CIMNE

International Center
for Numerical Methods
in Engineering

2014

Centres de recerca
de Catalunya

ACTIVITY
REPORT

2014

CONTENTS

PRESENTATION

The International Center for Numerical Methods in Engineering (CIMNE) is a research organization created in 1987 at the heart of the prestigious Technical University of Catalonia (UPC) as a partnership between the Government of Catalonia and UPC. The aim of CIMNE is the development of numerical methods and computational techniques for advancing knowledge and technology in engineering and applied sciences.

CIMNE's headquarters are located at the Campus Nord of the Technical University of Catalonia (UPC) in Barcelona. CIMNE has also premises at different buildings in several campus of UPC. CIMNE has also offices in Spain in Madrid, Terrassa, Castelldefels and Ibiza. In 2005, CIMNE started its international expansion and since then has created the following international branches: CIMNE Latinamerica (Non profit Foundation in Santa Fe, Argentina); CIMNE USA (Non profit Corporation in Washington DC, USA); CIMNE Singapore (Non profit Corporation in Singapore) and CIMNE Beijing (China).

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 has also established a network of 27 Classrooms and Joint Labs in partnership with Universities in Spain and 10 Latin American countries.

The research and technology development (RTD) activities of CIMNE cover a wide spectrum of topics ranging from classical engineering fields such as civil, mechanic, environmental, naval, marine and offshore, food, telecommunication and bio-medical engineering, computer sciences and applied sciences such as material sciences, bio-medicine, computational physics, nature, social and economic sciences and multimedia sciences, among others.

Since 1987, CIMNE has taken part in over 2000 RTD projects in cooperation with some 500 enterprises, universities and research centers worldwide.

The RTD activities of CIMNE are complemented by education and training activities via Master Courses, short courses and seminars and CIMNE Coffee Talks. CIMNE scientists supervise doctorate students in cooperation with several universities in Spain and worldwide.

CIMNE publishes books, monographs, research reports and technical reports. CIMNE also organizes international conferences and workshops in the different areas of interest for CIMNE. It has organized 139 conferences since 1987.

CIMNE has a vocation for transferring the scientific and technical outputs from RTD projects to the industrial sector. This is effectively carried out in cooperation with companies from different sectors that exploit and market CIMNE technology. CIMNE has actively promoted the creation of 16 spin-off companies, some of them totally or partially owned by CIMNE, that play an important role in the industrialization and exploitation of CIMNE technology.

CIMNE maintains close cooperation links with many universities and RTD centers in the field of computational engineering and sciences worldwide. CIMNE has access to the computing facilities of several supercomputer centers in Spain and Europe.

CIMNE has been identified as one of the International Centers of Excellence on Simulation-Based Engineering and Sciences in a recent National Science Foundation (NSF) report [Glotzer et al., WTEC Panel Report on International Assessment of Research and Development in Simulation Based Engineering and Science. World Technology Evaluation Center (wtec.org), 2009].

The following sections briefly explain the activities of CIMNE on education, dissemination, research, development and technology transfer in 2014. Also the RTD lines of the CIMNE departments and the spin-off companies and products developed at CIMNE are described.

GOVERNING BODIES

Governing Council

PRESIDENT

Dr. Andreu Mas-Colell
Conseller d'Economia i Coneixement, GC [1]

EXECUTIVE VICE-PRESIDENT

Dr. Eugenio Oñate
Catedràtic, UPC [2]

MEMBERS

Dr. Enric Fossas
Rector, UPC

Sr. Pere Palacín
Direcció General d'Energia, Mines i Seguretat Industrial, GC

Dr. Lluís Ramallo
President Comissió Espanyola de la UNESCO

Dr. Benjamín Suárez
Catedràtic, UPC

Sr. Santi Vila
Conseller de Territori i Sostenibilitat, GC

[1] *GC: Generalitat de Catalunya*
[2] *UPC: Universitat Politècnica de Catalunya*
[3] *CERCA: Centres de Recerca de Catalunya*

Executive Council

PRESIDENT

Dr. Eugenio Oñate
UPC

MEMBERS

Sr. Xavier Baulies
Departament de Territori i Sostenibilitat (TES), GC

Dr. Esteve Codina
UPC

Sra. Francisca García-Sicilia
UNESCO

Dr. Antonio Gens
UPC

Dr. Antonio Huerta
UPC

Dr. Juan Miquel
UPC

Dr. Sebastià Olivella
UPC

Dr. Fernando Orejas
UPC

Dr. Lluís Rovira
Institució CERCA [3], GC

Sra. Ana Simón
Centre d'Innovació Empresarial (ACC10), GC

Dr. Antoni Susin
UPC

Dr. Francesc Vallverdú
UPC

Scientific Advisory Council

CHAIRMAN

Dr. R. Owen
Swansea University, Swansea, UK

MEMBERS

Dr. E. Alonso
UPC

Dr. M. Casteleiro
Univ. of La Coruña

Dr. A. Combescure
INSA

Dr. M. Doblaré
Abengoa Research

Dr. S. Idelsohn
ICREA Research Professor at CIMNE

Dr. M. Kleiber
Polish Academy of Sciences

Dr. B. Kröplin
Univ. of Stuttgart

Dr. R. Löhner
George Mason Univ.

Dr. A. Marí
UPC

Dr. X. Oliver
UPC

Dr. M. Papadrakakis
National Technical University of Athens

Dr. B. Schrefler
Univ. of Padova

Dr. H. Sierra
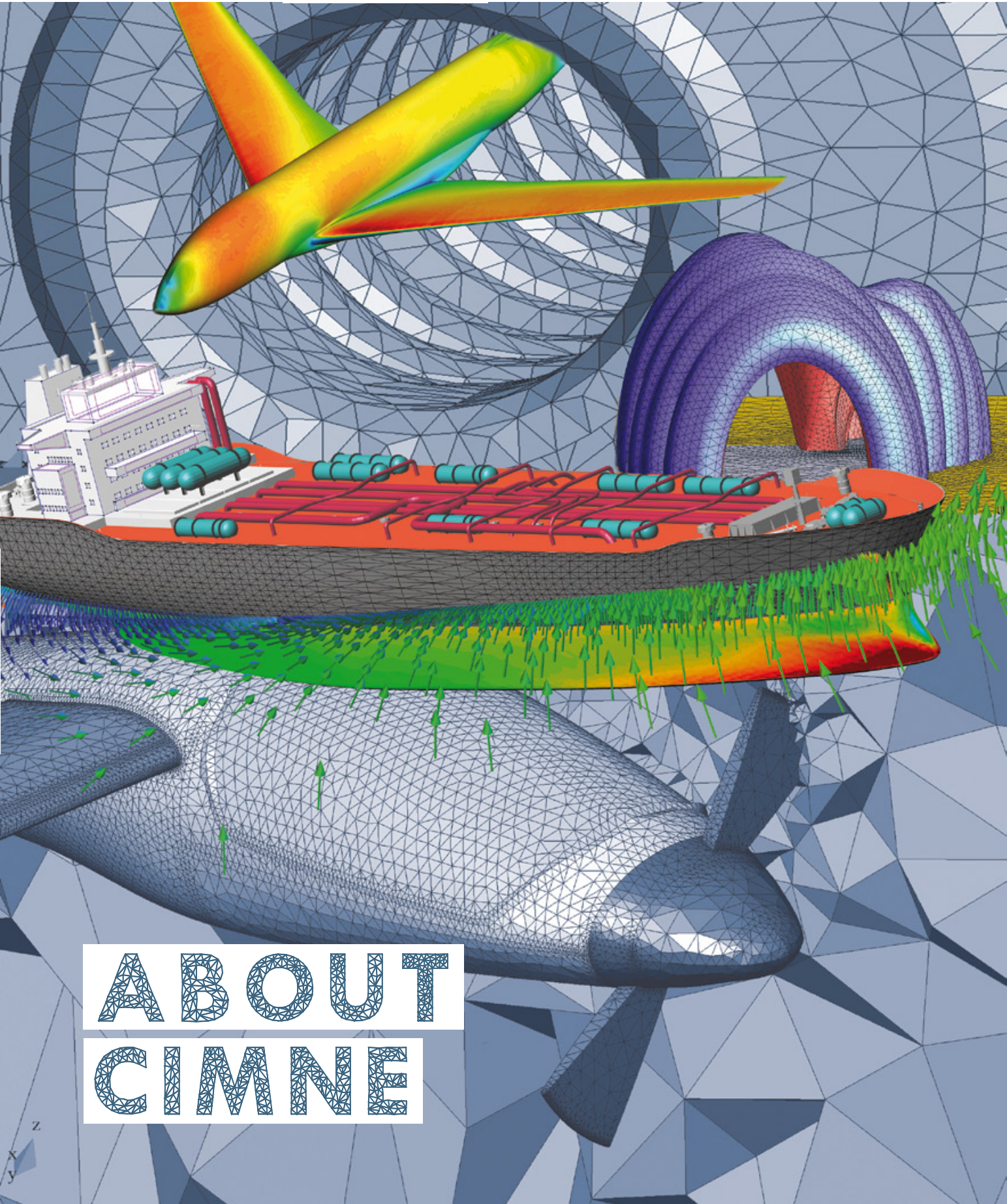Ph. D. in Naval Architecture

Dr. P. Wriggers
Leibniz Univ. Hannover

Scientific Advisory Council Meeting (February 6th, 2013)

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.

ABOUT
CIMNE

A vocation for research and technology transfer

The Cycle of Ideas

The mission and activity of CIMNE can be clarified if we examine what we call the Cycle of Ideas[1]. Fig. 1 shows the scheme of the transit of an idea, from the instant it originates until it is transformed in an industrial and commercial success. Similarly to what it happens in biological and environmental cycles (the water cycle for instance), the cadencies and tempos are very important in the Cycle of Ideas.
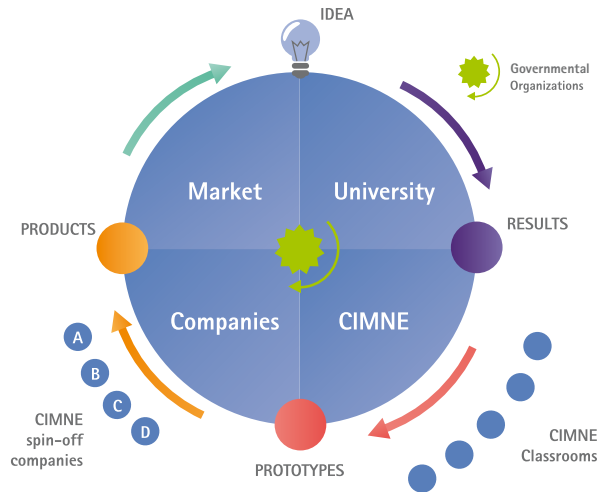

Fig 1. The Cycle of Ideas at CIMNE

Ideas (and here we refer to scientific advances) usually originate in university environments, where many professionals have the mission of studying, investigating and eventually discovering new areas of knowledge. The idea (the new discovery) would be equivalent to a seed, that even being very important it is far from becoming a fruit.

The idea matures in its "tour" by the first quadrant of the Cycle (the University) until it produces tangible results (thesis, papers, computer programs, physical devices, etc.). These "results", if they are not filed and protected, can be easily lost. This leads to undesirable repetitions or duplications.

What to do then with the results of an idea? The best is that they evolve until they reach the level of a prototype; i.e. something (a software code, a system, a device, etc.) that works in a contrastable manner. 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

1   Oñate, E. The Cycle of Ideas in Research, Development and Technology Transfer, PI 358, CIMNE, 2011

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 from the marketing activities in the development of new ideas.

Holistic view of CIMNE RTD activities

The overall research and technological development (RTD) activities of CIMNE has evolved over the years towards providing comprehensive solutions for solving problems that affect human beings. This can be achieved by integrating existing knowledge in a particular field with quantitative information emanating for prediction methods (i.e. computational-based techniques) and experimental measurements. The link between these four concepts: the problem to be solved, computational methods, experimental methods and existing knowledge is conceptually represented by the tetrahedron shown in Fig. 2 below.

Each of the nodes in the tetrahedron is connected to the other three by lines that represent information transfer pipelines (possibly internet). The intensity of the flow along the lines that interconnect two nodes will vary depending on the requirements for solving the problem.
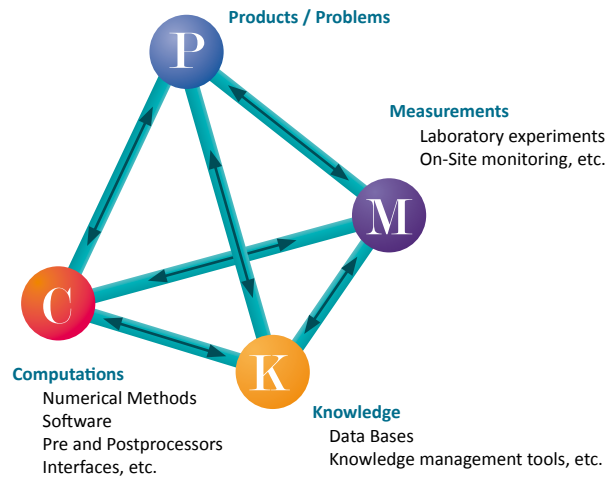

Fig 2. The holistic approach for solving problems at CIMNE

CIMNE in numbers

	2014			**2014**
▶ **Postgraduate courses**	6	▶ **Staff**		**226**
▶ **Seminars**	15	**Management Staff**		2
▶ **Congresses**	16	**Administration Staff**		33
▶ **Publications**	96	**Research Staff**		98
Books	5	Full Research Professors		2
Monographs	11	Associate Research Professors		4
Research reports	6	Assistant Research Professors		11
Technical reports	2	Post Docs		10
Papers in Journals	72	Staff Scientists		6
▶ **Patents** (1)	1 (5)	Affiliated Scientists		25
▶ **Contracts with industry**	63	Visiting Scientists		3
▶ **Spin-Off Companies** (2)	— (16)	Research Engineers		37
▶ **Competitive Projects** (3)	30 (73)	**Research Students**		**93**
National Projects	13 (28)	PhD Students		83
International Projects	17 (45)	Master Students		10

(1)   In brackets, the total numbers of patents

(2)   CIMNE has created a total of 16 Spin-off Companies since 2002.

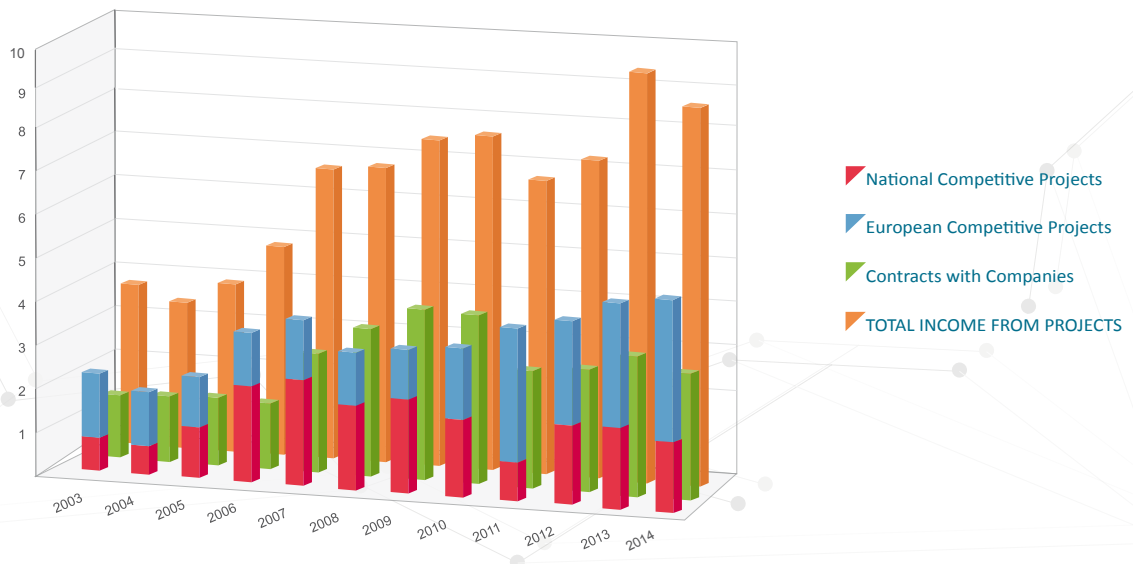(3)   In brackets, the total numbers of on-going RTD projects

Income from projects (2003-2014)

M €

- National Competitive Projects
- European Competitive Projects
- Contracts with Companies
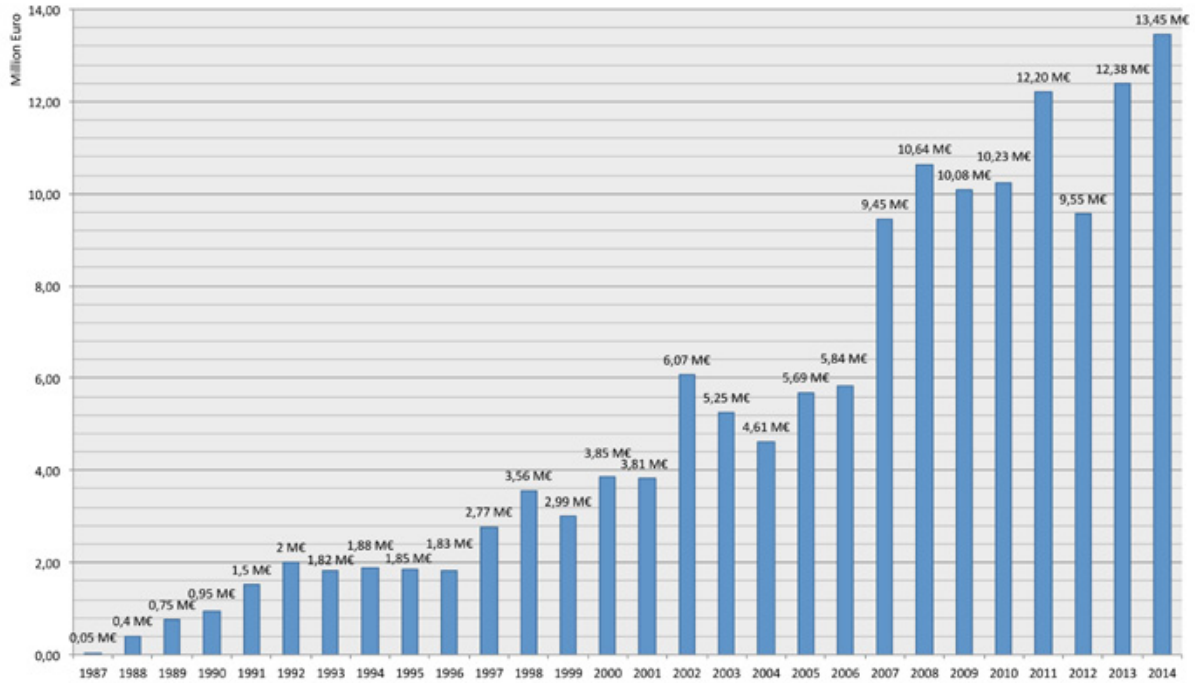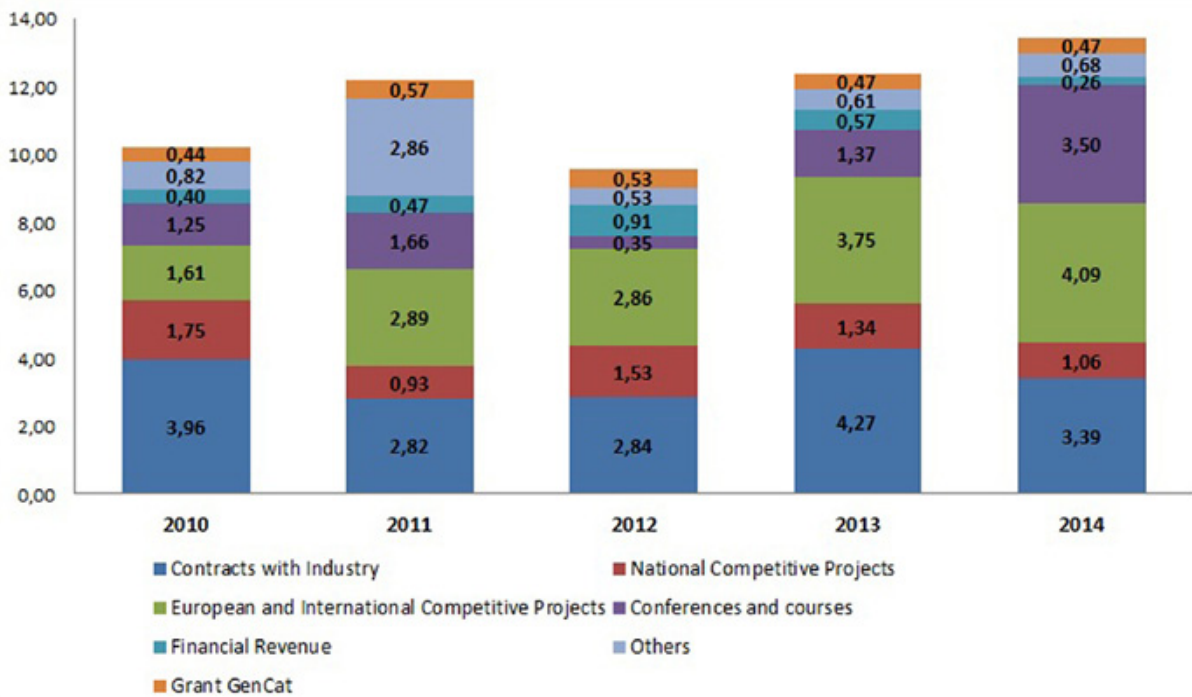- TOTAL INCOME FROM PROJECTS

Evolution of Annual Income (1987-2014)   in M€

Split of Annual Income (2010-2014)   in M€

Organization Chart

GOVERNING COUNCIL
President: A. Mas-Colell

EXECUTIVE COUNCIL
President: E. Oñate

ADVISORY SCIENTIFIC COUNCIL

DIRECTOR
E. Oñate

GENERAL MANAGER
A. Font

RESEARCH AND TECHNOLOGY DEVELOPMENT (RTD)
RTD Areas and Groups

CIVIL ENGINEERING AREA

- **Geomechanics Group**
  Leaders - E. Alonso and A.Gens
- **Risk Assessment Group**
  Leader - A. Barbat
- **Structural and Continuum Mechanics Group**
  Leader - E.Oñate

NUMERICAL METHODS AND SCIENTIFIC COMPUTING AREA

- **Mathematical & Computational Modeling Group**
  Leader - A.Huerta
- **Large-scale Scientific Computing Group**
  Leader - S. Badia

INFORMATION TECHNOLOGIES AREA

- **Information & Communication Technology Group**
  Leader - J.Jiménez
- **Pre & Post-Processing Group**
  Leader - A.Coll

BIO-MEDICAL ENGINEERING AREA

- **Computational Bioengineering Group**
  Leader - E.Soudah
- **Computer Modelling and Simulation in Biomechanics Group**
  Leader - M.Cerrolaza

ENERGY AND ENVIRONMENT AREA

- **Building, Energy and Environment Group**
  Leader - J.Cipriano
- **Nature Group**
  Leader - P.Arnau

