape.
Institution: European Research Council.

ALESSANDRO FRANCI

The PhD Thesis of Dr. Alessandro Franci "Unified Lagrangian Formulation for Fluid and Solid Mechanics, Fluid Structure Interaction and Coupled Thermal Problems using the PFEM" has received two important recognitions:



AWARD FOR THE BEST PHD THESIS OF THE YEAR 2015 (EX AEQUO)

Institution: Sociedad Española de Métodos Numéricos en Ingeniería (SEMNI).

PREMI PIONER 2015. AWARD FOR THE BEST PHD THESES OF THE CERCA NETWORK

Institution: Centres de Recerca de Catalunya (CERCA).

ANTONIO GENS



NARCÍS MONTURIOL MEDAL FOR SCIENTIFIC AND TECHNOLOGICAL EXCELLENCE

Institution: Generalitat de Catalunya.

SERGIO IDELSOHN

PROOF OF CONCEPT (FORECAST). Assessment and initial steps for the exploitation of a fast simulation software for casting manufacturing operations.
Institution: European Research Council.

“MAGAZZINI DI STOCCAGGIO E ROBOT, IL PORTO DEL FUTURO POTREBBE APPARIRE COSÌ”
SOURCE: CITTÀ DELLA SPEZIA

The Italian press dedicated an article to the European project “Rethink container management systems” where CIMNE participates actively as a partner.

APRIL 2015

MAY 2015

JUNE 2015

JULY 2015

MARCH 2015

“SINERGIAS TECNOLÓGICAS ENTRE EL BARCELONA CLÚSTER NÁUTICO Y LA UNIVERSITAT POLITÈCNICA”
SOURCE: NAUCHER GLOBAL

The associate research professor at CIMNE Julio García participated as speaker at the meeting ‘Barcelona Clúster Nàutic’.

“DOS UNIVERSIDADES ARGENTINAS FIRMAN ACUERDOS CON INSTITUCIONES DE BARCELONA”
SOURCE: CLARIN.COM

The Argentine daily Clarín reported the agreement between ITBA and CIMNE to create the space of collaboration ‘Aula ITBA - CIMNE’.

“CREAN EL PRIMER MARCO DE FOTOS INTELIGENTE”
SOURCE: WEBADICTOS.COM

“INVESTIGADORES ESPAÑOLES CREAN EL PRIMER MARCO DE FOTOS INTELIGENTE”
SOURCE: NCIYT

Digital and specialized media highlighted the creation of OKO, the first intelligent digital frame developed by CIMNE.

“UNA NUEVA APLICACIÓN COMPARA EL CONSUMO ELÉCTRICO DE LOS USUARIOS CON EL DE SUS VECINOS”
SOURCE: DIARIO ABC

The Spanish daily ABC dedicated a complete article to the results of the research carried out by Bee Group, the unit of energy efficiency of CIMNE.

“OKO ÉS UN PROJECTE NASCUT A CASA NOSTRA QUE HA ENCENAT UNA CAMPANYA A KICKSTARTER”
SOURCE: RTVE

The presentation and crowdfunding campaign carried out by OKO was reported on Spanish television.

SEPTEMBER 2015

“UN MARC DE FOTOS INTEL·LIGENT”
SOURCE: TV3

OKO became one of the most mediatic products created as a result of the technology transfer promoted by CIMNE.

“BIOGÁS A PARTIR DE BASURA CON LA MÍNIMA TECNOLOGÍA”
SOURCE: ENERGIAS-RENOVABLES.COM

Development of a prototype digester to treat organic waste and generate biogas and biol in Bolivia by CIMNE.

“SALUD DESDE EL TELÉFONO MÓVIL”
SOURCE: LA VANGUARDIA

The creation of an APP as a therapy for eating disorders arouses great interest in the press.

FEBRUARY 2015

LA UE OTORGA BECAS DE 150.000 EUROS A SEIS INVESTIGADORES DE CENTROS CATALANES”
SOURCE: EL PERIÓDICO

The researchers of CIMNE (Eugenio Oñate, Sergio Idelsohn and Santiago Badia) awarded a Proof of Concept grant by the European Research Council.



NOVEMBER 2015

“EL TERAPEUTA EN EL MÓVIL PARA TRASTORNOS ALIMENTICIOS”
SOURCE: EL MUNDO

TCAApp is an application to improve links between patients and therapists in eating disorders therapies developed by Healthapp. The company, created in 2013, is 15% owned by CIMNE Tecnología.

“EL PROYECTO NEREIDAS HA APORTADO CONSIDERABLES REDUCCIONES NATURALES DE LA CONTAMINACIÓN MEDIOAMBIENTAL”
SOURCE: MELILLA HOY

“ALGAS AUTÓCTONAS DE MELILLA AYUDAN A REDUCIR LOS NIVELES DE CONTAMINACIÓN”
SOURCE: EL FARO MELILLA

The environmental european project Nereidas where CIMNE participates occupied a highlighted space in the local press of Melilla.

DECEMBER 2015

“EL INSTITUTO DE TRASTORNOS ALIMENTARIOS INCORPORA LA PRIMERA ‘APP’ EN EUROPA PARA PACIENTES CON TCA”
SOURCE: LA VANGUARDIA

The *Instituto de Trastornos Alimentarios* (ITA –Eating Disorders Institute–) incorporated TCAApp to improve the treatment through using technology.

“CÓMO CONVERTIR UN TSUNAMI EN NÚMEROS PARA PREVENIR SUS EFECTOS”
SOURCE: EL PERIÓDICO

The research carried out by CIMNE on the prevention of natural disasters is highlighted on an special article published by the Spanish daily.



CIMNE’s research activities have been disseminated by key actors in the national and international media. It is important to highlight the media impact of CIMNE’s environmental projects, especially those devoted to prevent natural disasters. Projects resulting from technology transfer promoted by CIMNE based on big data and mobile applications, have also been relevant in the media.

@2015 IN TWEETS



CIMNE carries out an intensive activity through social media, with special attention to Twitter, where the center has more than 500 followers. Below we highlight some of the 2015 tweets to explain CIMNE’s activities through the networks.

First day of the 1st Pan-American Congress on computational mechanics in Buenos Aires
<http://congress.cimne.com/panacm2015/frontal/> ... @cimne



Numexas (FP7 led by @cimne) in #prace2015 DrRossi talks about “Emdedded methods for industrial CFD applications”



A punt d’encetar la 2a conferència @iCERCA! @cimne



Three Polish research institutions visited @cimne today to share experiences and increase cooperation @CERCA



El @DirectorCIMNE entrevistat a Terricoles, BTV. Podeu veure l’entrevista sencera a <http://www.btv.cat/> ... @cimne @CIMNEMC



L’equip de @cimne molt actiu a la Jornada #ConnectEu @accio_cat



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A Consortium of:



**Generalitat
de Catalunya**



UNIVERSITAT POLITÈCNICA
DE CATALUNYA
BARCELONATECH



In cooperation with: