



## Profolio of Researchers and Research Teams

# MATHEMATICAL ENGINEERING

(Last update 03/04/2013)

**Code:** GI-1563

**Department:** Matemática Aplicada

**Web:** [www.usc.es/ingmat/](http://www.usc.es/ingmat/)

**Contact:**

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**Center of Innovation and Thecnology Transfer**

[cittinfo@usc.es](mailto:cittinfo@usc.es)

Telf.: 981-547000

### Research field

- Numerical resolution of equations in partial derivates (finite elements).
- Numerical simulation of processes.
- Application in:
  - Fluid Mechanics.
  - Solid Mechanics.
  - Heat Transfer.
  - Electromagnetic.
- Interaction fluid structure.
- Spectral methods.
- Optimation and control of distributed systems
- Non linear equations in partial derivates. Problems of free boundary.

### Technology services

- Computer Aided Engineering (CAE).

- Calculation of structures for finite elements.
- Computacional mechanics of fluids and solids.

### Key words

Equations in partial derivates; numerical methods; finite elements; numerical simulation.

### Researchers

<b>Name</b>	<b>Position</b>
Bermúdez de Castro López-Varela,A.	Coordinator
Barral Rodiño,P.	Member
Ferrín González,J.L.	Member
Gómez Pedreira,M.D.	Member
López Pouso,Ó.	Member
Muñiz Castiñeira,M.d.	Member
Pena Brage,F.J.	Member
Quintela Estévez,P.	Member
Rodríguez García,J.	Member
Salgado Rodríguez,M.d.	Member
Santamarina Rios,D.	Member
Seoane Martínez,M.L.	Member
Vázquez Cendón,M.E.	Member
Gómez González,A.	IFP
Rial Silva,Á.	IFP
Albella Martínez,J.	PA
Eiroa Rosado,E.	PA
González Dieguez,F.J.	PA
Grela González,C.	PA
Piñeiro Peón,M.	PA
Sande Veiga,V.	PA

### External collaborators

Luis María Hervella Nieto	Universidade da Coruña
Carlos Vázquez Cendón	Universidade da Coruña
Michel Chipot	Universidad de Zurich
Luisa Cunha Costa Consiglieri	Universidade de Lisboa y CMAF
Ricardo Guillermo Durán	Universidad de Buenos Aires (Argentina)
Patrick Joly	I.N.R.I.A. Francia
Amable Liñán	