TRANSPORT AREA

- **Aerospace Group**
  Leader - J.Pons
- **Marine and Naval Group**
  Leader - J.García

MANUFACTURING AREA

- **Industrial Process Group**
  Leader - O.Fruitós

GENERAL SERVICES

- **ADMINISTRATION & FINANCES**
  Mª.Linares
- **PROJECT MANAGEMENT**
  S.Pérez
- **CONFERENCE BUREAU**
  C.Forace
- **POST GRADUATE TRAINING**
  L. Zielonka
- **SYSTEMS**
  M.Alonso
- **PUBLICATIONS & COMMUNICATION**
  Mª.J. Samper
- **LEGAL**
  R.Casanova
- **HUMAN RESOURCES**
  M. Linares

CIMNE Staff

Research And Innovation

RESEARCH STAFF

FULL RESEARCH PROFESSORS

Miguel Cerrolaza
Sergio Idelsohn

ASSOCIATE RESEARCH PROFESSORS

Joan Baiges
Liliana Carreño
Melba Navarro
Francisco Zárate

ASSISTANT RESEARCH PROFESSORS

Pedro Arnau
Josep Mª Carbonell
Pooyan Dadvand
Antonia Larese
Jaime Marti
Julio Marti
Prashanth Nadukandi
Hieu Trung Nguyen
Núria Pinyol
Pavel Ryzhakov
Borja Serván

POST DOCS

Jordi Cipriano
Abel Coll
Narges Dialami
José Manuel González
Kazem Kamran
Oriol Lloberas
Enrique Ortega
Jordi Pons
Anna Ramon
Emmanuel Roubin

STAFF SCIENTISTS

Stoyan Danov
Alessandra Di Mariano
Javier Mora
Fernando Rastellini
Omar Salomon
Cecilia Soriano

AFFILIATED SCIENTISTS

Carlos Agelet de Saracibar
Eduardo Alonso
Marino Arroyo
Santiago Badia
Àlex Barbat
Gabriel Bugeda
Juan Carlos
Miguel Cervera
Michele Chiumenti
Ramon Codina
Daniel Di Capua
Pedro Díez
Julio García
Antonio Gens
Antonio Huerta
Xavier Martínez
Juan Miquel
Xavier Oliver
Sergio Oller
Eugenio Oñate
Javier Príncipe
Antonio Rodriguez-Ferran
Riccardo Rossi
Josep Sarrate
Benjamín Suárez

VISITING SCIENTISTS

Alfredo Edmundo Huespe
Rafael Morán
Jacques Périaux

RESEARCH ENGINEERS

Carla Bellver
Jesus Carbajosa
Josep Cervelló
Alexis Cid
Marti Coma
Enrique Escolano
Alberto Ferriz
Pablo Martin Franzolini
Oscar Alejandro Fruitós
Gabriela Georgieva Ganeva
Javier Gárate
Daniel García
Jordi Jiménez
Jose Santos López
Andreu Marí
Adrià Melendo
Jaume Miró
Fernando Mónaco
Anna Monros
Gerard Jordi Mor
José Luis Oñate
Gilbert Peffer
Jorge Suit Pérez
Daniel Pérez
Angel Diego
Fabio Renda
Oriol Rius
Xavier Roca
Carlos Alejandro Roig
Javier San Mauro
Meritxell Sardà
Javier Soraluce
Andreu Tarracó
Alberto Tena
Ignacio Valero
Sergio Valero
Claudio Miguel Zinggerling
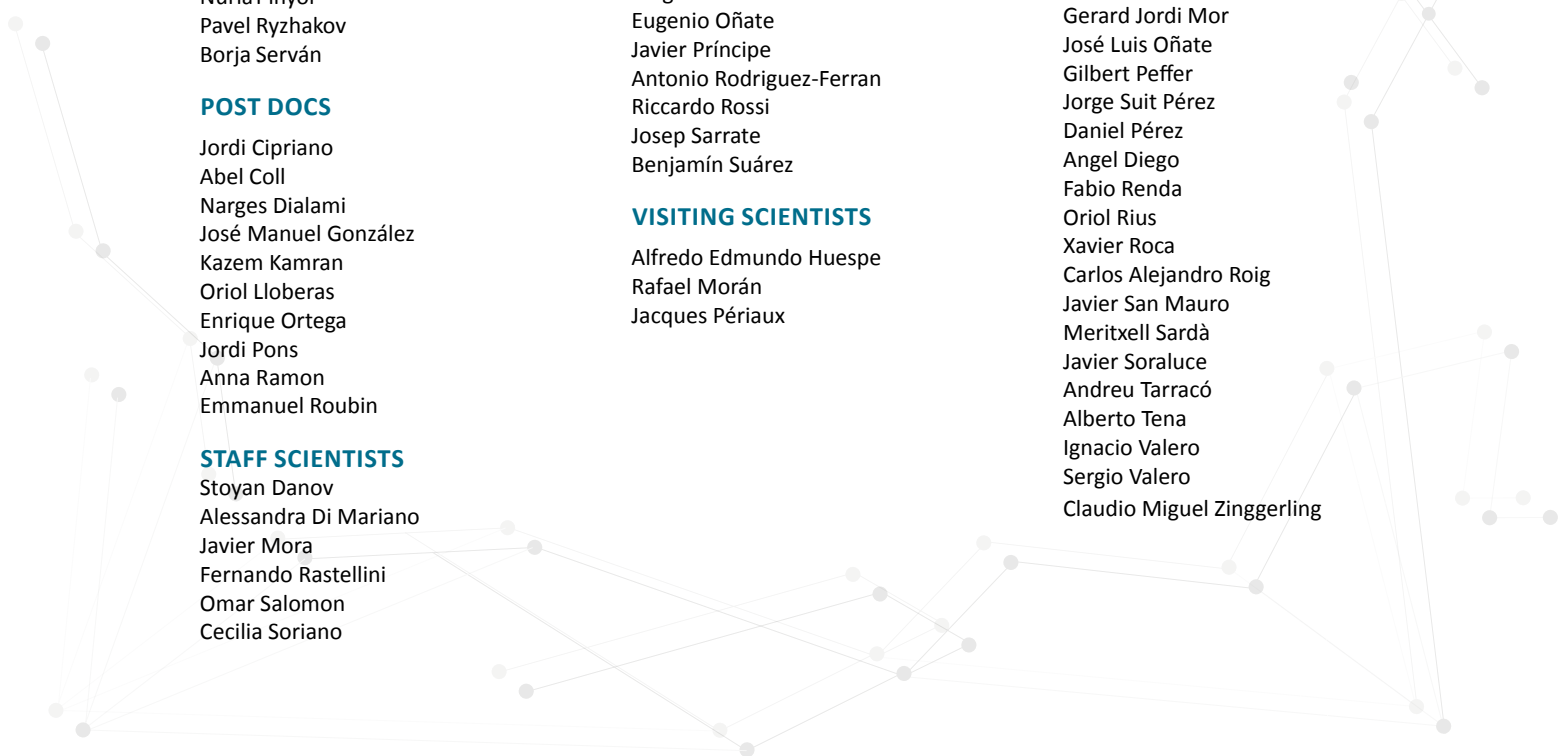
RESEARCH STUDENTS

PHD STUDENTS

Bashar Alfarah
Clara Alvarado
Mauricio Alvarado
Ferran Arrufat
Ramón Barboza
Lucía Gratiela Barbu
Camilo Andrés Bayona
Pablo Agustín Becker
Jordi Belles
Lorenzo Benedetti
Alejandro Blanco
Jesús Bonilla
Bernat Bosch
Mailhyn E. Cafiero
Manuel Alejandro Caicedo
Francesc Campà
Lucila Candela
Jordi Carbonell
Núria Cardellach
Guillermo Casas
Roberto Castilla
Ernesto Castillo
Mariano Andrés Cebrian
Miguel Angel Celigueta
Xavier Cipriano
Jonathan Colom
Josep Oriol Colomes
Ester Comellas
Xavier Corbella
Jordi Cotela
Rotman Alejandro Criollo
Cuauhtemoc Escudero
Héctor Gabriel Espinoza
Leandro Fernández
Àlex Ferrer
Alessandro Franci
Aitor Fuentes
María Olimpia García
Rodrigo Andrés Gómez
Laura González
Joaquin Alberto Henrández
Alba Hierro

Christian Amadeo Hoffman
Ilaria Iaconeta
Joaquín Irazábal
Alexandre Jarauta
Juan Salvador Latorre
Bàrbara Llacay
Juan Pablo Londoño
Ricardo Madrid
Alberto Francisco Martínez
Mabel Cristina Marulanda
Olga Christina Mavrouli
Vicente César de Medina
Nadia Mokni
Alejandro Núñez
Marc Olm
Fermin Enrique Otero
Jairo Andrés Paredes
Miguel Adolfo Pasenau
Marta Pérez
Arnau Pont
Miquel Portabella
Ignasi de Pouplana
Enrique Edgar Romero
Fernando Salazar
Sergio Samat
Alexandra Sánchez Jatnna
Miquel Santasusana
Núria Sau
Victor Serri
Eduardo Soudah
Mauricio Alberto Tapias
Daniel Tarragó
Eike Marie Thaysen
Erdem Toprak
Abel Tortosa
Javiera Valdivia
César Augusto Velásquez
Jordi Ventosa
María Teresa Yubero
Stefano Zaghi
María Dolores Zavala

MASTER STUDENTS

Aman Agarwal
Shadi Alameddin
Oleg Balabanov
Mostafa Barzegar
Macia Comella
Diego Corradini
Ataollah Ghavamian
Ceren Gurkan
Muhammad Saqib Hameed
Gabriela Lima
Jan Rojek
Jacob Esau Salazar
Akmaljon Shokirov
Rabindra Subedi

Management

DIRECTOR

Eugenio Oñate

GENERAL MANAGER

Anna Font

Administration Staff

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

DIRECTOR SECRETARY

Mercè Alberich

RECEPTION

Núria Holgado

ADMINISTRATION AND FINANCES

Mª Camen Linares (Head of Unit)
Mònica Camanforte
Valentín Catalan
Cristina Luque

PROJECT MANAGEMENT

Sandra Pérez (Head of Unit)
Daniel Cuadrat
Francisco de la Rosa
Elena Herrero
Erlantz Marín
Elena Martín
Jaume Urós

CONGRESS BUREAU

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

POST-GRADUATE TRAINING

Lelia Zielonka (Head of Unit)
Cristina Pérez

SYSTEMS

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

PUBLICATIONS AND COMMUNICATION

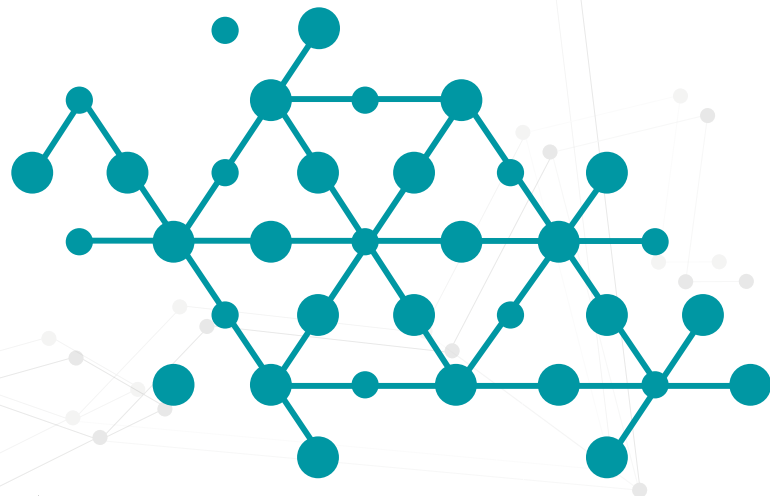Mª Jesus Samper (Head of Unit)
Sonia López
Alejandro Sans

LEGAL

Roger Casanova

HUMAN RESOURCES

Merce Linares (Head of Unit)
Irene Latorre

INTERNATIONAL BRANCHES

Sònia Sagristà (China)
Javier Piazzese (Argentina)
Manuel López (Singapore)
Francisca García-Sicilia (United States)

Visiting scientists

CIMNE promotes the visits of academics and researchers from around the world.

VISITING SCIENTISTS IN 2014:

Liesner Acevedo Martínez
University of Information Science, CUBA

Gilberto Arias Naranjo
University of Information Science, CUBA

Reza Attarnejad
University of Tehran, IRAN

Salvador Botello Rionda
Mathematics Research Center (CIMAT), MEXICO

Francisco Corona
Mathematics Research Center (CIMAT), MEXICO

Elías Cueto
University of Zaragoza, SPAIN

Victor Fachinotti
CIMEC, ARGENTINA

Carlos A Felippa
University of Colorado at Boulder, USA

Graciela González Farías
Mathematics Research Center (CIMAT), MEXICO

David González
University of Zaragoza, SPAIN

Enrique González Martin
Faculty of Construction (CIDEM), CUBA

Juan Carlos Heinrich
University of New Mexico, USA

Arturo Herández Aguirre
Mathematics Research Center (CIMAT), MEXICO C.P. 36240

Sergio Idelsohn
Universidad Nacional del Litoral (INTEC, ARGENTINA

Joo Woo Kim
Semyung University (UCA), KOREA

Seong Eun Kim
Technology Research Center,KOREA

Bernd Kröplin
Transatmospheric Operations (TAO) Gmb

Kangmin Lee
Chungnam National University, KOREA

Myungjae Lee
Chungnam National University, KOREA

Zhanli Liu
Tsinghua University, P. R. CHINA

Rainald Löhner
The George Mason University, USA

Susana Montalvo Melendez
Mathematics Research Center (CIMAT), MEXICO C.P. 36240

Jacques Periaux
Finland University Jyaväskylä, FRANCE

Javier Piazzese
CIMNE-Latin América Foundation, ARGENTINA

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Bau Geo Umwelt Technische Universität München, GERMANY

Carlos A Recarey Morfa
Central University "Marta Abreu" of Las Villas (UCLV), CUBA

Mariano Rivera Meraz
Mathematics Research Center, MEXICO C.P. 36240

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Institute of Fundamental Technological Research
Polish Academy of Sciences", POLAND

Roberto Luis Roselló Valera
Central University "Marta Abreu" of Las Villas (UCLV), CUBA

Mario Storti
National University of Coast (INTEC), ARGENTINA

Roland Wüchner
Technische Universität München Lehrstuhl für Statik, GERMANY

Jae Guen Yang
"Inha University Division of Architecture", KOREA

Zhuo Zhuang
Tsinghua University, P. R. CHINA

Map legend:
- CIMNE Joint Labs
- CIMNE Offices

Locations marked on map:
- Washington
- México
- Cuba
- El Salvador
- Venezuela
- Colombia
- Perú
- Brasil
- Argentina
- Santa Fe (Argentina)
- Chile
- Spain
- Beijing (China)
- Singapore

WHERE WE ARE

CIMNE premises in Spain

Background and location

CIMNE's main headquarters are located at the heart of the UPC in Barcelona. These premises are adjacent to the Civil Engineering School of UPC and occupy some 1000 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 hosts some 90 CIMNE researchers and the main administration offices.

CIMNE also owns offices at several sites of UPC, such as in the Castelldefels campus, and the School of Naval Engineering. It has also premises in Spain in Madrid,

Terrasa and Ibiza. In September 2014 CIMNE started the construction of a new building of some 2000 m2 at Campus Nord of UPC to be finished in December 2015.

BARCELONA — *Port of Barcelona*

MADRID — *Gardens of El Escorial, Madrid*

IBIZA — *Creek in Ibiza*

CIMNE - BARCELONA

The central office of CIMNE is in Barcelona, it was created in 1987. CIMNE - BARCELONA covers an area of 800m^2 in the North Campus of the UPC.

CIMNE
Edifici C-1, Campus Nord UPC - Gran Capità, s/n
08034 Barcelona, Spain
Tel. 34 - 93 205 70 16 - Fax 34 - 93 401 65 17
cimne@cimne.upc.edu - www.cimne.com

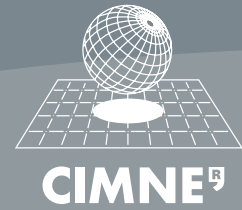∧ Main entrance of CIMNE - Barcelona

∧ View of CIMNE - Barcelona building

∧ Reception

CIMNE - TERRASSA

It was created in 2001. It covers an area of 150m^2 and houses the department of Building Energy and Environment Group (BeeGroup).

CIMNE- TERRASA
Edifici GAIA (TR14)
C/ Rambla Sant Nebridi 22
08222 Terrassa (Barcelona), Spain
Tel. 34 - 93 789 91 69
Fax. 34 - 93 788 31 10

Building housing Bee-Group in Terrassa ∧

Working area ∧

Terrassa-Gaia Building ∧

CIMNE - CASTELLDEFELS

CIMNE-CASTELLDEFELS was inaugurated on October 15th 2008. The facilities are located at the UPC Campus in Castelldefels. CIMNE premises occupy some 1500m² in a new building constructed in collaboration with the at UPC.

CIMNE CASTELLDEFELS
Campus del Baix Llobregat
Edifici C3, despatx 303, 3ºpl.
Esteve Terradas n. 5
08860 Castelldefels, Barcelona, Spain
Tel. 34 - 93 413 41 86

Λ   Classroom
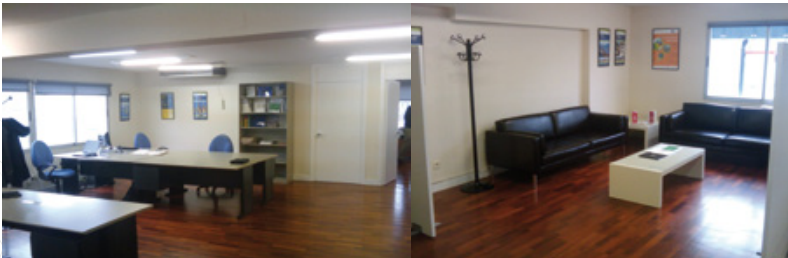

Λ   Meeting room

Λ   Lounge

Λ   Main entrance of CIMNE Castelldefels

CIMNE - MADRID

On May 2008 CIMNE inaugurated a new office in Madrid situated in the center of the city. It has 150m².

CIMNE - MADRID
Paseo General Martínez Campos nº41
28010 Madrid, Spain
Tel. 34 - 91 319 13 59

Working area ∧

Reception - Entrance hall ∧

Building ∧

CIMNE - IBIZA

In 2009 CIMNE inaugurated the CIMNE - IBIZA branch. It has 80m² and is located in the city of Ibiza.

CIMNE-IBIZA
Bisbe Azara, nº4 3º-2ª
07800 Eivissa, Spain
Tel. 34 - 971 93 11 94

Working area ∧

Ibiza beaches ∧

CIMNE - IBIZA Main entrance ∧

International Branches

CIMNE has expanded its presence in different geographical areas in the world: South America (Santa Fe, Argentina), North America (Washington DC, USA) and Asia (Singapore and Beijing in China) The objective of CIMNE is to take part in international RTD projects in cooperation with research centers, universities and companies of different countries.

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

⋀   Washington, USA

⋀   China

⋀   Santa Fe, Argentina

⋀   Singapore

CIMNE in Latin America

The presence of CIMNE in Latin America was initially implemented via the CIMNE Joint Lab Network. This network has 20 Joint Labs in different Latin American countries (Argentina (5), Mexico (3), Brasil (2), Colombia (2), Cuba (1), Chile (1), El Salvador (1), Guatemala (1), Perú (1) and Venezuela (3).

The formal establishment of CIMNE in Latin America was achieved by the creation of a Foundation to foster the activity of CIMNE in that region. **The CIMNE-Latin America Foundation (FCL)** is located in the city of Santa Fe (Argentina), the place where the first CIMNE Joint Lab in the Latin American region was created in cooperation with the National University of Litoral.

The activity of CIMNE in the Latin American region is coordinated by Mr. Javier Piazzese, civil engineer and CIMNE researcher from January 2002 to March 2007.

Contact: piazzese@cimne.upc.edu

We list below the main projects carried out by FCL in 2014::

RTD PROJECTS

GAR15 - Global Risk Update. UNISDR – The United Nations Office for Disaster Risk Reduction.
01/06/2014 - 31/07/2014

BID Chile: Perfil de riesgos para Chile.
Inter-American Development Bank.
05/02/2014 – 31/12/2015

BID Argentina: Desarrollo del perfil de riesgo de desastres para Argentina. Inter-American Development Bank.
04/07/2014 – 04/07/2015

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

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

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

UNAL-CURSO: Aunar esfuerzos para mejorar la gestión del riesgo en la planificación y la toma de consciencia en el municipio de Manizales fase 1". Universidad Nacional de Colombia.
01/12/2014 - 28/02/2015

www.cimne.com/spacehome/0/106

FCL meeting room

Javier Piazzese Director of FCL

CIMNE in United States

CIMNE has developed a number of RTD projects funded by several US organizations such as the Interamerican Development Bank (BID), the World Bank and the Office for Naval Research, among others.

In 2010 CIMNE created a non-profit corporation named CIMNE-USA with the aim of fostering the scientific and technological activities of CIMNE in that country. This CIMNE branch is located at the city of Washington DC and is jointly directed by Mrs. Francisca García-Sicilia and Dr. Dave Cranmer. Dr. Cranmer is a senior scientist of the National Institute of Standards and Technology (NIST) in the US and advisor of many companies. Mrs. García-Sicilia is a senior UNESCO consultant and also acts as the director of the international liaison activities in CIMNE.

Contact: garcia-sicilia@cimne.upc.edu

In the recent past years, CIMNE-USA has taken part in different RTD projects in the US in cooperation with universities, research centers and enterprises. We highlight the following projects:

SELECTED RTD PROJECTS

Modelling the dynamic response of the structural part of the BHA (bottom hole assembly) without fluid
WEATHERFORD INTERNATIONAL LTD.
01/07/2012 - 01/07/2013

WEATHERFORD INTERNATIONAL LTD.
01/10/2014 - 01/01/2016

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

Development of an advanced Transient 1D Multi-Phase Hydraulics Network Solver for MPD (managed pressure drilling) operations.

Meeting-room in CIMNE-USA

David Cranmer , Conductor of CIMNE-US

CIMNE in Singapore

CIMNE has developed a close relationship with several RTD organizations in Singapore such as the Institute of High Performance Computing (IHPC), belonging to the A*Start National Agency of the Singapore Government. This relationship led to the signing of a cooperation agreement between CIMNE and IHPC aiming to the development of joint RTD projects.

The increasing activity of CIMNE in Singapore motivated CIMNE to create a new organization in Singapore, named CIMNE Singapore, with the objective of fostering RTD activities and projects in the South East Asia region in cooperation with IHPC.

The director of CIMNE-Singapore is Mr. Manuel López, a Naval Architect with wide experience in the management of international projects.

Contact: mlopez@cimne.upc.edu

We list below the main projects carried out by CIMNE in Singapore in the period 2010-2014:

SELECTED RTD PROJECTS

NITTO - An integrated Software System for Modelling and Simulating Blood Flow in the Cardiovascular System to Determine the Mechanical Properties of the Vessel Walls.
NITTO DENKO
01/12/2010 - 31/08/2011

Development of numerical methods for fluid-structure interaction problems CIMNE - IHPC
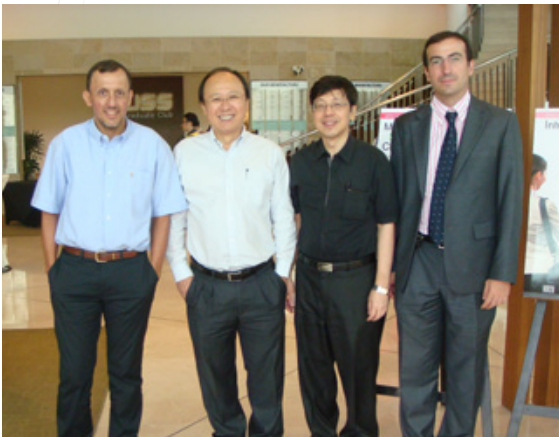*01/2009-12/2012*

SELECTED ACTIVITIES

Organization of the International Workshop on Advances in Computational Methods for Fluid-Structure interaction
27-29 April 2011, Singapore

Support to the activities of the companies OMNI Ltd and Build Air Asia-Pacific Ltd.

Course on the CIMNE codes GID and Kratos. IHPC, 2011.

From left to right: Mr. Manuel López (Director of CIMNE-Singapore), Prof. Choo Yoo Sang (Director from Centre for Offshore Research & Engineering from UNS), Wang Chien Ming (Director Structures & Mechanics from UNS) and Mr. Pere-Andreu Ubach (CIMNE researcher)

Constitution of CIMNE Singapore at IHPC (May 2010)

CIMNE in China

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

Resulting from these several partnerships, CIMNE has been engaged in number of RTD projects. Supported by the 6th and 7th Framework Programme of the EU, CIMNE has carried out the coordination on the European side of a series of projects aimed at promoting joint EU-China research on aeronautics. Financed by Chinese organizations, CIMNE has participated in research projects in areas of risk assessment of natural disasters.

In 2011, CIMNE created the **CIMNE Beijing office** in cooperation with Professor Mingwu Yuan, of Peking University and President of the International Chinese Association for Computing Mechanics. In 2013 the office was officially established.
The officce is directed by Ms. Sònia Sagristà.

Contact: ssagrista@cimne.upc.edu

www.cimne.com/spacehome/2/107

Sònia Sagristà
Director of CIMNE
Beijing

Dr. García at the seminar delivered at the China University of Petroleum in Beijing. October, 29th, 2014

Profs. Eugenio Oñate and Ming Wu Yuan in Beijing (May 2011)

Dr. P. Dadvand of CIMNE (second from the right) at the Co-Design Workshop, with organizers Prof. Mingwu Yuan and Tian Rong (October 31st, 2013)

SELECTED RTD PROJECTS

GRAIN 2: GReener Aeronautics International Networking 2
October 2013 - October 2015

Manipulation of Reynolds Stress for Separation Control and Drag Reduction (MARS)
October 2010 - March 2014

Research of Prediction Theory and Numerical Analysis Methods for Severe Engineering Geological Disaster
January 2010 - December 2014

Tri Continental Alliance in Numerical Methods applied to Natural Disasters (TCAiNMaND)
*January 2014 - December 2017*

CIMNE took part in the International Workshop on Deepwater Engineerig Development. March, 17th, 2014

TCAiNMaND consortium at the mid-term meeting, Barcelona. July 18th, 2014

Dr. Dadvand delivering a Kratos course during the "High-level Forum for the Comprehensive Analysis of Geological Disasters and Potential Applications of Open-Source Codes" in Beijing, October 31st, 2014
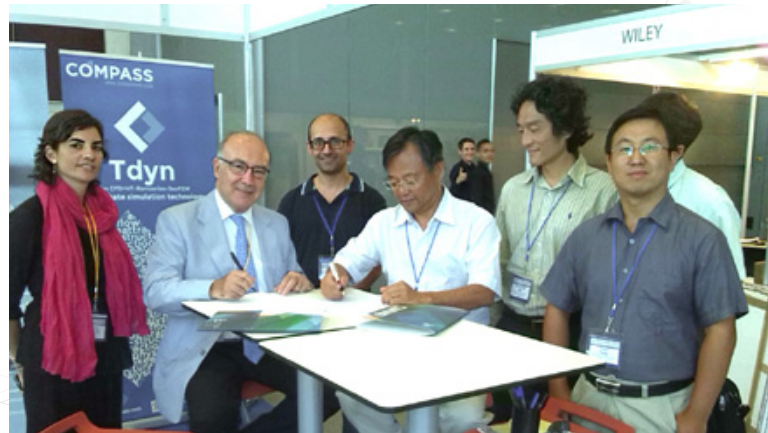
Prof. Oñate and Prof. Li signing the agreement for cooperation between CIMNE and Institute of Mechanics. Chinese Academy of Sciences, Barcelona. July 25th, 2014

SELECTED ACTIVITIES OF CIMNE-BEIJING:

International Workshop on Deepwater Engineering Development "Numerical Advances on Ocean Engineering"
Sònia Sagristà,
March 17th, 2014

Society for Underwater Technology Technical Conference
"An Advanced Time-domain FEM Coupled Seakeeping and Mooring Dynamics Solver"
Sònia Sagristà
October 13th, 2014

Seminar at the North Western Polytechnical University of Xi'an "The International center for numerical methods - CIMNE"
Dr. Michele Chiumenti
June 9th, 2014

Seminar at the North Western Polytechnical University of Xi'an "Numerical simulation of industrial metal forming processes"
Dr. Michele Chiumenti
June 10th, 2014

Seminar at the Chinese University of Petroleum, Beijing
"An advanced time-domain coupled seakeeping and mooring dynamics FEM solver"
Dr. Julio García
October 29th, 2014

High-level Forum for the Comprehensive Analysis of Geological Disasters and Potential Applicadtions of Open-Source Codes Kratos
Course and public seminar: "Open Source Based Software towards Industrial Solutions"
Dr. Pooyan Dadvand
October 31st, 2014

CO-DESIGN Annual Workshop 2014
"Heterogeneous HPC Platforms for Industrial Simulation: A Software Development Point of view"
Dr. Pooyan Dadvand
November 7th, 2014

Beijing, Republic of China

CIMNE Joint Labs

The CIMNE Joint Labs (also called 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 CIMNE Joint Labs promote educational and training activities at graduate and postgraduate levels and development of RTD projects in cooperation with companies.

www.cimne.com/spacehome/2/107

Spain

México
Guatemala
El Salvador
Colombia
Perú

Cuba

Brasil

Argentina

Chile

Circles denote the countries where CIMNE-Joint Labs have been established. ∧

These are the CIMNE Joint Labs created since 2000:

FICH CLASSROOM – CIMNE (ARGENTINA)

Universidad Nacional del Litoral
Director: Sergio Idelsohn
Created on: 28/October/2002
Activity: Applications of numerical methods to problems related to water resources, mechanical engineering and computer engineering.

IUA CLASSROOM – CIMNE (ARGENTINA)

Instituto Universitario Aeronáutico
Director: Carlos Sacco
Created on: 5/September/2002
Activity: Applications of numerical methods to problems related to fluid mechanics, structures, heat transfer, etc.

UNER CLASSROOM – CIMNE (ARGENTINA)

Universidad Nacional de Entre Ríos
Director: José Di Paolo
Created on: 14/March/2013
Activity: Applications of numerical methods to problems related to Bioengineering.

UNSA CLASSROOM – CIMNE (ARGENTINA)

Universidad Nacional de Salta
Director: Dr. Liz Nallim
Created on: 10/April/2008
Activity: Development of computer models for application in civil engineering.

UNT CLASSROOM – CIMNE (ARGENTINA)

Universidad Nacional de Tucumán
Director: Guillermo Etse
Created on: 01/November/2002
Activity: Development of computational models of bridges (degradation and repair mechanisms).

FEMEC CLASSROOM – CIMNE (BRASIL)

Universidad Federal de Uberlândia
Director: Sonia Goulart
Created on: 25/April/2004
Activity: Applications related to the metal stamping process and mold design.

IFRO CLASSROOM – CIMNE (BRASIL)

Instituto Federal de Educaçao, Ciéncia e Tecologia de Rondônia
Director: George Madson Dias Santos
Created on: 1/July/2009
Activity: Applications of numerical methods in engineering

IFSP CLASSROOM – CIMNE (BRASIL)

Instituto Federal de Educaçao, Ciéncia e Tecologia de Sao Paulo
Director: Écio Naves
Created on: 1/July/2009
Activity: Applications of numerical methods for solving engineering problems.

UTFSM CLASSROOM – CIMNE (CHILE)

Universidad Técnica Federico Santa María
Director: Franco Perazzo
Created on: 05/March/2004
Activity: Numerical methods in mechanical engineering. Development of numerical methods.

UNC CLASSROOM – CIMNE (COLOMBIA)

Universidad Nacional de Colombia
Director: Jorge Hurtado
Created on: June/2005
Activity: Numerical methods applied to civil engineering.

UNIANDES CLASSROOM – CIMNE (COLOMBIA)

Universidad de los Andes
Director: René Meziat
Created on: 24/January/2003
Activity: Teaching and research in numerical methods, optimization, variational principles and computational mechanics.

UCLV CLASSROOM – CIMNE (CUBA)

Centro de Investigación de métodos computacionales y numéricos en la ingeniería
Universidad Central de las Villas
Director: Carlos Recarey
Created on: 16/July/2003
Activity: Modeling and analysis of structures and grounds to the application of numerical methods.

UCA CLASSROOM – CIMNE (EL SALVADOR)

Universidad Centroamericana "José Simeón Cañas" UCA
Director: Mauricio Pohl
Created on: 12/February/2010
Activity: Civil engineering applications and multi objective optimization and applications.

UMG CLASSROOM – CIMNE (GUATEMALA)

Universidad Mariano Gálvez
Director: Rolando Torres Salazar
Created on: 01/February/2011
Activity: Development of computer models for application in civil engineering.

Red
Aulas CIMNE

CIMAT CLASSROOM – CIMNE (MEXICO)

Centro de Investigaciones en Matematicas
Director: Miguel Angel Moreles
Created on: 26/June/2006
Activity: Applied mathematics, numerical methods, engineering and statistical analysis.

UGTO CLASSROOM – CIMNE (MEXICO)

Universidad de Guanajuato
Director: Jesus Gerardo Valdes
Created on: 16/January/2002
Activity: Civil engineering applications and multi objective optimization and applications.

ITESM CLASSROOM – CIMNE (MEXICO)

Instituto Tecnológico de Estudios Superiores de Monterrey
Director: Sergio Gallegos
Created on: 18/May/2009
Activity: Applications of numerical methods in civil engineering.

PUCP CLASSROOM – CIMNE (PERU)

Universidad Católica de Perú
Directors: Quino Valverde y Salvador Botello
Created on: 16/April/2009
Activity: Modeling and analysis of structures and grounds to the application of numerical methods.

ETSEIAT CLASSROOM – CIMNE (SPAIN)

UPC deTerrassa
Director: Roberto Flores
Created on: 20/April/2007
Activity: Industrial and aeronautical engineering

EUETIB CLASSROOM – CIMNE (SPAIN)

Escuela Técnica de Ingeniería Industrial
Directors: Gabriel Bugeda y Daniel Di Capua
Created on: 18/July/2001
Activity: Promote Development and USING them in the numerical Methods ingenierías industrial and civil in industrial and civil engineering.

FNB CLASSROOM – CIMNE (SPAIN)

Facultad de Náutica de Barcelona
Director: Julio García
Created on: 1/March/2002
Activity: Applications of numerical methods to problems related to marine engineering.

UDL CLASSROOM – CIMNE (SPAIN)

Universidad de Lleida
Directors: Manuel Ibáñez y Jordi Cipriano
Created on: 24/July/2004
Activity: Numerical methods applied to physics teaching buildings and renewable energy online.

UPM CLASSROOM - CIMNE (SPAIN)

Universidad Politécnica de Madrid
Director: Rafael Morán
Created on: 25/May/2010
Activity: Applications of numerical methods in civil engineering.

UVA CLASSROOM – CIMNE (SPAIN)

Universidad de Valladolid
Director: Antonio Foces
Created on: 18/April/2002
Activity: Civil engineering projects, ports, marine, industrial, aerospace and architecture.

INABIO CLASSROOM – CIMNE (VENEZUELA)

Universidad Central de Venezuela
Director: Miguel Cerrolaza
Created on: 15/February/2004
Activity: Applications of numerical methods to problems related to Bioengineering.

UC CLASSROOM – CIMNE (VENEZUELA)

Universidad de Carabobo
Director: David Ojeda
Created on: 29/April/2009
Activity: Applications of numerical methods in optimization and inverse problems in engineering failure analysis.

UCLA CLASSROOM – CIMNE (VENEZUELA)

Universidad Centroccidental "Lisandro Alvaro" (UCLA)
Director: Juan Carlos Vielma Pérez
Created on: 20/October/2008
Activity: Applications of numerical methods to civil engineering problems.

For more information visit: www.aulas.cimne.com

CIMNE Joint Labs Meetings

1st Meeting, Barcelona 2004

2nd Meeting, Santa Fe (Argentina) 2006

3rd Meeting, Barcelona 2007

4th Meeting, Barcelona 2009

5th Meeting, Guanajuato (México) 2013

6th Meeting, Buenos Aires (Argentina) 2015

Fifth General Meeting of the AULAS CIMNE Network
(Guanajuato, México, 4-5 November 2013)

Thematic conferences

1ST SEMINAR ON BIOENGINEERING OF CIMNE JOINT LABS

Mérida, Venezuela, March 2010

2ND SEMINAR OF CIMNE JOINT LABS

Salta, Argentina, November 2012

Unesco Chair on Numerical Methods in Engineering

Prof. O. C. Zienkiewicz,†
fisrt UNESCO Professor on
Numerical Methods in Engineering

Prof. J. Périaux,
current UNESCO Professor on
Numerical Methods in Engineering

www.cimne.com/unesco

The creation of CIMNE was sponsored by UNESCO, aiming to promote international cooperation and development in the field of the application of numerical methods in science and technology.

As a result of the cooperation between UNESCO and CIMNE, in 1989 the UNESCO Chair on Numerical Methods in Engineering was created at the Universitat Politècnica de Catalunya (UPC) with the support of the Generalitat de Catalunya. This was the first UNESCO Chair in the world.

Prof. O. C. Zienkiewicz held the UNESCO Chair since its creation in 1989 until his death on January 2nd, 2009.

In 2009 the Unesco Chair of Numerical Methods in Engineering was awarded to Dr. Jacques Périaux. He is a recognized expert in the field of numerical methods applied to aerospace engineering. Dr Périaux contributions have resulted in a significant increase in the RTD activities of CIMNE in the aerospace sector, in particular with academic organizations and industry in China, the organization of numerous training courses, exchanges with leading scientists worldwide and several RTD projects at international level.

Meeting of the Unesco Chairs established in Spain at UPC. Barcelona, December 2011

TRAINING AND DISSEMINATION

Courses and Seminars

CIMNE regularly organises courses and seminars related to the theory and application of numerical methods in engineering. The courses are addressed to recent university graduates and professionals from schools of engineering and applied sciences universities.

In 2014 CIMNE has organised the following courses and seminars:

Courses

Master on Numerical Methods in Engineering
September 2014

Master of Science in Computational Mechanics
October 2013 - June 2014

Curso de Máster en Métodos Numéricos Para Cálculo y Diseño en Ingeniería
July 2014

Simulation in Engineering and Entreprenership Doctorate - SEED
October 2013 - June 2014

Cursos de Iber Online
January 2014

VIRTUAL LEARNING CENTRE

CIMNE has 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.

The Virtual Center of CIMNE is useful in gathering information early on in a course to facilitate the registration process. Teachers can also follow the student progress and carry out the different tutorials and exercises.

Through the Virtual Center of CIMNE students can access the latest information on the various courses and any other academic or administrative matters related to the course.

The Virtual Center of CIMNE hosts the Master Course in Numerical Methods in Engineering and other postgraduate courses of CIMNE.

www.cimne.com/vpage/2/0/scientific-events/post-graduate

Seminars

Seismic Performance of Precast Concrete Structures
Prof. Fabio Biondini

14/02/14

Convergència a l'equilibri i capes límit
en un sistema de la Cromatografia
Prof. Joan Solà-Morales

20/02/14

Domain Decomposition Methods for Uncertainty Quantification
Prof. Waad Subber

28/02/14

Multi-Resolution Models: Recent Progress in Coupling Geometry and Numerical Simulation
Prof. Ernst Rank

05/03/14

Some results on the Navier-Stokes- equations in connection with the Navier-Stokes equations
Prof. Juan Vicente Gutierrez Santacreu
20/03/14

Domain Decomposition Methods for Uncertainty Quantification
Prof. Waad Subber
28/03/14

Nonlinear coupled problems solved by hp-FEM
Dr. Pavel Kus
08/04/14

Introduction to Polymer Electrolyte Fuel Cell Mathematical Modelling Using OpenFCST
Prof. M. Secanell

14/05/14

SA finite element projection-based VMS turbulence model with wall laws

Prof. Samuele Rubino

15/05/14

A Local ALE Method for Flows with Moving Boundaries
Prof. Juan Carlos Heinrich

22/05/14

Explicit discontinuous galerkin methods for High fidelity flow simulations
Prof. Florian Hindenlang

24/05/14

Synthesis of Mechanisms – Metamorphic Mechanisms

PROF. Alberto Cardona

17/06/14

Decomposition techniques for computational limit analysis
Prof. Nima Rabiei

27/10/14

Approximation of phase-field models with meshfree methods: exploring biomembrane dynamics
Prof. Christian Peco Regales

28/10/14

Conferences

Since 1987 CIMNE has organised 165 conferences on different topics of numerical methods and their applications in engineering and applied sciences.

More information in: *http://congress.cimne.com/web/*

Conferences in 2014

30 GEF

31 GEF, 31 Encuentro del Grupo Español de Fractura
2-4 de Abril 2014, San Lorenzo del Escorial, España

ParCFD2014

26th International Conference on Parallel Computational Fluid Dynamics
20-22 May 2014, Trondheim, Norway

CODE_BRIGHT

A 3-D program for Thermo-Hydro-Mechanical Analysis in Geological Media
4 - 6 June 2014, Barcelona, Spain

10th CDIO

10th Internacional CDIO Conference at Universitat Politècnioca de Catalunya
15-19 June 2014, Barcelona, Spain

6th WCSCM

6th World Conference on Structural Control and Monitoring
15 - 17 July 2014, Barcelona, Spain

7th GiD

7th Convention on Advances and Applications of GiD
17 - 18 July, 2014, Barcelona, Spain

Conferences in 2014

WCCM XI — ECCM V — ECFD VI

Joint Organization of
11th. World Congress on Computational Mechanics
5th. European Conference on Computational Mechanics
6th. European Conference on Computational Fluid Dynamics
20-25 July 2014, Barcelona, Spain

ISOMETRIC ANALYSIS 2014

Isogeometric Analysis - Advanced School
25-27 July 2014, Barcelona, Spain

IABSE 2014

IABSE Symposium Madrid 2014
3 - 5 September, 2014, Madrid, Spain

COMPUTATIONAL MECHANICS

27 Nordic Seminar on Computational Mechanics
22-24 October 2014, Stockholm, Sweden

Conferences planned for 2015-16

PANACM 2015,

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

COUPLED PROBLEMS 2015

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

Conferences planned for 2015-16

IGA 2015

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

MARINE 2015

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

COMPLAS XIII

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

PARTICLES 2015

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

ADAPTATIVE MODELING AND SIMULATION

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

ECCOMAS

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

ICCB 2015

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

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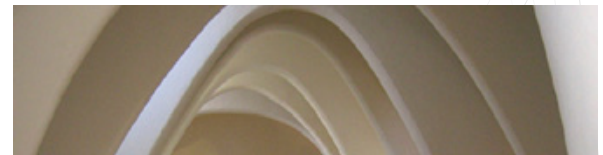
VII International Conference on Textile Composites and Inflatable Structures - STRUCTURAL MEMBRANES 2015
19 - 21 October, 2015, Barcelona, Spain

CIMNE Coffee Talks 2014

The CIMNE Coffee Talks are seminars of one hour organized by CIMNE researches. Each talk opens with a welcome coffee and ends up with an open discussion on the content of the talk.

Meso-Escale Fe and Morphological modeling of Cementitious Material
Emmanuel Roubin
10/12/14

Beyond drilling degrees of freedom
Pere-Andreu Ubach,
26/11/14

Implementation and Evaluation of NURBS-Surface Representation in Kratos for Embedded Fluid Solvers and Realizaition of an Isogeometric Laplace Solver
Matthias Mayr
12/11/14

Reduced-order modeling in multiscale simulations
Joaquín A. Hernández
10/12/14

Challenges in the constitutive modelling of a human cervical spine
Ester Comellas
01/11/14

A monolithic unified approach for FSI and multi-fl uid fl ow problems using the fixed mesh PFEM-2
Pablo Becker
17/09/14

FDFLO: Finite Difference Code to Compete With Lattice Boltzmann and DG
Rainald Lohner
02/07/14

Detail-preserving Mesh Simplification
Miguel A. Pasenau de Riera
28/05/14

Analytical and computational features of Zigzag theories for multilayered composite and sandwich structures
Luigi Iurlaro
21/05/14

Del continuo al discontinuo: el Método de los Elementos Discretos (¿y de vuelta al continuo?)
The DEM TEAM
14/05/14

Analytical and numerical analysis of droplet dynamics on the GDL surface of a PEM fuel cell cathode
Alex Jarauta
07/05/14

Compass Ingeniería y Sistemas, del I+D al mercado del software
Ramón Ribo
02/04/14

Advances in the Solution of NS Equations in GPU Hardware
Mario Alberto Storti
12/03/14

Understanding granular mechanics from spatio-temporal averaging
Carlos Labra
05/03/14

Applications of FEM in structural steel design. A perspective from the design codes and from the design engineer
Rolando Chacon
19/02/14

Detail-preserving simplification
Miguel Pasenau
05/02/14

CIMNE coffee talks

www.cimne.com/vpage/2/0/Scientific-Events/Coffee-talks

Publications

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

The publications of CIMNE can be visited and ordered via Internet in www.cimne.com. Most publications can be freely downloaded from the web.

We list below the publications of CIMNE in 2014.

Books

L141, *F. Magoulès, F. Roux, G. Houzeaux,* , Cálculo Científico Paralelo, 978-84-941686-3-5, 311PP. CIMNE 2014

L143, *M. Cervera y E. Blanco,* Mecánica de estructuras, 430pp, 978-84-942844-8-9. CIMNE 2014

T. Kvamsdal, A.M. Kvarving, H. Holm, C.B. Jenssen, M.Kumar, B.Pettersen, 26Th International Conference On Computional Fluids Dynamics, 978-84-941686-6-6, 150PP. CIMNE 2014

Iabse Syposium Madrid 2014, Engineering for Progrees, Nature and People, 978-3-85748-134-5, 878PP. CIMNE 2014

6WCSCM, Sixth World Conference on Structural Control and Monitoring, Barcelona, Spain 15-17 July 2014, ISBN: 978-84-942844-5-8, J. Rodellar, A. Güemes, F. Pozo (Eds.), ebook. CIMNE 2014

Journals

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

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

Monographs

IS 68, *J.C. Vielma,* Contribuciones a la evaluacion de la vulnerabilidad sísmica de edificios. 2014

M141, *J.A. Hernández, X. Oliver, A.E. Huespe, M.A. Caicedo, J.C. Cante,* Computational homogenization of inelastic materials using model order reduction. 2014

M142, *E. Moreno, M. Cervera,* Elementos finitos mixtos estabilizados para flujos viscoplásticos. 2014

M143, *E. Ortega, E. Oñate, S. Idelsohn,* Development and applications of the finite point method t compressible aerodynamics problems. 2014

M144, *X. Diego, M. Chiumenti,* On the theory of cell migration: Durotaxis and chemotaxis. 2014

M145, *M.A. Pasenau de Riera, C. Andujar,* Detail-preserving mesh simplification. 2014

M146, *A. Coll, P. Dadvand, E.Oñate,* Robust volume mesh generation for non-watertight geometries. 2014

M147, *J.-Y. Wu, M. Cervera,* Strain localization and failure mechancs for elastoplastic damage solids. 2014

M148, *V.S.A. Monteiro, E. Oñate, S. Oller,* Computational model of the human urinary bladder. 2014

M149, *A. Eijo, E. Oñate, S. Oller,* Finite element modeling of delimination in advanced composite beams and plates using one-andtwodimensional, finite elements based on the refined zigzag theory. 2014

M150, *K. Kamran, E. Oñate, S.R. Idelsohn, R. Rossi,* A compressible lagrangian frameworks for the simulation of underwater implosion problems. 2014

M151, *C.E. Dávalos, J. C. Cante, J.A. Hernández, J. Oliver,* On the modelling of granular flows in industrial applications via the particle finite element method. 2014

Year	Technical Reports	Research reports	Monographs	Books
2004	28	7	5	28
2005	25	6	8	13
2006	24	4	8	18
2007	30	11	9	14
2008	28	8	8	17
2009	44	6	7	11
2010	12	3	7	9
2011	18	7	8	21
2012	7	7	7	20
2013	8	10	6	20
2014	2	12	4	6
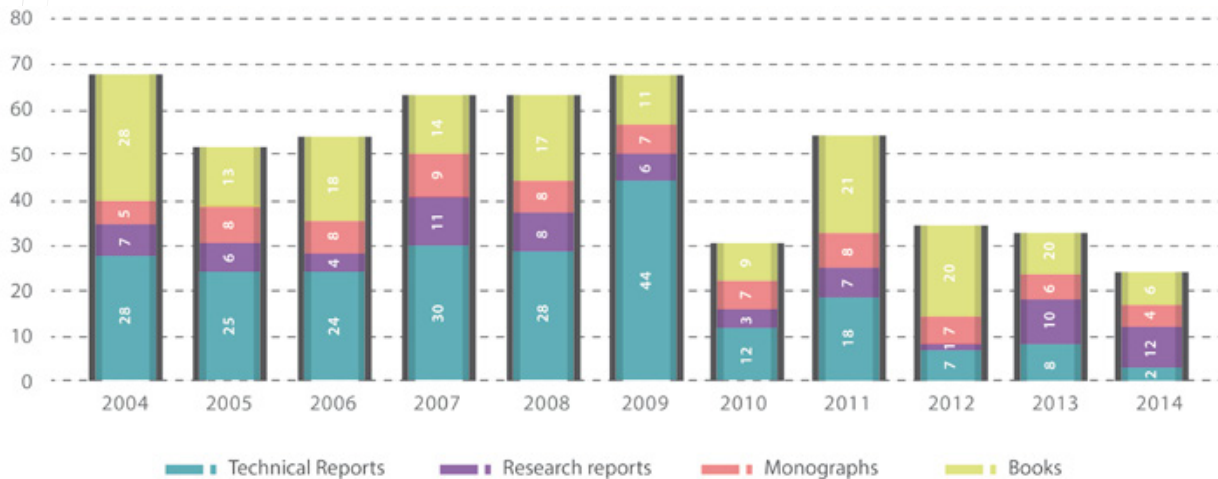
Research reports

PI403, E. Oñate, A. Franci, J.M. Carbonell, A particle finite element method (PFEM) for coupled thermal analysis of quasi and fully incompressible flows and fluid-structure interaction problems

PI404, A. Franci, E. Oñate, J.M. Carbonell, Unified updated lagrangian formulation for fluid-structure interaction problems

PI405, E. Oñate, M.A. Celigueta, S. Latorre, G. Casas, R. Rossi, J. Rojek, Lagrangian analysis of multiscale particulate flows with particle finite element method

PI406, E. Oñate, A. Franci, J.M. Carbonell, A particle finite element method for analysis of industrial for analysis of industrial forming processes

PI407, Alessandro Franci, Eugenio Oñate, Josep M. Carbonell, Unified updated lagrangian formulation for the analysis of quasi and fully incomprenssible fluids and solids and their interaction via a partitioned scheme

PI 408, P. Nadukandi, Numerically stable formulas for a material point based explicit exponnetial integrator

Technical reports

IT 642 Research lines and software products for the oil and gas industry, 2014

Since 1987 CIMNE has edited 1387 scientific and technical publications.
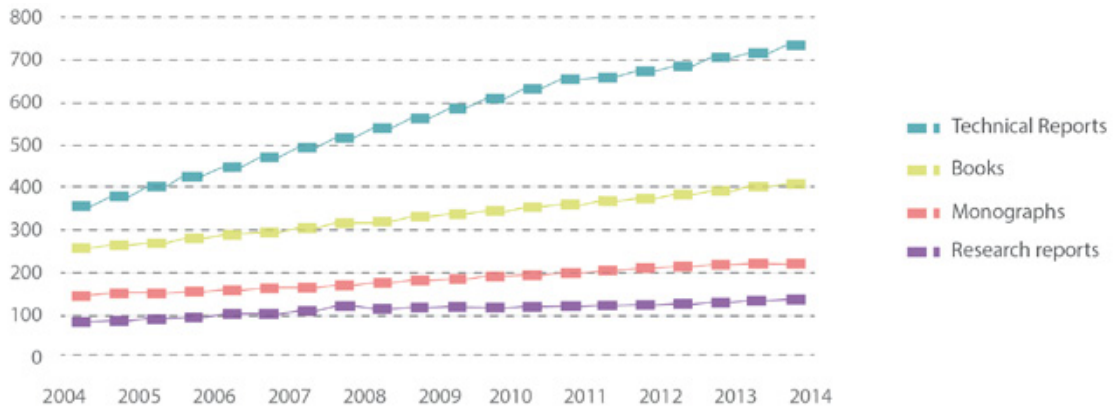
Number of cites of CIMNE scientists recorded by CIMNE Scholar

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Number of cites	Total	Since 2010
Cites	37104	19338
index h	88	62
i10 index	636	455
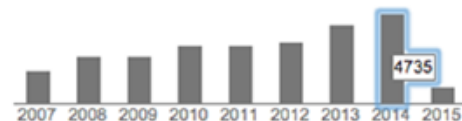
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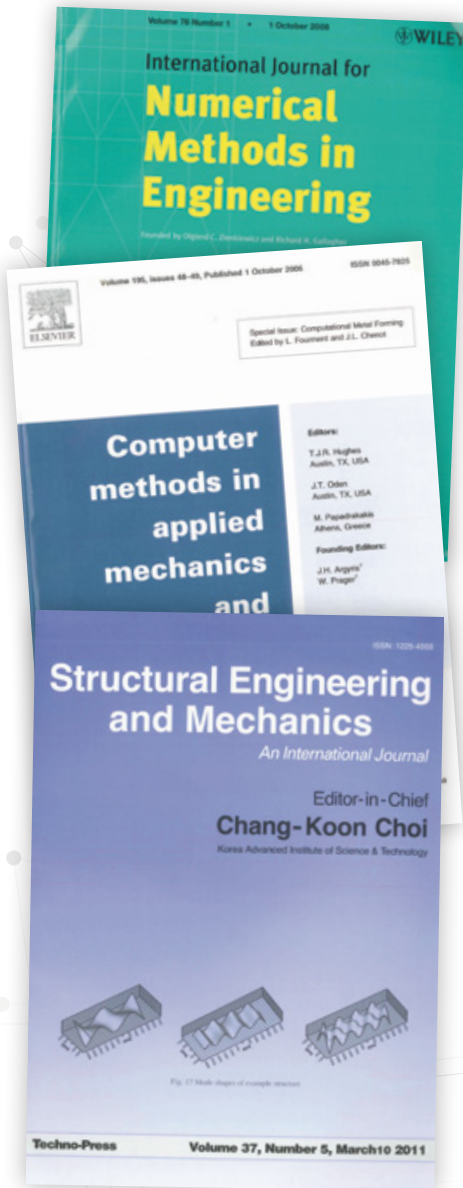
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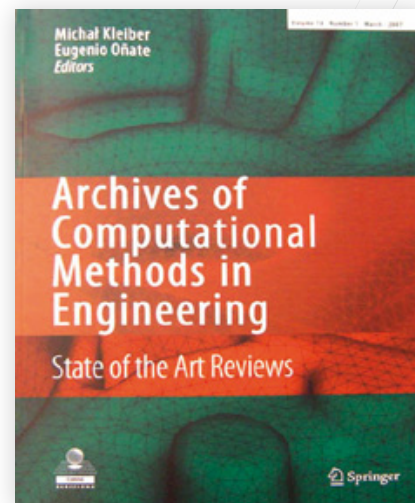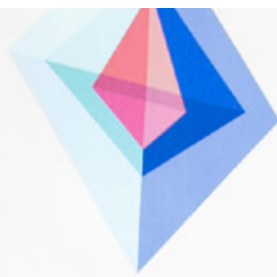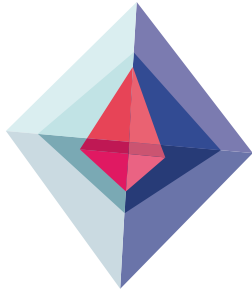
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The Catalan Institute of Applied Research, Technology Innovation and Creativity (ARTIC) is an association of independent institutions that generates, captures, and transfers scientific and technological knowledge. The goal of ARTIC is to improve the competitiveness of companies, institutions and administrations and enhance the quality of life of citizens through research and innovation.

ARTIC links the expertise of CIMNE, Barcelona Media and the Fundació CTM Centre for Technology (two technological centers of the TECNIO network). Each of these organizations provides the alliance with a distinctive skill, enabling ARTIC to make new contributions to the fields of Content Creation, Social Media Analysis, Security, Culture and Tourism, Energy, Environmental Technology, Numerical Simulation, Civil Engineering, Aeronautics, and Socioeconomics, among others.

ARTIC was created in 2013. In 2014, Dr. Anna Mª Sánchez, innovation management expert, was appointed CEO of the ARTIC alliance.

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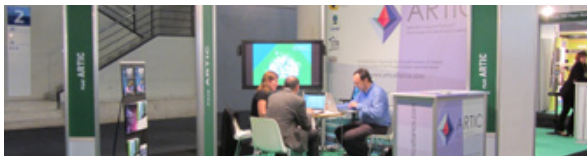
19-21 November 2013, Barcelona, Spain ∧

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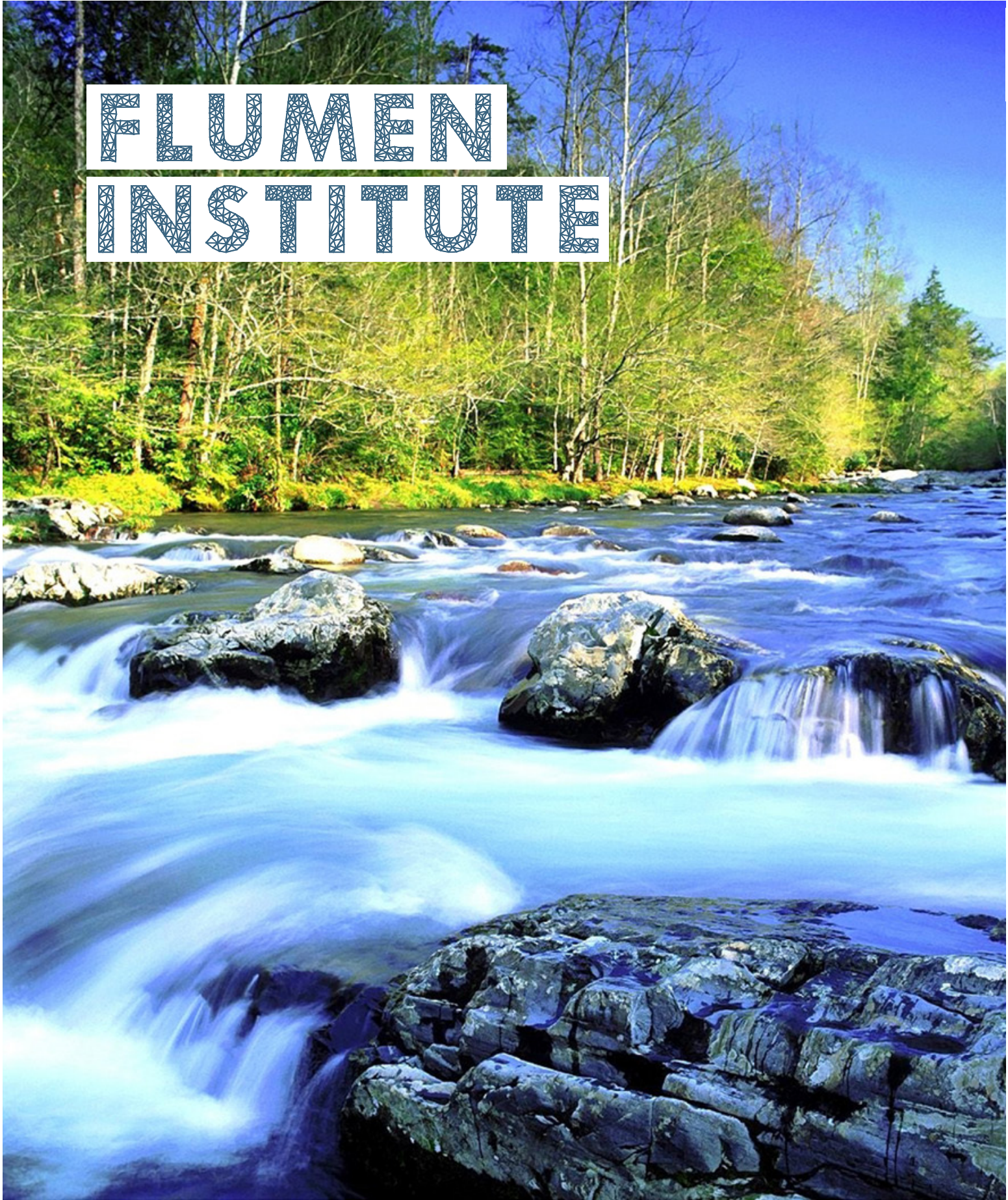
FLUMEN Institute

In 2011, CIMNE in partnership with the Technical University of Catalonia (UPC) created the FLUMEN Institute for River Dynamics and Hydrologic Engineering. FLUMEN Institute is the outcome of the merging of the prestigious Flumen RTD group existing since 2005 at the School of Civil Engineering of UPC and CIMNE. This partnership brings together the numerical and experimental expertise of the Flumen RTD group in hydraulics with the broad experience of CIMNE on numerical methods, computer simulation and integration of decision support systems.

The FLUMEN Institute is located at the North Campus of the UPC. 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 the UPC professor Josep Dolz.

On September 2014, CIMNE started the construction of a new building that will allocate the FLUMEN Institute. The new building is located in the North Campus of UPC, just beside CIMNE. Apart from becoming the new laboratory and offices for FLUMEN, the building will also provide work areas for researchers at the graduate level (masters, doctoral and postdoctoral) and for senior researchers from CIMNE and UPC. It will also provide working spaces for the School of Civil Engineering activities in the framework of the Graduate School of Engineering of UPC.

The new facilities for FLUMEN will be equipped with modern experimental facilities for model scale testing of river dynamic and hydraulic problems, as well as with advanced computer simulation codes.

www.flumen.upc.edu

Prof. Josep Dolz Director of Flumen Institute

Construction of the new premises of the FLUMEN Institute at Campus Nord, UPC, Jan. 2015

SCIENTIFIC SOCIETIES

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Sociedad Española de Métodos Numéricos en Ingeniería (SEMNI)

www.semni.org

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 of SEMNI are based in CIMNE. Currently, SEMNI has over 400 members in Spain and in other countries. Some of the main activities of SEMNI include the organization of technical workshops and the Spanish Conference on Numerical Methods in Engineering. SEMNI congresses take place in several cities; the first one was in the Canary Islands (1990). The subsequent SEMNI conferences took place in A Coruña (1993), Zaragoza (1996), Sevilla (1999), Madrid (2002), Lisbon (2004), Granada (2005), Porto (2007), Barcelona (2009), Coimbra (2011) and Bilbao (2013). The 12th SEMNI congress will be organized in Lisbon on 6-9 July 2015. SEMNI organized the 4th World Congress on Computational Mechanics in Buenos Aires in 1998 and the ECCOMAS congress in Barcelona in September, 2000. and the 2014 World Congress on Computational Mechanics in Barcelona. SEMNI also organizes workshops and courses on numerical methods in engineering. Since 1989 the SEMNI S ecretariat is located at CIMNE.

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Congress on Numerical Methods in Engineering — CNM
June 29-July 2, 2015. Lisbon

European Community on Computational Methods in Applied Sciences (ECCOMAS)

www.eccomas.org

ECCOMAS is a scientific organization founded in 1992, grouping together 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 in the fields of interest of ECCOMAS.

The main event organized by ECCOMAS is a large European Congress taking place on a four year cycle and addressing scientists and engineers both in and outside Europe. The main objective of these conferences is to provide a forum for presentation and discussion of state-of-the-art in scientific computing applied to engineering sciences. Equal emphasis is given to basic methodologies, scientific development and industrial applications. The ECCOMAS Congress 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 previous ECCOMAS Congresses were held in Paris, France (1996), Barcelona, Spain (2000), Jyvaskyla, Finland (2004), Venezia, Italy (2008) in conjunction with the World Conference on Computational Mechanics of the IACM, and Vienna, Austria (2012). The next ECCOMAS congress will take place in Crete (Greece) on 2016.

The ECCOMAS Congress, together with the ECCOMAS Conference on Computational Solid and Structural Mechanics (ECCM) and the ECCOMAS Conference on Computational Fluid Dynamics (ECFD), constitute the three main scientific events of ECCOMAS organized every four years, on even years, which attract approximately 5000 participants in total.

The previous ECCM conferences were held in Munich, Germany (1999), Cracow, Poland (2001), Lisbon, Portugal (2006), Paris, France (2010). The previous ECFD conferemces were held in Stuttgart, Germany (1994), Swansea, UK (2001), Egmond aan Zee, The Netherlands (2006), Lisbon, Portugal (2010).

The ECCM and ECFD Conferences were held jointly in Barcelona on July 20-25, 2014.

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

ECCM and ECFD Conference in Barcelona 20-25July 2014

The secretariat of ECCOMAS is based in CIMNE since 1996.

ECCOMAS MANAGING BOARD

www.iacm.info

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International Association for Computational Mechanics (IACM)

The International Association for Computational Mechanics (IACM) was founded in 1981. Its goal is the promotion of advances in computational mechanics.

For the purposes of the IACM, computational mechanics is defined 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.

Since 1994 the IACM Secretariat is located at CIMNE.

IACM organizes the World Congress on Computational Mechanics (WCCM) every four years. Former editions of this congress were held in Austin (1986), Stuttgart (1990), Tokyo (1994), Buenos Aires (1998), Vienna (2002), Beijing (2004), California (2006), Venice (2008), Sydney (2010) and São Paulo (2012). The 11th WCCM took place in Barcelona on July 20-25, 2014. The congress registered same 3.800 participants from 63 countries whose scientific contributions – 3152 in total – were distributed among 218 Minisymposia and 26 Contributed sessions, as well as 115 poster presentations. 543 sessions took place at a maximum of 48 parallel sessions. The success of the 11th WCCM was also recognised in the media, with over 50 impacts on TV, radio and paper and electronic press. This has been, so far, the largest congress in the computational methods history.

Finally, it is important to highlight that IACM also publishes a biannual bulletin and supports the organization of special interest conferences, IACM Symposia and courses in various fields of computational mechanics.

The Executive Council of IACM is composed by:

PRESIDENT:

Wing Kam Liu, U.S.A.

PAST PRESIDENTS:

G. Yagawa, Japan
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T.J.R. Hughes, U.S.A.
T. J. Oden, U.S.A.
A. Samuelson†, Sweden
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VICE PRESIDENT FOR THE AMERICAS:

S. Idelsohn, Argentina

VICE PRESIDENT FOR ASIA-AUSTRALIA:

K. Terada, Japan

VICE PRESIDENT FOR EUROPE-MIDDLE EAST-AFRICA:

P. Wriggers, Germany

GENERAL SECRETARY

A. Huerta, Spain

MEMBERS:

R. de Borst (United Kingdom), J. S. Chen (USA), A. Coutinho (Brazil), C. Farhat (U.S.A.), G. Hulbert (U.S.A.), K. Kashiyama (Japan), P. Ladevèze (France), T. Laursen (UAE), G.R. Liu (Singapore), H. Mang (Austria), N. Moës (France), D. Roger J. Owen (UK), M. Papadrakakis (Greece), W. Wall (Germany) and M. Yuan (China).

www.iacm.info

World Congress of the IACM. Barcelona July 20-25, 2014

European Research Community On Flow, Turbulence And Combustion (ERCOFTAC)

www.ercoftac.org

The ERCOFTAC network was founded in 1987. It is composed of more than 60 research centers and companies, promoted by several European aerospace companies with the objective of gathering all European research centers working primarily in the numerical simulation of fluid mechanics problems in engineering. Since 1989, CIMNE is a Pilot Center of ERCOFTAC in Spain.

ERCOFTAC activities in Spain organized by the Pilot Center include the 8th European Turbulence Workshop (Barcelona 2000), the Europe-Russia Workshop (Barcelona 2006), the 3rd Workshop on Research in Turbulence (Seville 2008) and the 5th Workshop on Research in Turbulence (Tarragona 2010). The ERCOFTAC Pilot Center managed by cimne has organized next ERCOFTAC Spring Festival that will be held in Terrassa, Barcelona, next 15-16 May, 2014.

CIMNE has coordinated the E-caero project of the EC (2010-2013) aiming to promote joint activities of different scientific associations in the aeronautic field in Europe. ERCOFTAC is a partner in this project.
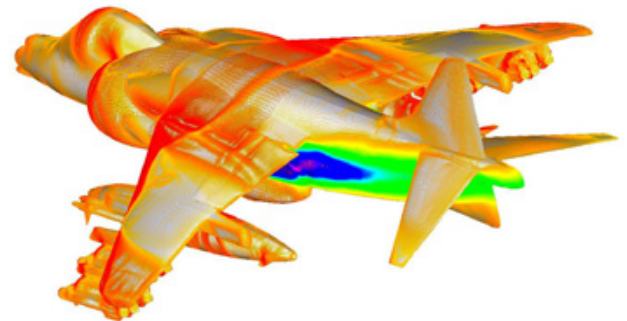
AWARDS
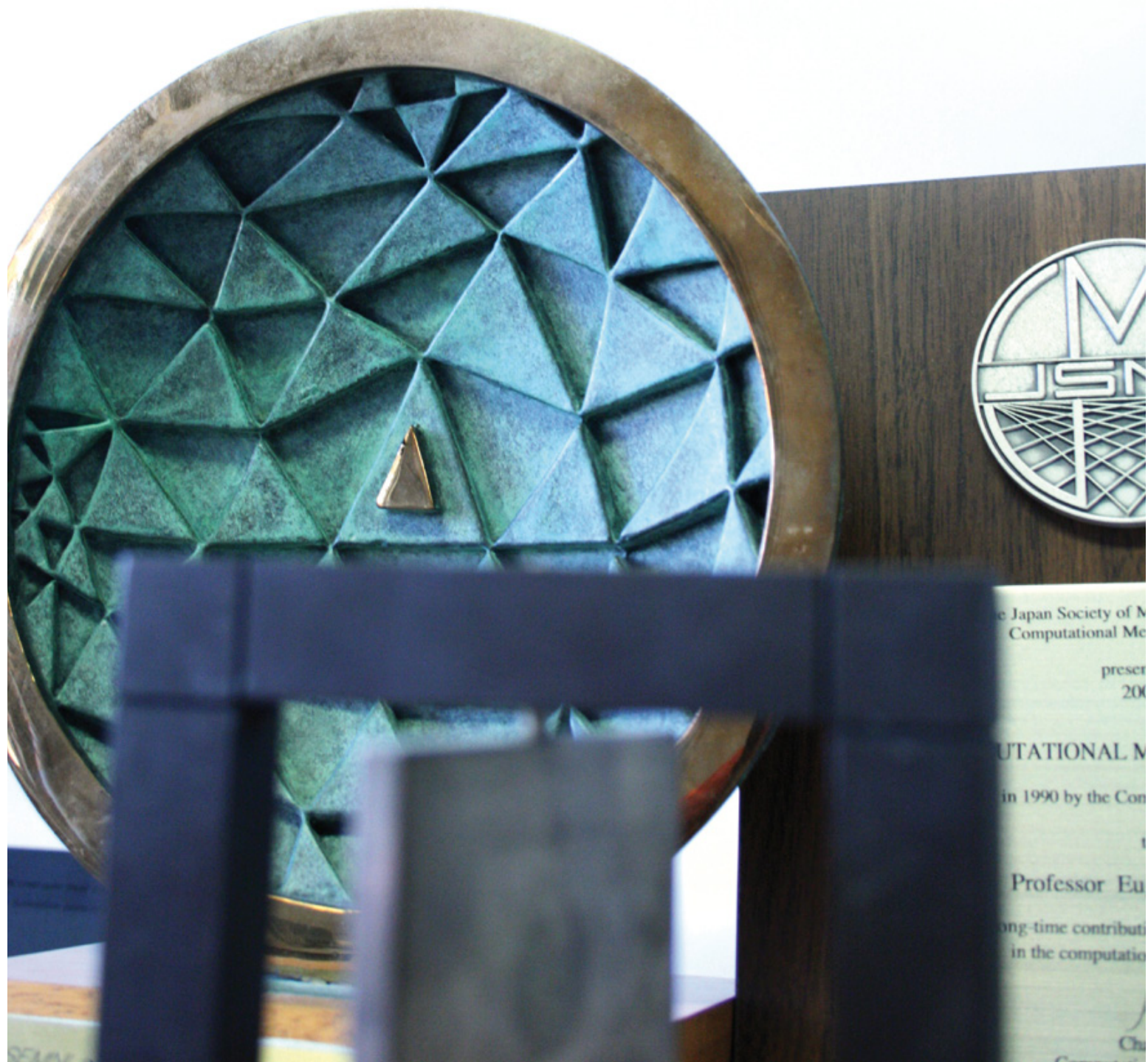
Awards to CIMNE Scientists

Eduardo Alonso

GEOTECHNICAL RESEARCH MEDAL. Institution of Civil Engineers (United Kingdom), 2009

GEOTECHNICAL RESEARCH MEDAL. Inst. of Civil Engineers (United Kingdom), 2010

The Third Kezdi Lecture. From Hungarian Society of Soil Mechanics an Foundation Engineering. Budapest, 2013

The 30th Rocha Lecture. From, Sociedade Portuguesa de Geotecnia. Lisboa, 2013

The Third ISRM online Lecture. From International Society of Rock Mechanics, 2013

Santiago Badia

PREMI EXTRAORDINARI DE DOCTORAT ENGINYERIA CIVIL, Universitat Politècnica de Catalunya, 2008

STARTING GRANT of the European Research Council (ERC), 2010

SEMA Award to young researchers by the Spanish Society of Applied Mathematics, 2012

PROOF OF CONCEPT GRANT HOLDER from the European Research Council , 2014

THE MOST SCALABLES CODES BY THE JÜLICH SUPERCOMPUTING Center Author of FEMPAR, selected for

Miguel Cerrolaza

PREMIO NACIONAL DE CIENCIA Y TECNOLOGÍA AL INVESTIGADOR DE AMPLIA TRAYECTORIA Gobierno Venezolano, 2014

Julio García

MEDALLA DE PLATA DEL 53 CONGRESO DE INGENIERÍA NAVAL E INDUSTRIA MARÍTIMA por el trabajo "Procedimiento para el estudio del comportamiento dinámico de artefactos flotantes en el dominio del tiempo" , 2014

Antonio Gens

OUTSTANDING CONTRIBUTIONS Award from International Association for Computer Methods and Advances in Geomechanics (IACMAG), 2011

MIEMBRO DE LA ROYAL ACADEMY OF ENGINEERING OF UK. 2011

VICEPRESIDENT FOR EUROPE of the International Society for Soil Mechanics and Geotechnical Engineering (ISSMGE), 2013

DOCTOR HONORIS CAUSA Université de Grenoble - Joseph Fourier, 2014

MEDALLA DE HONOR Colegio de Ingenieros de Caminos Canales y Puertos , 2014

GEOTECHNICAL RESEARCH MEDAL Institution of Civil Engineers. UK

1ST GEOFFREY BLIGHT LECTURE Technical Committee on Unsaturated Soils of the International Society for Soil Mechanics and Geotechnical Engineering, 2014
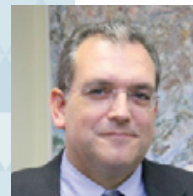
Antonio Huerta

PRANDTL MEDAL **of the European Community on Computational Methods in Applied Science, 2008**

Sergio Idelsohn

SEMNI 2009 AWARD in recognition to a professional and international career in the Numerical Methods in Engineering, 2009

ADVANCED GRANT of the European Research Council, 2009

PERSONALITY OF THE YEAR. Newspaper El Litoral, Santa Fe, Argentina, 2010

PRANDTL MEDAL of the European Community on Computational Fluid Dynamics, 2012

EMERALD AWARD FOR EXCELLENCE PAPER published in Engineering Computations, 2013

Antonia Larese

SPECIAL DOCTORAL AWARD 2014 DELIVERED BY UPC BARCELONATECH for the PhD thesis "A coupled Eulerian-PFEM model for the simulation of overtopping in rockfill dams", 2014

Xavier Oliver

IACM COMPUTATIONAL MECHANICS AWARD, Venezia, 2008

PREMIO AMCA INTERNACIONAL A LA TRAYECTORIA CIENTÍFICA, San Luis, Argentina, 2008

ADVANCED GRANT, of the European Research Council, 2012

Sergio Oller

DOCTOR HONORIS CAUSA awarded by the Universidad Nacional de Salta, Argentina, 2007

Eugenio Oñate

O.C. ZIENKIEWICZ MEDAL of the Polish Association for Computational Mechanics (PACM), 2009

TED BELYTSCHKO APPLIED MECHANICS AWARD (ASME), 2009

COMPUTATIONAL MECHANICS AWARD from Japan Society of Mechanical Engineers (Jsme), 2009

LITERATI AWARD FOR EXCELLENCE to the best paper published in Engineering Computations, 2009

GAUSS-NEWTON MEDAL from International Association For Computational Mechanics (Iacm), 2010.

ADVANCED GRANT, of the European Research Council, 2010

HONORARY DOCTORATE DEGREE by the Institut National des Sciences Appliquées (INSA), Lyon, 2012

DOCTOR HONORIS CAUSA by the University "Martha Abreu" of Las Villas, Santa Clara (Cuba), 2013

"DR. LUIS FEDERICO LELOIR" AWARD to the International Cooperation in Science, Technology and Innovation. Buenos Aires, Argentina, 2013
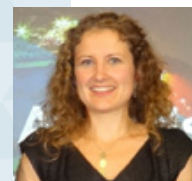
Núria Pinyol

PRIMER PREMIO. GEOTECHNICAL RESEARCH MEDAL MARÍTIMA by the Institution of Civil Engineers , 2014

BEST PAPER IN THE LANDSLIDES JOURNAL by the International Consortium of Landslides, 2014

Benjamín Suárez

MEDAL TO THE PROFESSIONAL MERIT FROM THE COLEGIO DE INGENIEROS DE CAMINOS Canales y Puertos, 2010

Awards to CIMNE

AINE 2010 Award

CIMNE was distinguished with the 2010 AINE Award, as the most innovative organization related to the naval sector the Award in promoted by the Asociación de Ingenieros Navales de España (AINE).

Award Duran i Farrell for Research and Technology Univesitat 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. Aplications to the design of sailing ships for the America Cup race".

Ciutat de Barcelona 2002 Award in Technological Research

On February 11 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, for the development of the GID system, an innovative and user-friendly graphic interface that allows the geometric modeling and visualization of the results of numerical simulations.

Narcís de Monturiol Plate Award to the Scientific and Technological Merit 1999

On November 3, 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 the fostering of cooperation between industry and university research groups.

› For many training activities and the promotion of science and technology at the 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 modeling and structural analysis of the Barcelona Cathedral.

IST Award to the best product of the Information Society Technologies Programme of European Commission (EC).

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

∧ Narcís de Monturiol Plate

∧ IST Award
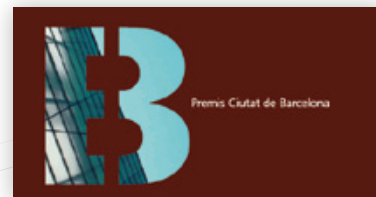
∧ Premi Ciutat de Barcelona, 2002

∧ AINE 2010 Award

RESEARCH AND DEVELOPMENT
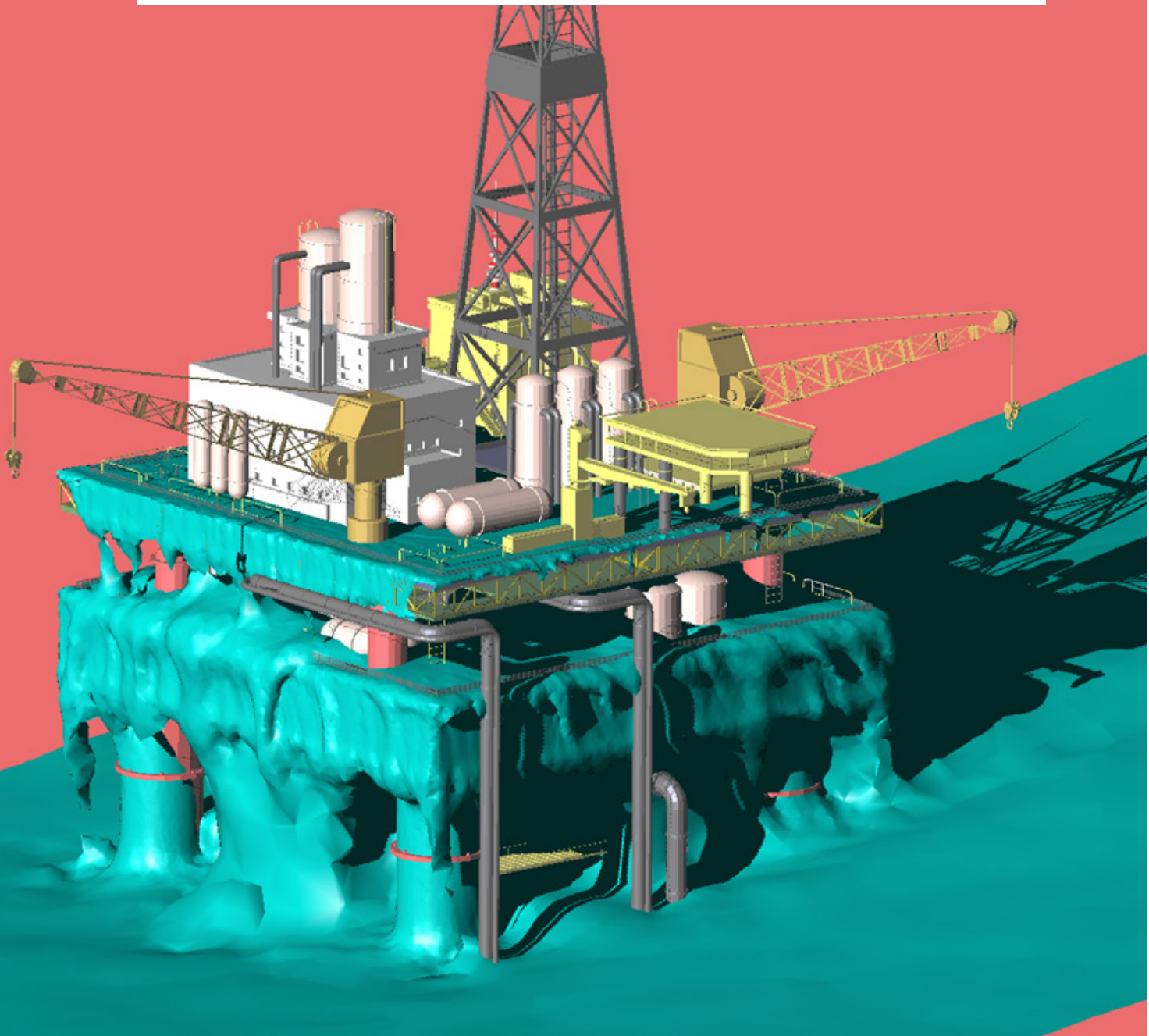
Research lines

CIMNE's Research and Development activities are split into the following research lines :

Algorithms for Multiphysics Problems

Computational Fluid Dynamics

Computational Geomechanics

Mathematical and Computational Modeling

Modelling and Analysis of Structural Materials

Solid and Structural Mechanics

Energy Efficiency Methods

Information and Communication Technology

Nature

Optimization Methods

Pre and Post processing

In the following pages the main topics of each research line are described.
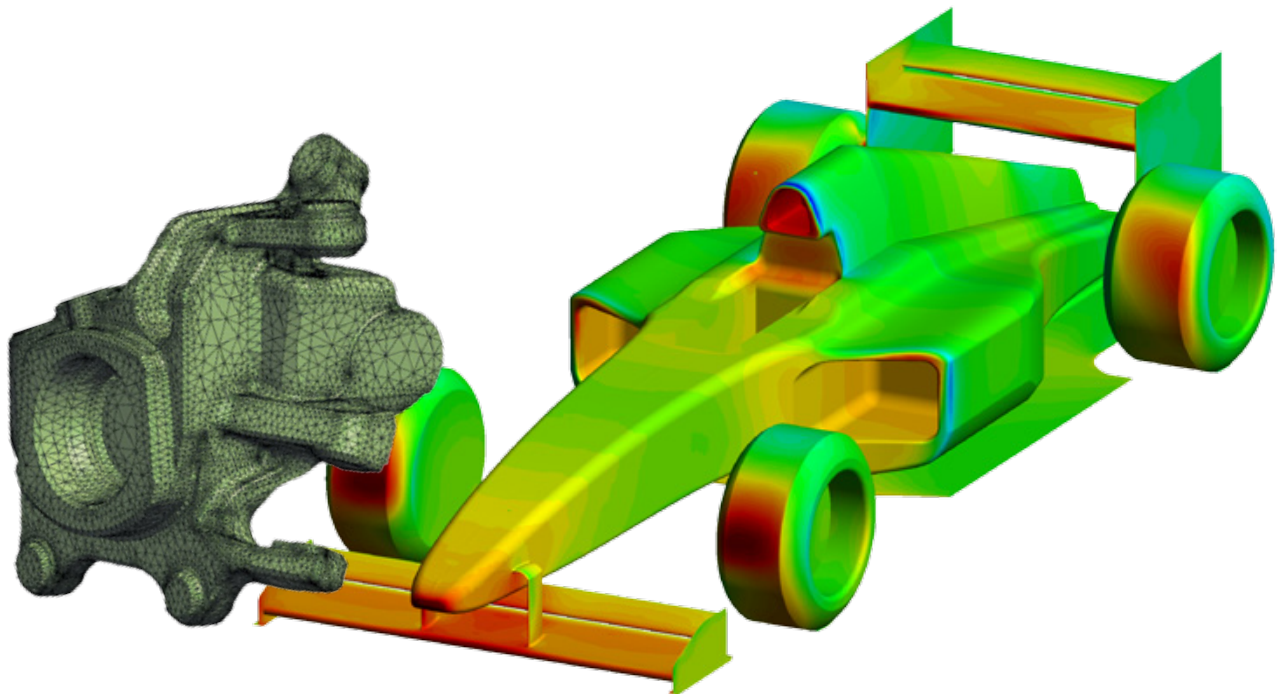
Algorithms for Multiphysics Problems

› Finite element and particle-based methods for fluid-soil-structure interaction

› Numerical methods for coupled thermal-mechanical problems

› Finite element methods (FEM) for electro-magnetic-mechanical problems

› Numerical methods for plasma physics and fusion technology

› Numerical methods for the oil and gas industry

Computational Fluid Dynamics

› Stabilized finite element and finite volume methods in compressible and incompressible fluid mechanics

› Meshless methods in fluid mechanics

› Finite element and particle methods for free surface flows

› Numerical methods for multidisciplinary problems in fluid mechanics (fluid-structure interaction, thermal flows, electromagnetics, etc.)

› Computational methods for multifluids and flow in porous media

› Unstructured mesh adaptivity in CFD

Computational Fluid Dynamics

› Constitutive models to study the constitutive behaviour of soils and rocks by finite element methods

› Finite element methods for coupled problems in geotechnical engineering

› Finite element and particle methods for modelling and analysis of bed erosion in free surface flows

› Discrete element methods for geomechanical problems

› Particle finite element methods for geomechanical problems

› Numerical methods for underground construction problems

› Study of tool wear in construction machines
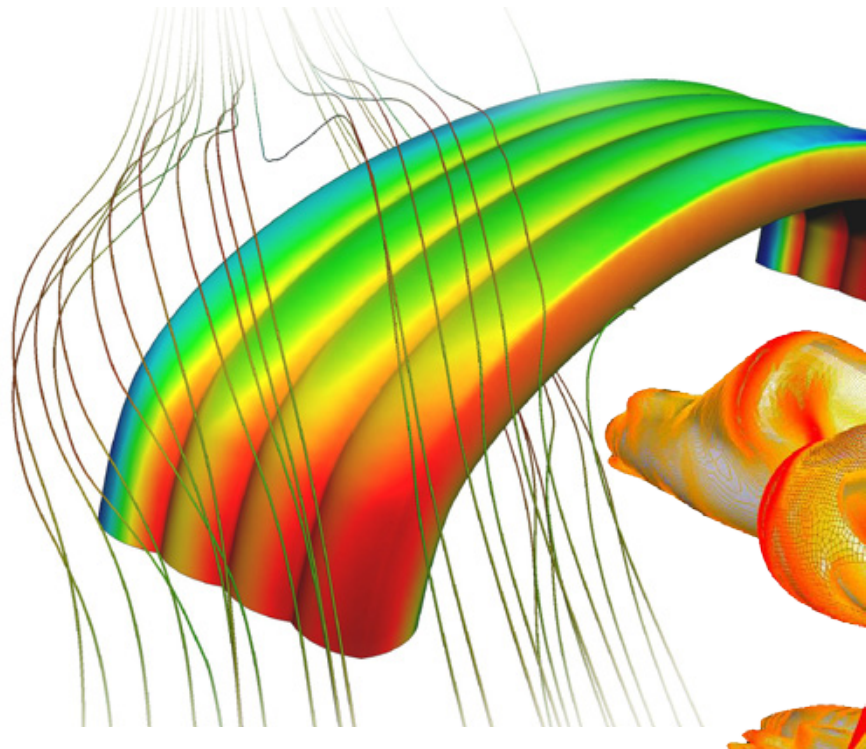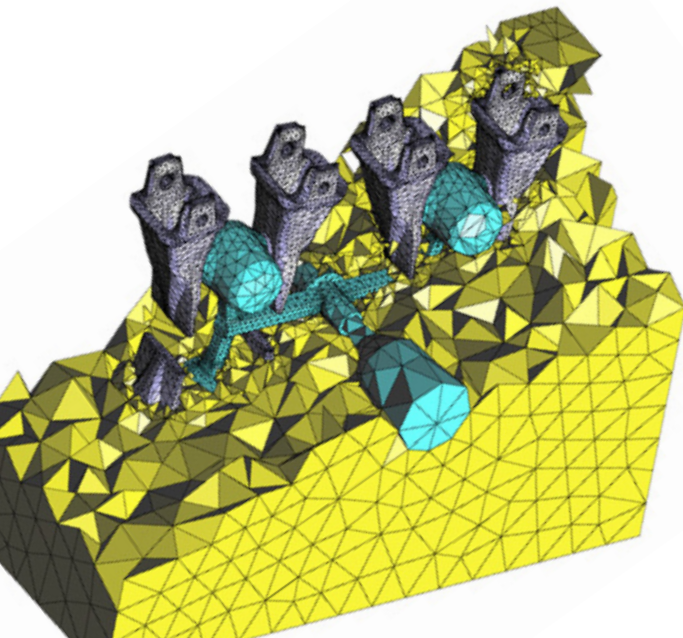
Mathematical and Computational Modeling

› Advanced numerical methods for computat. mechanics (X-FEM, G-FEM, meshless methods, etc)

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

› High-order solvers with high-fidelity geometrical resolution. Goal-oriented error assessment and mesh adaptivity

› Modeling thin objects in nano & bio-systems

Modelling and Analysis of Structural Materials

› New constitutive models for frictional materials (concrete, rocks, soil) and metallic materials

› Constitutive models for composite materials

› Nano-material models

› Constitutive models for bio-materials

› Parameter identifications in constitutive models of materials

› Multi-scale analysis of materials

› Material models for discrete element methods

Solid and Structural Mechanics

› Finite element methods for linear and non linear analysis of solids and structures

› Meshless and particle-based methods in solid mechanics

› Fracture analysis in solids

› Strong discontinuity analysis in solids. Applications to fracture mechanics.

› Rotation-free plate and shell elements

› Coupled problems in solid mechanics (fluid-structure interaction, thermal-mechanical problems, electromagnetics, etc.)

› Combination of finite element and particle methods in solid mechanics.

› FEM for analysis of metal forming processes

Energy Efficiency Methods

› Energy efficiency procedures in buildings and urban areas

› Customers' empowerment.

› Smart urban environments.

› Energy Positive living.

› Small and medium scale bio-digesters.
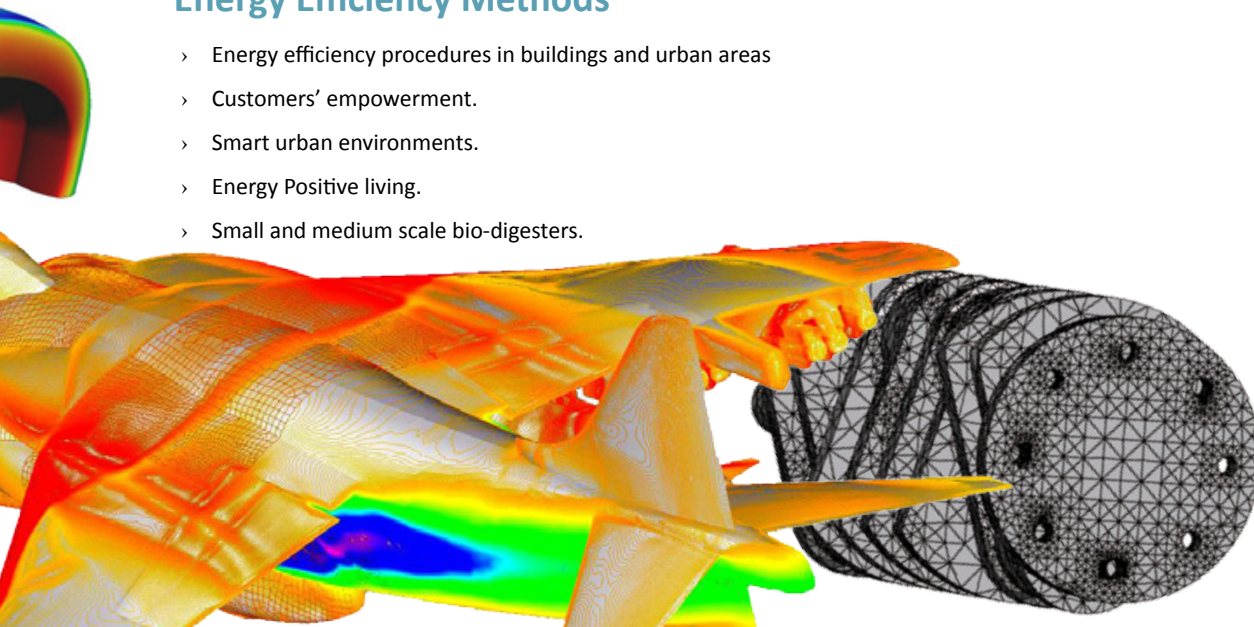
Information and Communication Technology

› Internet tools for supporting management and training activities of individuals and organizations

› Embedded systems

› Methods for integrating and managing wireless sensors in Internet platforms

› Health monitoring methods for constructions and buildings using wireless sensors and ICT

› Development and integration of geographic information tools into decision support systems

› Decision support systems integrating wireless sensors, networks, data bases, info-mechanics systems, computer simulation methods and AI technology

› Application of ICT to manufacturing processes in industry

Nature

› Climate change

› Natural hazards

› Fresh water production and other environmental challenges

Optimization Methods

› Development of optimization algorithms based in gradient techniques

› Development of optimization methods based in evolutionary algorithms

› New methods for robust optimal design using game theory

› Parameter identification in constitutive models via optimization technics

› Identification of the optimal mesh size in optimal design processes

Pre and Post processing

› Development and maintenance of the GiD pre and post processing system (www.gidhome.com)

› New methods for generating structured and unstructured meshes

› Input data technology for large scale computational problems

› Graphical visualization techniques for large scale simulation problems

› Generation of input data for finite element analysis from medical images

› Integration of geographical information systems (GIS) with pre and post processing tools and finite element analysis codes

› Meshless methods for the parametrization of geometries for shape optimization problem
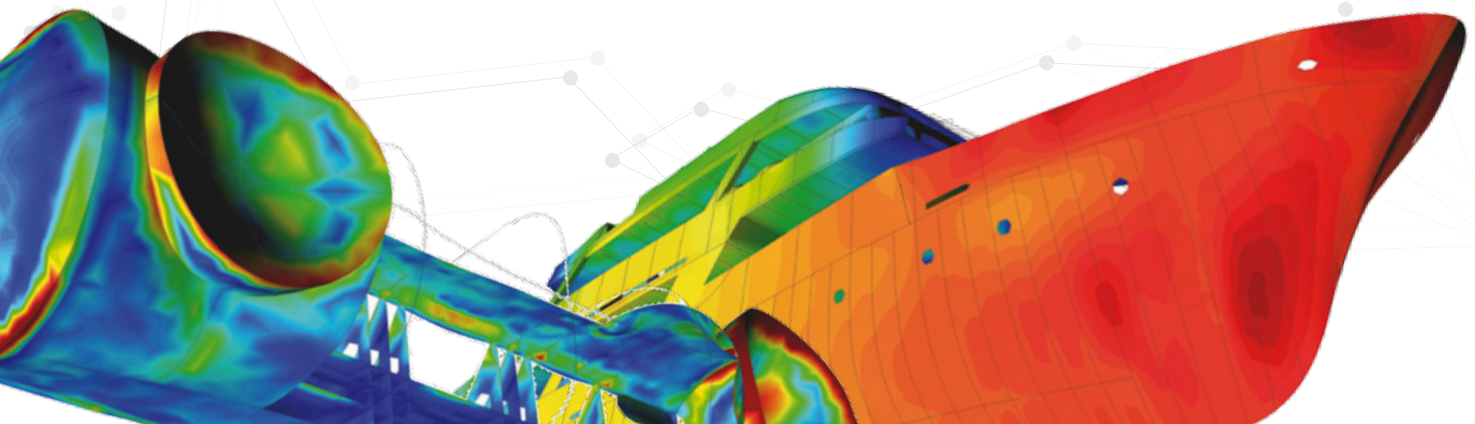
RESEARCH AREAS AND RTD GROUPS

The research, development and technological innovation (RDT) activities at CIMNE are carried out by the following RDT Areas and Groups:

Bio-Medical Engineering Area

- **Computational Bioengineering Group**

- **Computer Modelling and Simulation in Biomechanics Group**

Civil Engineering Area

- **Geomechanics Group**

- **Risk Assessment Group**

- **Structural and Continuum Mechanics Group**

Energy and Environment Area

- **Building, Energy and Environmental Group**

- **Nature Group**

Information Technology Area

- **Information and Communication Technology Group**

- **Pre, Postprocessing Group**

Manufacturing Area

- **Industrial Processes Group**

Numerical Methods and Scientific Computing Area

- **Mathematical and Computational Modeling Group**

- **Large Scale Scientific Computing Group**

Transport Area

- **Aerospace Group**

- **Marine and Naval Group**

In the following pages we list the key objectives of each RTD Group, its staff and the more relevant on-going competitive RTD projects, including the funding agency, the coordinator and the participants in the project.

More information on the activities of the different RTD Groups of CIMNE can be found in:

www.cimne.com

Computational Bioengineering Group

Modeling the function of the human system in health and disease represents a fascinating scientific challenge. This challenge can only be addressed by combining a deep understanding of the physiologic, biologic, engineering and mathematical principles involved. Rather than focusing on the computational methods themselves, we are concerned with their appropriate application for the resolution of practical and fundamental clinical questions. Our research group is focused on Cardiovascular Problems, Medical image processing, Pulmonary Problems, Biomedical devices and Clinical Decision Support Systems.

The mission of the BioMedical Department of CIMNE is to create a fusion of engineering and the medicine that promotes scientific discovery and the development of new technologies and therapies through research and education. BioMedical Departament of CIMNE works in the below areas:

› Development of numerical methods for modelling and simulation of biomechanical and bio-medical engineering problems.
› Simulation of the mechanics of the cardiovascular system
› Study of the heart mechanics
› Study of the mechanics of the urology system
› Fluid-dynamic analysis of the blood flow in vessels
› Decision support system in bio-medical engineering
› Biomedical signal
› Image processing

STAFF

Group Leader
Eduardo Soudah

Members
Jorge Suit Pérez

CONTACT ADDRESS

CIMNE- Barcelona
Edifici C-1, Campus Nord UPC
Gran Capità s/n 08034 Barcelona

esoudah@cimne.upc.edu

ON-GOING RTD PROJECTS

WITH ME: The European Platform to Promote Healthy Lifestyle and improve care through a Personal Persuasive Assistant
FP7-ARTEMIS-JU
ATOS (Coordinator), CIMNE + 6 partners
01/06/2013 - 31/05/2016

MR 4D FLOW: Flow quantification
Direct Contract from PIE-MEDICAL Imaging
15/12/2012 - 15/07/2014

Computer Modelling and Simulation in Biomechanics Group

> Bio-Medical Engineering
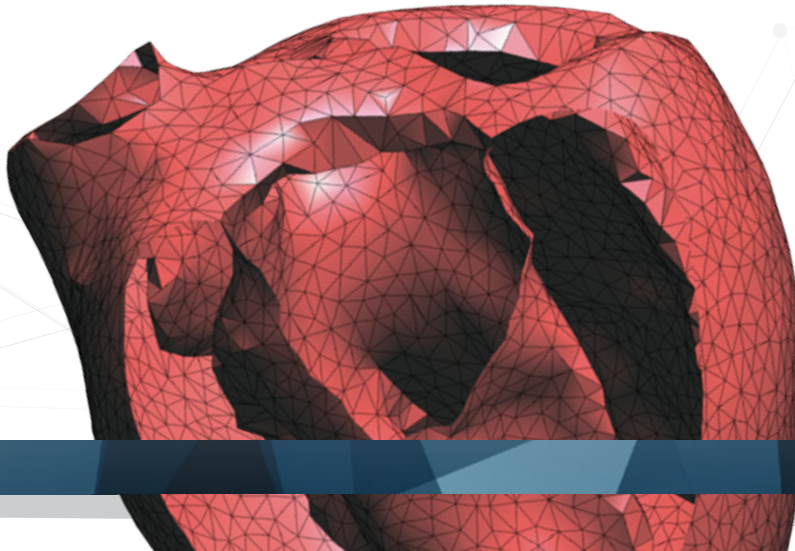
The Computer Modelling and Simulation in Biomechanics (CMSB) Group works in the following research lines and fields:

› Bone simulation and modeling

› Platform for the virtual modeling and representation of the human body

› Low contact plates for fractures

› Dynamic compression plates for fractures

› Boundary elements in biomechanics

› Numerical simulation and design of dental implants

› Numerical simulation of biomedical devices

STAFF

Group Leader
Miguel Cerrolaza

Members
Javiera Valdivia
Reinaldo Wiener
Sergio Oller
Melba Navarro
Ester Comellas
Everling Dávila
Juan Carlos Osorio
Mailhyn Cafiero
Iranel González
Eduardo Soprano

CONTACT ADDRESS

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08860, Castelldefels
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mcerrolaza@cimne.upc.edu

ON-GOING RTD PROJECTS

TOTAL.KNEE: Development of a new generation of knee prostheses with enhanced lifespan features using advanced computational biomechanics
FP7 – PEOPLE
CIMNE (Coordinator)
01/04/2012 - 31/03/2016

Geomechanics Group

> Civil Engineering

STAFF

Group Leaders
Eduardo Alonso and Antonio Gens

Members

David Abadias	Laura González	Tobias Roetting
Mauricio Alvarado	Claudia Gonzalez	Enrique Edgar Romero
Clara Alvarado	Meritxell Gran Esforzado	Daniel Ruiz
Gonzalo Auría	Christian Hoffmann	Jatnna Alexandra Sánchez
Marcelo Bagur	Francesc De Paula Jordana	Xavier Sanchez
Ramón Barboza	Anna Jurado	Núria Sau
Jordi Belles	Akemi Kiyota	Victor Serri
Alejandro Blanco	Alberto Ledesma	Karim Tamoh
Lucila Candela	Olga Christina Mavroula	Mauricio Tapias
Mariano Andrés Cebrian	Enrique Mirambell	Daniel Tarragó
Matteo Oryem Ciantia	María Del Mar Obrador Gil	Eike Thaysen
Fernando Cortés	Sebastian Olivella	Erdem Toprak
Rotman Alejandro Criollo Manjarrez	Marta Pérez	Ana Trapote
Alessandra Di Mariano	Núria Mercè Pinyol	Jean Vaunat
Daniel Fernández	Mónica Prats Martínez	Violeta Velasco
María García	Estanislao Pujades	Claudia Villarraga
Vicente Gibert	Anna Ramón Tarragona	María Teresa Yubero
Raúl Gimenez	Celia Riera	Mª Dolores Zavala
Berta María Gomez	Danny Rodriguez	

ON-GOING RTD PROJECTS

PARTING: Métodos de partículas en Geomecánica
Retos Investigación - MINECO
CIMNE (Coordinator)
01/01/2014 - 31/12/2017

CONTACT ADDRESS
CIMNE- Barcelona
Edifici C-1, Campus Nord UPC
Gran Capità s/n 08034 Barcelona
Telf: + 34 93 2057016

e-mail: eduardo.alonso@upc.edu
        antonio.gens@upc.edu

Civil Engineering
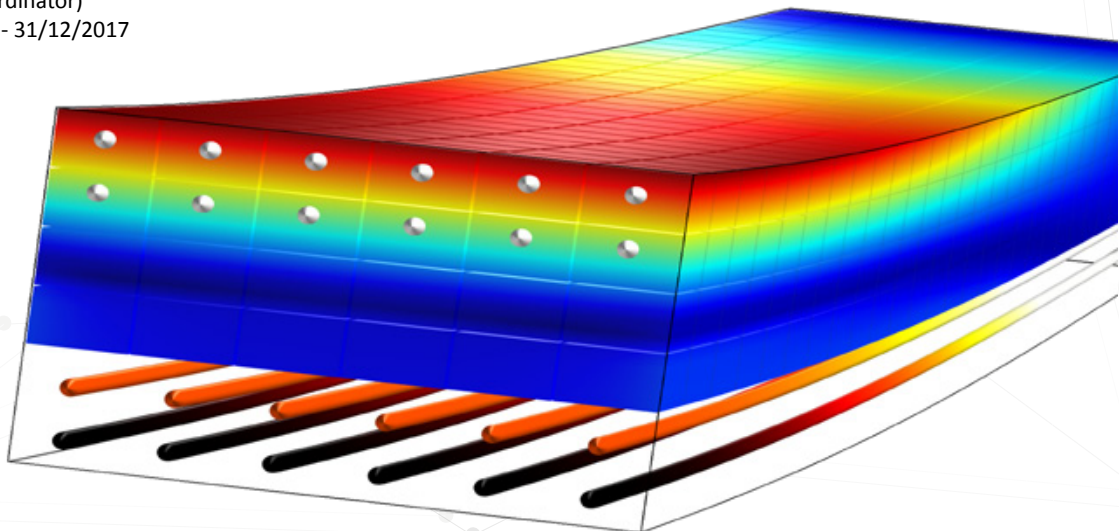
Risk Assessment Group

The Risk Assessment Group, RAG, made important contributions to seismic vulnerability and risk studies in Spain, Europe and Latin-America. 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 modeling 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.

The RAG has been involved in European RTD projects in the risk assessment field such as SERGISAI, VAB, RISK-UE, RAMFLOOD, LESSLOSS, MOVE and DESURBS of the FP7 of the European Commission, but also in the Program of Indicators of Risk and Risk Management in the Americas (2002-2004) and its updates (2009 and 2013), and in the development and application of the Mega-Cities Indicator System in Manila. At national level, in Spain, members of this group participated in the project CoPASRE (CGL2011-29063), that is working in the seismic risk evaluation from a comprehensive and probabilistic approach for Spain; EVASIS (REN2002-03365/RIES), whose main results were physical seismic risk scenarios for the city of Barcelona, in HABITAT 2030 and in SEDUREC (both projects related to the risk assessment of civil engineering structures). The team also participates in important projects in the field of disaster risk assessment funded by the World Bank, the Inter-American Development Bank and the International Strategy for Disaster Reduction of United Nations (UN-ISDR).

RAG 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 hazards.

The countries where RAG has been working are: Argentina, Bahamas, Barbados, Belize, Bolivia, Brazil, Chile, Colombia, Costa Rica, Dominican Republic, Ecuador, El Salvador, Guatemala, Guyana, Haiti, Honduras, Jamaica, Mexico, Nicaragua, Panama, Paraguay, Peru, Surinam, Trinidad & Tobago Uruguay, Venezuela and Spain.

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ON-GOING RTD PROJECTS

COPASRE: Enfoque integral i probabilista para la evaluación del riesgo sísmico en España
PLAN NAC. I+D (2008-2011) - Inv. Fundamental No Orientada
CIMNE (Coordinator), CIMNE + 5 partners
01/01/2012 - 31/12/2014

> Civil Engineering

Structural and Continuum Mechanics Group

The Structural and Continuum Mechanics (SCM) Group of CIMNE specializes on 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 and simulation and optimization of industrial forming processes.

The research activities of the SCM 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 SCM Group 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 recognized. The scientific contributions and software derived from the SCM Group´s research activity are of particular relevance to the solution of multidisciplinary problems in the field of civil, industrial, aerospace, marine and naval engineering, among others.

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Guillermo Casas
Miguel Angel Celigueta
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ON-GOING RTD PROJECTS

> Civil Engineering

M-RECT: Saving Energy in Europe's Public Buildings

FP7-Multiscale reinforcement of semi-crystalline thermoplastic sheets and honeycombs
VICTREX (Coordinator), CIMNE + 16 partners
15/04/2010 - 14/04/2014

ULCF: AUltra low cycle fatigue of steel structures under high strain transient loading conditions

RFCS-Research Fund for Coal and Steel.
FLUP (Coordinator), CIMNE + 6 partners
01/07/2011 - 30/06/2014

REALTIME: Real Time Computational Mechanics Techniques for Multi-Fluid Problems

FP7
CIMNE (Coordinator), + 2 partners
01/12/2009 - 30/11/2014

MUMOLADE: Multiscale Modelling of Landslides and Debris Flows

FP7
BOKU (Coordinator), CIMNE + 20 partners
01/01/2012 - 31/12/2015

MARS: Manipulation of Reynolds stress for drag reduction and separation control

FP7
CIMNE (Coordinator) + 20 partners
01/10/2010 - 31/03/2014

DESURBS: Planning, (re)design and re(engineering) of urban areas to make them less vulnerable and more resilient to security threats

FP7
Resman (Coordinator) + 26 partners
01/01/2011 - 31/12/2014

COMFUS: Computational Methods for Fusion Technology

FP7
CIMNE (Coordinator)
01/01/2011 - 31/12/2015

SAFECON: New Computational Methods for Predicting the security of constructions to Water Hazards accounting for fluid-soil-structure interactions

FP7
CIMNE (Coordinator)
01/01/2011 - 31/12/2015

CHANGES: Changing Hydro-Meteorological Risks- As Analyzed by A New Generation of European Scientists

FP7
UTWENTE (Coordinator)
01/01/2011 - 31/12/2014

TOTAL.KNEE: SDevelopment of a new generation of knee prostheses with enhanced lifespan features using advanced computational biomechanics

FP7
CIMNE (Coordinator)
01/04/2012 - 31/03/2016

FLEXICAST: Robust, and FLEXible CAST iron manufacturing

FP7
UPC (Coordinator), CIMNE + 16 partners
01/11/2012 - 31/10/2016

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

FP7
CIMSA (Coordinator), CIMNE + 7 partners
01/12/2012 - 31/05/2015

EUNISON: Extensive UNIfied-domain SimulatiON of the Human Voice

FP7
KTH (Coordinator), CIMNE + 4 partners
01/03/2013 - 29/02/2016

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

FP7
CIMNE (Coordinator)
01/02/2013 - 31/01/2018

ULITES: Ultra-lightweight structures with integrated photovoltaic solar cells: design, analysis and application to an emergency shelter prototype

FP7
BUILDAIR (Coordinator), CIMNE + 5 partners
07/01/2013 - 06/01/2015

ON-GOING RTD PROJECTS

> **Civil Engineering**

ULITES: Ultra-lightweight structures with integrated photovoltaic solar cells: design, analysis and application to an emergency shelter prototype
FP7
BUILDAIR (Coordinator), CIMNE + 5 partners
07/01/2013 - 06/01/2015

SOLARNET: High-Resolution Solar Physics Network
FP7
IAC (Coordinator), CIMNE + 34 partners
01/04/2013 - 31/03/2017

UMRIDA: unCertainty quAntification Robust DesIgN Aeronautics
FP7
NUMECA (Coordinator), CIMNE + 23 partners
01/10/2013 - 30/09/2016

GRAIN 2: Greener Aeronautics International Networking
FP7
CIMNE (Coordinator), CIMNE + 22 partners
01/10/2013 - 30/09/2015

ICMEG: Integrative Computational Materials Engineering expert group
FP7
ACCESS e.V. (Coordinator), CIMNE + 9 partners
01/10/2013 - 30/09/2016

HYPERMEMBRANE-DEMO: Development of an adaptable structure for architecture application
FP7
Eurocomercial de Nuevas Tecnologías, S.L. ,
CIMNE (Coordinator) + 4 partners
01/01/2014 - 31/12/2015

T-MAPPP: Training in Multiscale Analysis of multi-Phase Particulate Processes
FP7
University of Edimburgh (Coordinator), CIMNE + 8 partenrs
01/01/2014 - 31/12/2017

TCAiNMaND: Tri Continental Alliance in Numerical Methods applied to Natural Disasters
FP7
CIMNE (Coordinator), CIMNE + 8 partenrs
01/01/2014 - 31/12/2017

NUMEXAS: TNumerical methods and tools for key exascale computing challenges in engineering and applied sciences
FP7
CIMNE (Coordinator) + 4 partners
01/10/2013 - 30/09/2016

VELaSSCo: Visualization for Extremely Large-Scale Scientific Computing
FP7
CIMNE (Coordinator), CIMNE + 4 partners
01/01/2014 - 31/12/2016

SimPhoNy: CSimulation framework for multi-scale phenomena in micro- and nanosystems
FP7
Fraunhofer (Coordinator), CIMNE + 13 partners
01/01/2014 - 31/12/2016

Dragon-Star: "Dragon-Star travel Grant in the framework of the Dragon-STAR— Dragon - Sustaining Technology And Research (EU-China Collaboration)"
FP7
CIMNE (Coordinator)
01/09/2014 - 30/10/2014

Castincloud (FORTISSIMO): Sustainable CLOUD Services for bringing High Performance CASTINg Simulations to the SMEs
FP7
QUANTECH (Coordinator), CIMNE + 2 partners
01/10/2014 - 31/03/2016

WAM-V: ADVANCED NUMERICAL SIMULATION AND PERFORMANCE EVALUATION OF WAVE ADAPTIVE MODULAR VESSELS (WAM-V®) IN SPRAY GENERATING CONDITIONS
FP7
Office for Naval Research (ONR), CIMNE
01/07/2012 - 30/06/2015

ON-GOING RTD PROJECTS

ROMSCALE: Modelado multiescala del comportamiento mecánico y de fallo estructural en materiales, utilizando técnicas de reducción de modelos
PLAN NAC. I+D (2008-2011) - Inv. Fundamental No Orientada
CIMNE (Coordinator)
01/01/2012 - 31/12/2014

XLIDE: Desarrollo de Herramientas para el Análisis de Estabilidad en Laderas con Riesgo Potencial sobre Infraestructuras
INNPACTO
OFITECO S.A. (Coordinator), CIMNE + 2 partners
01/07/2011 - 31/12/2014

ACUÑA: Desarrollo de un prototipo de bloque en forma de cuña y de la metodología para su uso como protección frente a la erosión en presas o balsas de materiales sueltos
INNPACTO
PREHORQUI (Coordinator), + CIMNE 2 partners
04/05/2011 - 30/06/2014

BALAMED: Modelación numérica del conjunto carril-traviesa-balasto mediante el Método de los Elementos Discretos
PLAN NAC. I+D (2008-2011) - Inv. Fundamental No Orientada
CIMNE (Coordinator)
01/01/2013 - 31/12/2015

SODDAT (2012): Simulación numérica de la distorsión óptica debida a la turbulencia atmósferica
CIMNE
ACCESS e.V. (Coordinator), CIMNE + 9 partners
01/10/2013 - 30/09/2016

EHEA: Estructura Hinchable Energéticamente Autosuficiente
INNPACTO
BUILDAIR (Coordinator), CIMNE + 1 partenrs
01/10/2012 - 30/09/2014

MMEX: Multimedia Mobile Experience
INNPACTO
BUILDAIR (Coordinator) , CIMNE + 1 partenrs
01/10/2012 - 31/03/2015

POLILAB: Diseño del prototipo de una compuerta fusible recuperable tipo laberinto de fondo poliédrico para la mejora de la seguridad hidrológica de las presas (POLILAB).
INNPACTO
JGICSA (Coordinator), CIMNE + 3 partners
01/09/2012 - 31/12/2015

PARFLOW: "Desarrollo y validación de métodos computacionales para análisis de flujos ambientales de partículas y sus efectos en la construción y elterreno"
RETOS
CIMNE (Coordinator) + 2 partners
01/01/2014 - 31/12/2016

EACY: Marco computacional de alta precisión para localización de deformaciones y mecanismos de fallo
Fomento Excelencia
CIMNE (Coordinator)
01/01/2014 - 31/12/2016

LWIN-BRIDGE: LIGHT WEIGHT INFLATABLE BRIDGE
Acción Dinamización
CIMNE (Coordinator)
01/10/2013 - 30/09/2014
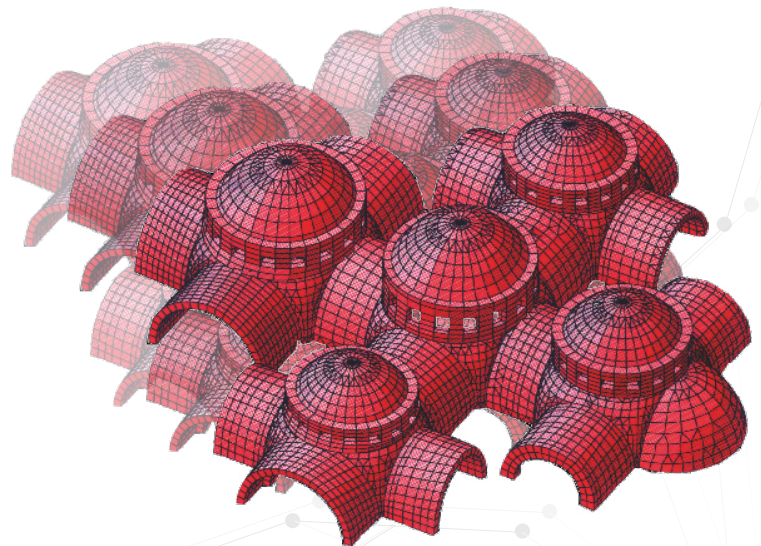
Building, Energy and Environment (BEE GROUP)

The Building, Energy and Environment Group (BEE Group) was founded in 2001. Its R&D activities are focused on the field of renewable energies and energy efficeincy. Their main research lines are:

› Numerical methods for analysis and design of energy sustainable buildings and constructions.

› Numerical methods for acoustic analysis and design of structures with enhanced materials.

› Methods for analysis of recycling processes of natural and artificial wastes for energy saving and environmental applications.

› Development of decision support systems in the energetic and environment sectors integrating wireless sensors, networks, databases, info-mechanical systems, computer simulation methods and AI technology.

› Development of computational methods for analysis and design of wave power plants.

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ON-GOING RTD PROJECTS

SMART SPACES: Saving Energy in Europe's Public Buildings
CIP-Competitiveness and Innovation Framework Programme
EMPIRICA (Coordinator), CIMNE
01/01/2012 - 31/12/2014

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

SEMANCO: S. Tools for Carbon Reduction in Urban Planning
FP7
FUNITEC (Coordinator) + 7 partners
01/09/2011 - 30/11/2014

AIDA: Affirmative Integrated Energy Design Action
CIP
TU WIEN (Coordinator), CIMNE
01/04/2012 - 31/03/2015

EMPOWERING: Empowering households to save energy by informative billing
CIP
CIMNE (Coordinator) + 11 partners
01/04/2013 - 30/09/2015

ENCERTICUS: Energy Certification, Technology, Information and Communication for User Benefit
MED Programme.ENVIRONMENT
CIMNE (Coordinator) + 4 partners
01/03/2013 - 30/06/2015

ZEBRA: Nearly Zero-Energy Building Strategy
CIP
TECHNISCHE UNIVERSITÄT WIEN (Coordinator) + 6 partners
01/04/2014 - 30/09/2016

Nature Group

The main activity of the CIMNE-Nature Group is to advance knowledge and technology in global environmental research by bringing together and managing skilled scientists and engineers to develop strategic and applied environmental solutions. The main RTD lines of the group are:

› Water desalination and purification

› Chemical methods for energy storage

› Climate adaptation

› Risk events studies

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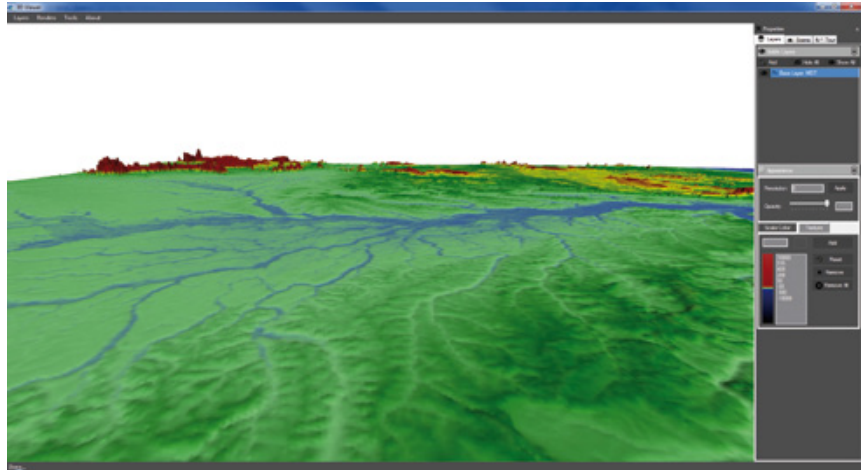
ON-GOING RTD PROJECTS

NEREIDAS: Implementation of environmental restoration techniques for dimishing the environmental impacts of ports: steps towards a new certification.
TEN-T (Trans-European Transport Network)
Melilla Port Authority (Coordinator), CIMNE + 4 partners
01/08/2013 - 31/12/2015
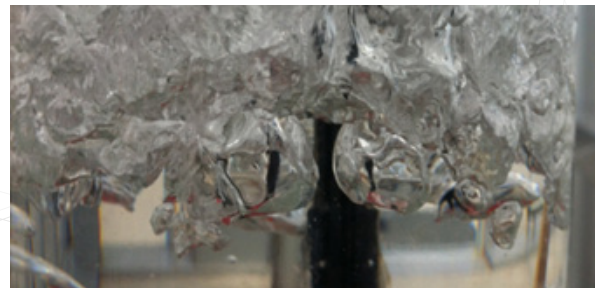
Information and Communication Technologies Group

This group is currently working on:

› Development of Internet tools for supporting management and training activities of individuals and organizations

› Methods for integrating and managing wireless sensors in Internet platforms.

› Development of health monitoring methods for constructions and buildings using wireless sensors and ICT.

› Development and integration of geographic informations tools into decision support systems.

› Development of decision support systems integrating wireless sensors, networks, data bases, info-mechanics systems, computer simulation methods and AI technology.

› Application of ICT to manufacturing processes in industry.

STAFF

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ON-GOING RTD PROJECTS

DESURBS: Planning, (re)design and re(engineering) of urban areas to make them less vulnerable and more resilient to security threats
FP7
Resman (Coordinator), + 26 partners
01/01/2011 - 31/12/2014

NEUROLINGUA: Plataforma de estimulación y rehabilitación de las alteraciones del lenguaje basada en fundamentos de neurociencia cognitiva.
INNPACTO.
ICA (Coordinator), CIMNE + 1 partners
01/06/2011 - 30/06/2014

JUST4ME: Just-in-time and just-for-me: Hacia la autogestión del aprendizaje en un entorno personal ubicuo
INNPACTO
ICA (Coordinator), CIMNE + 4 partners
01/06/2011 - 30/06/2014

NEREIDAS: Implementation of environmental restoration techniques for dimishing the environmental impacts of ports: steps towards a new certification.
TEN-T Programme
Melilla Port Authority (Coordinator), CIMNE + 3 partners
01/08/2013 - 31/12/2015

WiderMoS: Wide Interoperability and new governance moDels for freight Exchange linking Regions through Multimodal maritime based
TEN-T Programme
La Spezia Port Authority (Coordinator), CIMNE + 14 partners
01/06/2013 - 31/12/2015

MONALISA 2.0
TEN-T Programme
Swedish Maritime Administration (Coordinator) CIMNE + 29 partners
01/01/2012 - 31/12/2015

ULISES: Desarrollo de juna plataforma Autónoma para vigilancia y defensa en entornos Offshore
RETOS
Industrias Ferri (Coordinator), CIMNE + 1 partners
28/01/2014 - 28/12/2016

TrainMos II: Training Motorways of the Sea 2
TEN-T Programme (Trans-European Transport Network)
UNIVERSITY OF STRATHCLYDE (Coordinator)
15/08/2014 - 31/12/2015

> Information Technology

> Information Technology

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 are the main research lines:

› Development and maintenance of the GiD pre and post processing system (www.gidhome.com).

› Development of methods for generating structured and unstructured meshes.

› Development of input data technology for large scale computational problems.

› Graphical visualization techniques for large scale simulation problems.

› Generation of input data for finite element analysis from medical images.

› Integrations of geographical information systems (GIS) with pre and post processing tools and finite element analysis codes.

› Meshless methods for the parametrization of geometries for shape optimization problems.

STAFF

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RTD PROJECTS

VELaSSCo: Visualization for Extremely Large-Scale Scientific Computing
FP7
CIMNE (Coordinator) + 7 partners
01/01/2014 - 31/12/2016

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> Manufacturing
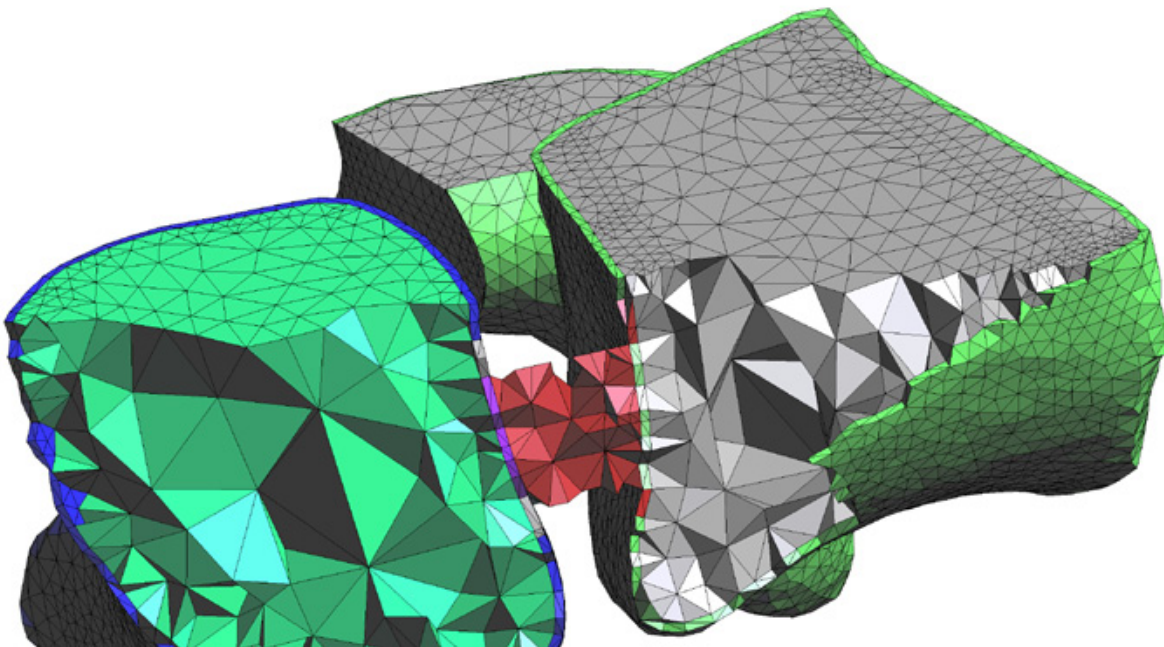
Industrial Processes Group

The Industrial Processes Group is formed by a team of professionals specialized in technology transfer companies in the field of metal forming parts, elastomers, in the environmental area and project management.

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

› Studies of improved manufacturing processes of metal (steel, aluminum, etc.).

› Deep drawing process simulation with elastomers.

› Treatment and recovery of wastes.

› Development of pre/post processing interfaces for simulations software for industrial applications.

In addition, CIMNE integrates Help Center Network for Technology Innovation (XIT) of ICW.

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ON-GOING RTD PROJECTS

HYPERMEMBRANE-DEMO: Development of an adaptable structure for architecture applications
FP7
Eurocomercial de Nuevas Tecnologías, S.L. (Coordinator)
BUILDAIR (Coordinator), CIMNE + 4 partners
01/01/2014 - 31/12/2015

> Numerical Methods and Scientific Computing

Mathematical and Computational Modeling Group

The mission of the Mathematical and Computational Models 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 modeling 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 modeling, numerical methods, and interest in their applicability

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ON-GOING RTD PROJECTS

SAFER: Optimización de sistemas de aislamiento ferroviario
MICINN - INNPACTO
COMSA (Coordinator)+ CIMNE
01/07/2011 - 30/04/2014

> Numerical Methods and Scientific Computing
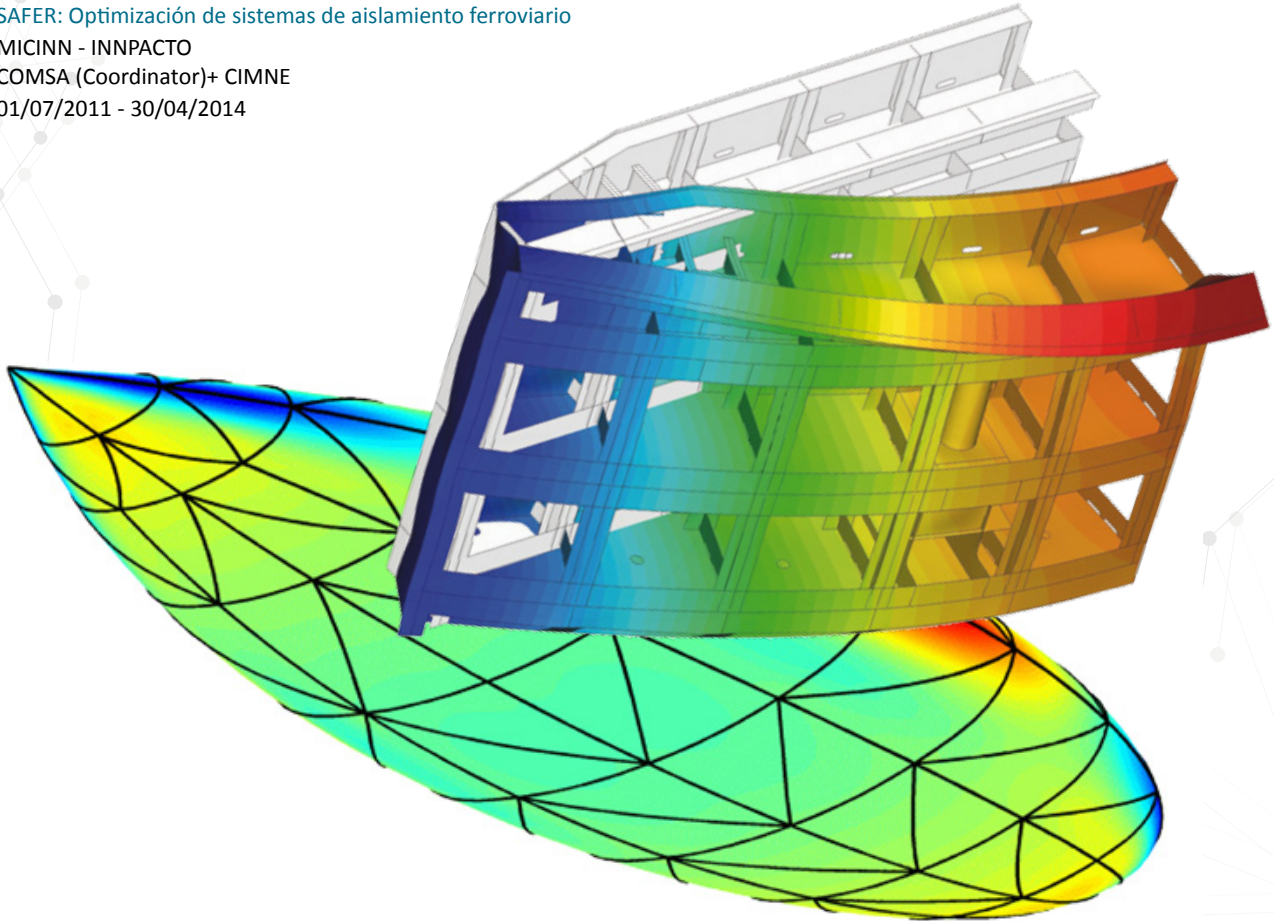
Large Scale Scientific Computing Group

The objective of the Large Scale Scientific Computing (LSSC) Group is the development of new computational methods for the solution of scientific and engineering problems. More precisely, we develop high performance finite element methods for multiphysics problems. A more detailed description of our research lines can be found in these pages.

The LSSC team is hosted by CIMNE-Castelldefels, at the Parc Mediterrani de la Tecnologia in the Universitat Politècnica de Catalunya

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Alba Hierro	Ramón Planas
Alberto Francisco Martín	Ricardo Javier Príncipe
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ON-GOING RTD PROJECTS

COMFUS: Computational Methods for Fusion Technology
FP7 - ERC - Starting Grant
CIMNE (Coordinator)
BUILDAIR (Coordinator)
01/01/2011 - 31/12/2015

FUSIM: Herramientas computacionales para interacción solidometal líquido. Aplicación al diseño de módulos de ensayo de envoltura líquida
FP7 - ERC - Starting Grant
IFNO - PLAN NAC. I+D (2008-2011) (Coordinator)
CIMNE (Coordinator)
01/01/2012 - 28/02/2015

NUMEXAS: Numerical methods and tools for key exascale computing challenges in engineering and applied sciences
FP7
CIMNE (Coordinator) + 4 partners
01/10/2013 - 30/09/2016

Superconducting (FORTISSIMO): Multi-physics simulation of high temperature superconducting devices
FP7
OXO (Coordinator) CIMNE + 2 partners
01/10/2014 - 31/03/2016

> Transport
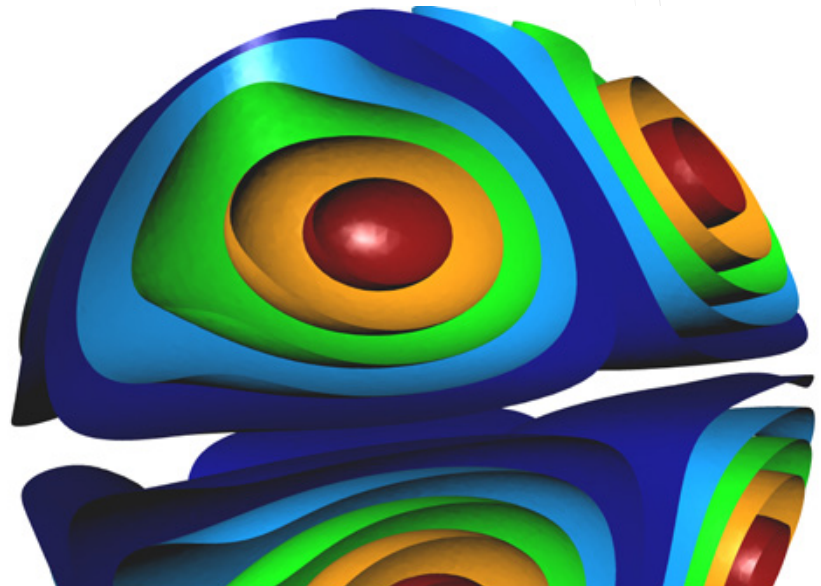
Aerospace Group

The CIMNE Aeronautics Department is in charge of developing RTD projects in the aeronautical field, including:

› Unstructured grid stabilized finite element and meshless methods for analysis of fluid flows.

› 3D adaptive mesh refinement techniques for compressible/ incompressible flows.

› Optimum shape design in aerodynamics combined with adaptive mesh refinement.

› Structural analysis of composite aerospace structures under static and dynamic load.

› Aeroelastic analysis of parachutes.

› Pre/ post processing tools (GiD) for aerospace engineering problems

› 3D unstructured mesh generation

› Analysis data definition

› Visualisation of results

› New algorithms for multidisciplinary problems in aerospace engineering: aeroelasticity, thermal flows, electromagnetics, aeroacoustics, etc

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Alexandre Jarauta
Enrique Ortega
Jacques Périaux

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ON-GOING RTD PROJECTS

MARS (FLOW CONTROL): Manipulation of Reynolds stresses for drag reduction and separation control
FP7
CIMNE (Coordinator) + 20 partners from Europe and China
01/10/2010 - 31/03/2014

PARAPLANE: Development of a New Steerable Parachute System for Rescue of Small and Medium Size Airplanes
FP7
CIMSA (Coordinator) CIMNE + 7 partners
01/12/2012 - 31/05/2015

UMRIDA: unCertainty quAntification Robust DesIgN Aeronautics
FP7
NUMECA (Coordinator) + 23 partners
01/10/2013 - 30/09/2016

GRAIN 2: Aeronautics International Networking
FP7
CIMNE (Coordinator) + 21 partners from Europe and China
01/10/2013 - 30/09/2015

e-CAERO 2: European Collaborative Dissemination of Aeronautical research and applications 2
H2020
CIMNE (Coordinator) + 5 partners
01/12/2014 - 30/11/2017

> Transport
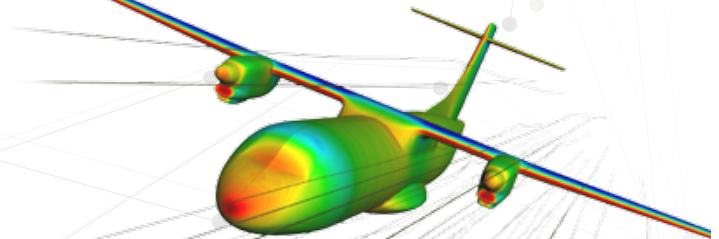
Marine and Naval Engineering Group

The main RTD lines of the Marine and Naval Engineering Group are:

› Numerical methods for hydrodynamic analysis of vessels.

› Finite element methods for analysis of composite materials and structures in ships accounting for fluid-structure interaction effects.

› Numerical methods for analysis of off-shore constructions accounting for fluid-structure interaction effects.

› Numerical methods for environmental problems in naval and marine engineering.

› Optimum shape design methods for ships

› Numerical methods for multidisciplinary problems in naval and marine engineering.

› Development of decision support systems in naval and marine engineering, integrating wireless sensor networks, data bases, computer simulation methods and AI technology (neuronal networks).

STAFF

Group Leader
Julio García

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ON-GOING RTD PROJECTS

WiderMoS: Wide Interoperability and new governance moDels for freight Exchange linking Regions through Multimodal maritime based cOrridorS
TEN-T (Trans-European Transport Network)
La Spezia Port Authority (Coordinator), CIMNE + 6 partners
01/06/2013 - 31/12/2015

PARAPLANE: Development of a New Steerable Parachute System for Rescue of Small and Medium Size Airplanes
TEN-T (Trans-European Transport Network)
Swedish Maritime Administration (Coordinator) CIMNE + 7 partners
01/01/2012 - 31/12/2015
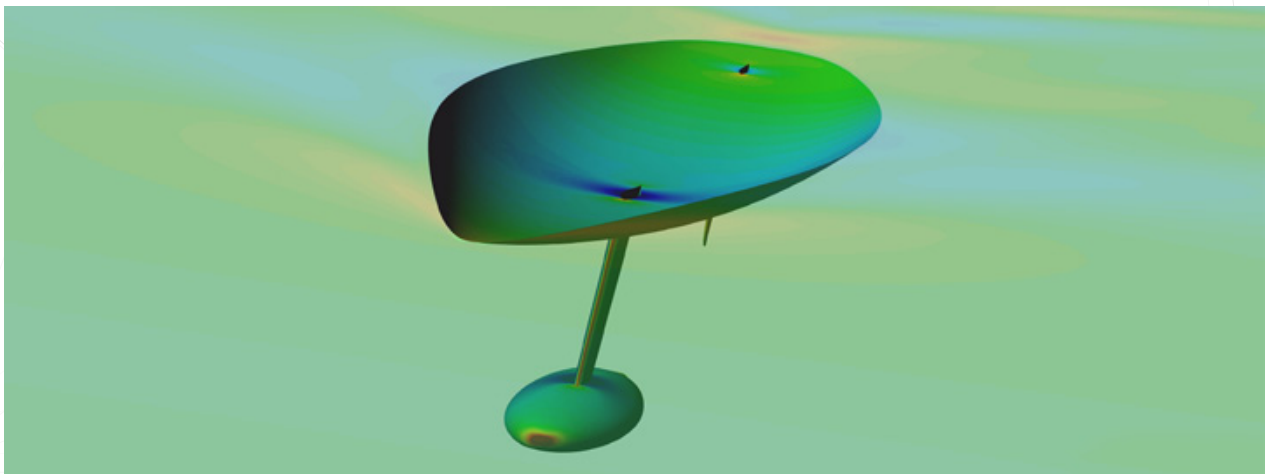
INNOVATION AND TECHNOLOGY TRANSFER

CIMNE products

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

SIMULATION SOFTWARE

MANUFACTURING PROCESSES

STAMPACK
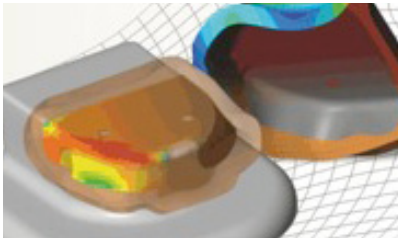
Sheet metal forming processes. Developed by Quantech ATZ, SA. in cooperation with CIMNE.

Marketed by Quantech ATZ, SA since 1999

www.quantech.es

VULCAN
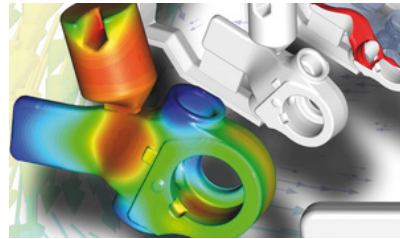
Casting and foundry processes.

Developed by Quantech ATZ, SA. in cooperation with CIMNE.

Marketed by Quantech ATZ, SA since 2001

www.quantech.es

WELDPACK

Welding processes.

Developed by CIMNE

STRUCTURAL ENGINEERING

RAMSERIES
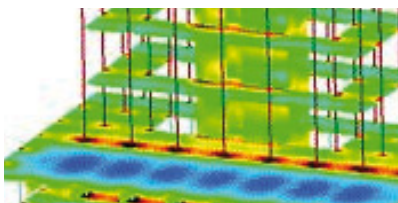
Finite element code for analysis of structures in engineering and architecture.

Developed by Compass Ingeniería y Sistemas, SA. in cooperation with CIMNE.

Marketed by Compass Ingeniería y Sistemas, SA. since 2003

www.compassis.com

DEMPACK
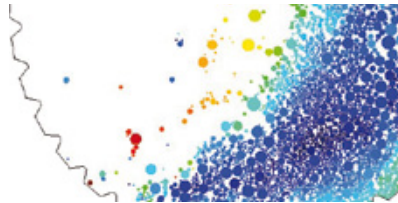
Analysis of granular systems and multifracturing problems in geomechanics and industrial processes using discrete and finite element methods.

Developed by CIMNE

www.cimne.com/dempack

COMET
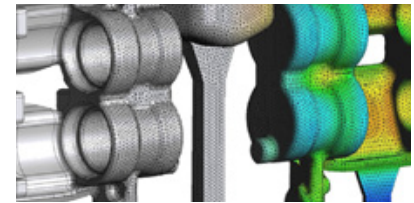
Finite element code for non linear analisys of thermomechanical problems in solid and structural mechanics acounting for frictional contact situations.

Developed at CIMNE

www.cimne.com/comet

FLUID DYNAMICS

TDYN
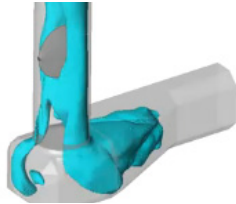
Finite element code for analysis of a wide range of multi-physic problems in engineering and applied science (fluid dynamics, heat transfer, fluid-structure interaction, etc.)

Developed by Compass Ingeniería y Sistemas, SA. in cooperation with CIMNE. Marketed by Compass since 2003
www.compassis.com

SEAFEM
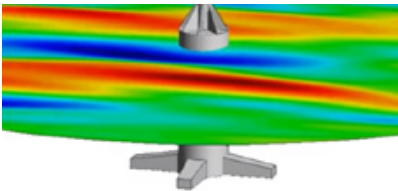
Hydrodynamics and seakeeping analysis of ships and marine structures. Application to wind tower generators in the sea.

Developed by Compass Ingeniería y Sistemas, SA. in cooperation with CIMNE. Marketed by Compass since 2011
www.compassis.com

MULTI-PHYSICS

KRATOS
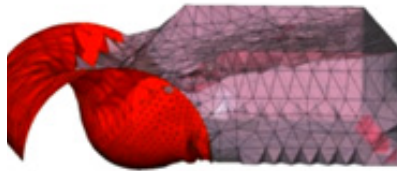
Kratos is an open object-oriented software platform for the development and application of finite element codes for multidisciplinary applications in engineering and applied science.

Developed by CIMNE
www.cimne.com/kratos

PFIRE

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

Developed by CIMNE

ERMES
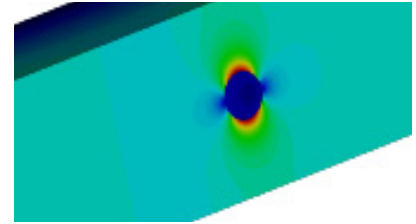
Computational electromagnetics using advanced finite element methods

Developed by CIMNE

http://www.gidhome.com/gid-plus/modules/research-modules/373-ermes

CLICK2CAST
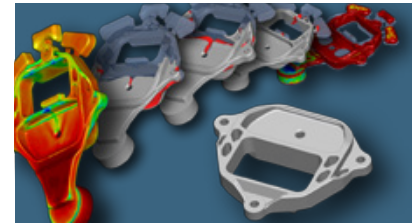
Fast simulation of casting precesses.

Developed by Quantech ATZ in cooperation with CIMNE

Marketed by Quantech ATZ since 2013
www.click2cast.com

BIO-MECHANICS and HEALTH

Health App

App to control eating disorders.

Developed by HealthApp SL in cooperation with CIMNE .

Marketed by HealthApp since 2013
www.bcnhealthapp.com

BodyGiD

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

DECISION SUPPORT SYSTEMS

BEACHING

Information system for management of tourism activities in beach areas.

Developed by CIMNE and marketed by TAOC SA since 2011

www.beaching.com

ROBOCOPT

Interpolated platform for robust optimization in engineering.

Developed by CIMNE

GIS+

Web-based interactive Geographic Information System.

Developed by CIMNE

SIE

Information system for management of energy consumption in public buildings and municipalities.

Developed by CIMNE

Marketed by Gassó Auditors SL and CIMNE since 2005

http://www.inergybcn.com/

ROEM

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

Developed by CIMNE

ETESTING

Web-based platform for e-management of experimental tests.

Developed by CIMNE and Applus

OPEN NN

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

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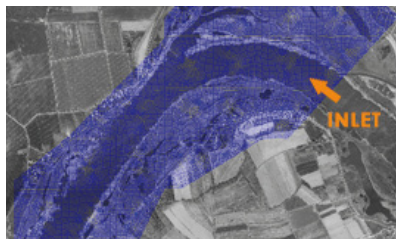
Decision support system (DSS) for risk assessment and managing of floods.
Developed by CIMNE and FLUMEN
www2.cimne.com/ramflood

WSNP

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

PRE AND POST PROCESSING SOFTWARE

GID
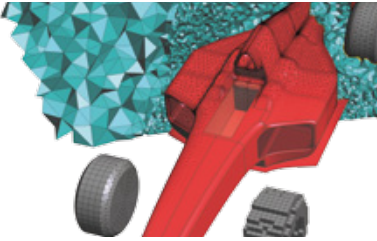
A universal and adaptive pre and postprocessor for computer simulation in engineering and applied science.

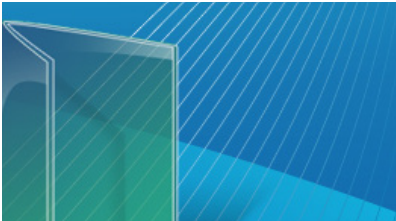Developed & marketed by CIMNE since 1998

www.gidhome.com

DIPPO
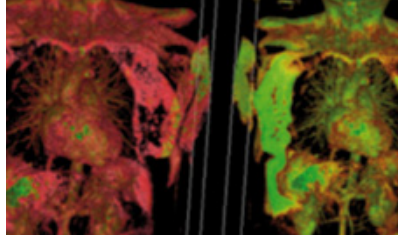
Digital image processing platform.

Developed and marketed by CIMNE since 2011

COLLABORATIVE WORK PLATFORMS

SIGPRO

Integrated software platform for the management of the research and financial activities and reports in RTD projects.

Developed by CIMNE

Mi colegio en red (MCR)

Integrated communications and services system for schools via the Internet.

Developed by CIMNE, Since 2000

LHINGS

Lhings is a cloud platform designed to provide access and links to all kind of things and let users management, share and interact with those things anywhere and when they like.

Developed and marketed by Lyncos SL in cooperation with CIMNE

www.lhings.com

FRAKTALIS

Fully customizable Web application that creates virtual communities where users can communicate, share information and work collaboratively.

Developed & marketed by CIMNE since 2009

www.fraktalis.com

ENGINEERING SYSTEMS AND HARDWARE

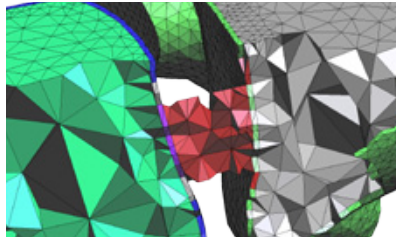## EDUCATIONAL SOFTWARE

Inflatable structures
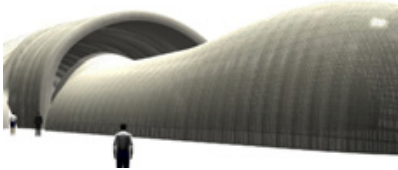
Inflatable pavilions, shelters and bridges for applications in engineering and architecture.

Developed by Building Ingenieria y Arquitectura SL in cooperation with CIMNE.
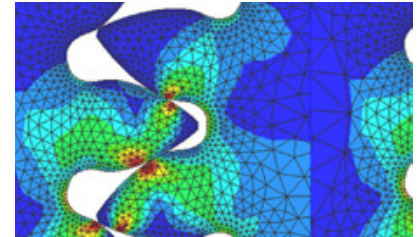
Marketed by BuildAir since 2002 (www.buildair.com)

SoftEducatiu

Educational software for interactive elearning on structural analysis and the finite element method

Developed and marketed by CIMNE

MAT-Fem

Educational program written in MATLAB for introduction to the finite element method for analysis of structures and field problems (thermal, acoustics, seapage, electromagnetics, etc).

Developed by CIMNE

www.cimne.com/mat-fem

Spin-off companies

We list below the companies promoted by CIMNE since 2002.

COMPASS INGENIERÍA Y SISTEMA S.A. *(Created in 2002). The objective of COMPASS is to develop commercial activities in the application of numerical methods in engineering, with emphasis on civil, naval and maritime engineering. COMPASS offers design and analysis services in engineering, project management, specialized software systems for engineering design, innovative developments in engineering and advanced training courses. (www.compassis.com). CIMNE owns 24% of COMPASS.*

SOLUCIONES INTEGRALES DE FORMACIÓN Y GESTIÓN STRUCTURALIA S.A. *(Created in 2002). The objective of STRUCTURALIA is to develop training and consulting activities in civil engineering and construction sector via Internet. The company was sold in 2011 to the US company KAPLAN (The Washington Post Group).*

INGENIA A.I.E. *(Created in 2004). It is a Group of Economic Interest formed by 8 companies and CIMNE. The objective of INGENIA is to promote the participation of its members in projects of industrial size in the aeronautics and space fields in cooperation with the main international manufacturers in the sector. The partners in INGENIA are: Applus, Cimsa, Compass, CT Ingenieros, Prae Trade, Quantech ATZ, Rücker Lypsa, Solid Enginyeria and CIMNE. (www.ingenia.aero). CIMNE owns 12% of INGENIA AIE.*

CIMNE TECNOLOGIA S.A. *is a company 100% owned by CIMNE aiming to industrialize and market the products and technology developed at CIMNE. CIMNE Tecnología S.A. is also an incubator and promoter of new companies. Created in 2011 (http://www.cimnetecnologia.com).*

TECNOLOGÍAS AVANZADAS PARA EL OCIO S.L. (TAOC) *is a company 100% owned by CIMNE Tecnologia SA. It specializes in the development and market of information systems for leisure sectors such as tourism and music. Created in 2012. (www.beaching.com)*

SERVICIOS ENERGÉTICOS AVANZADOS S.L. *is a company 100% owned by CIMNE Tecnología SA. It specializes in the development and marketing of services of software products for energy management of public and private buildings in urban areas. Created in 2012.*

BUILDAIR INGENIERIA Y ARQUITECTURA S.A. *is a company created in 2002. It specializes in the development and marketing of inflatable structures for a wide range of applications in engineering and architecture. CIMNE Tecnología SA owns 5% of BUILDAIR (www.buildair.com).*

COMPUTATIONAL AND INFORMATION TECHNOLOGIES S.A. *is a company 100% owned by CIMNE Tecnología SA. It specializes in the development and application of computational methods and information technology systems in engineering and applied sciences. Created in 2012. (www.citechsa.com)*

LYNCOS TECHNOLOGIES, S.L. *is a company specialized in the development, application and marketing of information and communication technologies and devices for a wide range of application in the Internet of Things sector. CIMNE Tecnología SA owns 15% of LYNCOS TECHNOLOGIES, SL. Created in 2011. (www.lhings.com)*

BUILDAIR APAC *is a subsidiary of Build AIR operating in the Asia-Pacific region from Singapore. CIMNE Tecnología SA owns 20% of BUILDAIR APAC. Created in 2012. (www.buildair.com)*

RSM GASSÓCIMNE ENERGY, S. L. *Created in 2012. This company specializes in the marketing of services and products for energy management of buildings and urban areas. The company is 50% owned by Servicios Energéticos Avanzados, S.L. (www.inergybcn.com)*

PORTABLE MULTIMEDIA SOLUTIONS SL (PMS) *Created in 2013 It specializes in the development and marketing of mobile pavilions incorporating multimedia technology for the leisure, sport and events sectors, among others. The company is 20% owned by CIMNE Tecnología SA. (www.portablemultimediasolutions.com)*

FRESH WATER NATURE S.L *Created in 2013. it specializes in the development of solutions for obtaining fresh water from desalinization of sea water and distillation of waste water. The company is 100% owned by CIMNE Tecnología SA.*

HEALTHAPP S.L. *Created in 2013 and 20% owned by CIMNE Tecnología SA, HealthApp focusses on improving the links between therapists and patients by providing trustful information to the later and their relatives about the therapy and its process. (www.bcnhealthapp.com)*

PNEUMATIC STRUCTURES TECHNOLOGIES S.L. *Created in 2015 and 20% owned by CIMNE Tecnologia SA. It specializes on the development of innovative solutions for pneumatic structures applicable to a wide number of engineering problems. (www.ps-technologies.com)*

BIOMECHANICS DEVELOPMENTS S.L. *Created in 2015 and 50% owned by CIMNE Tecnología S.A.. It specializes on the development of software solutions and services in the biomedical field.*
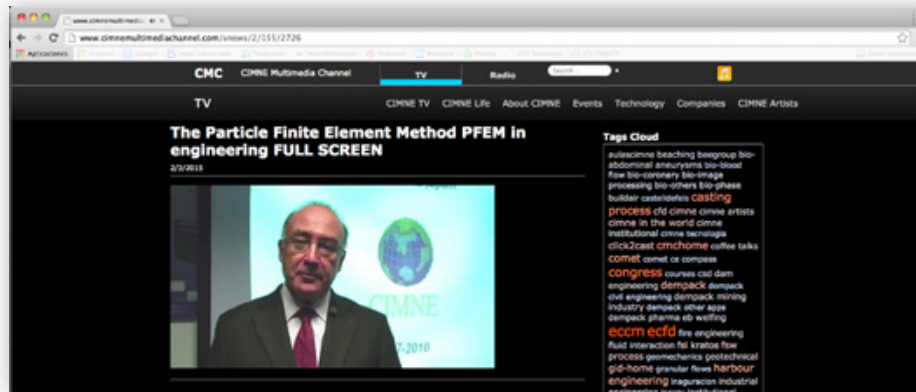
CIMNE MULTIMEDIA CHANNEL

The CIMNE Multimedia Channel was created on December 2013 with the aim of disseminating scientific, technological and cultural events organized and promoted by CIMNE.
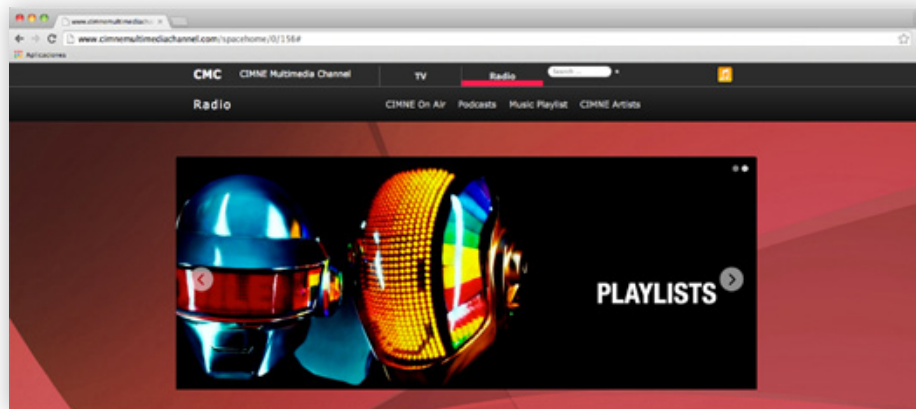

www.cimnemultimediachannel.com

The **CIMNE Tv Channel** broadcasts selected videos and on-line events of interest to CIMNE.

The **CIMNE Radio Channel** broadcasts interviews, cultural and educational programs and music performanced produced and/or selected by CIMNE.

The **CIMNE MULTIMEDIA CHANNEL** is the official channel of Cimne, where you will find videos about technologies, products and spin off companies promoted by Cimne.
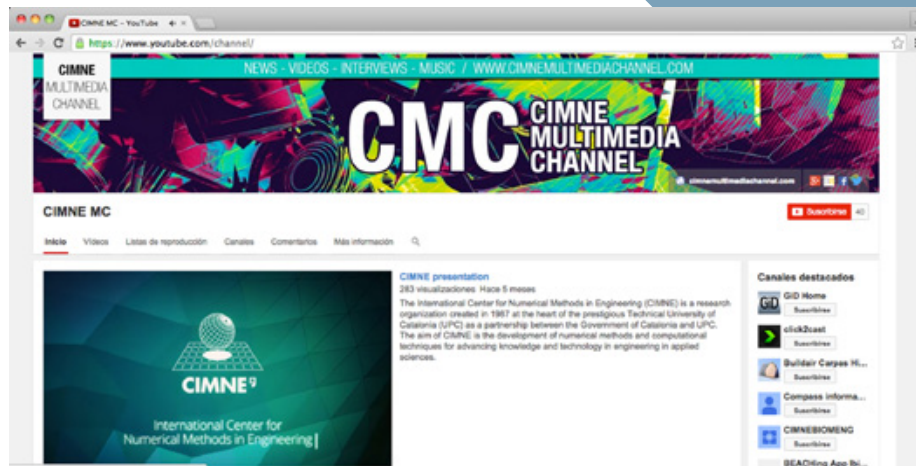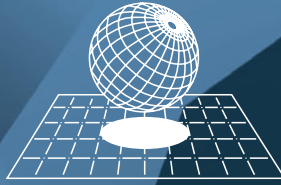
CIMNE IN THE MEDIA

CIMNE's research activities have been disseminated by key actors in press, tv, radio, among others. Some of the impacts in 2014 are shown below.

CIMNE ®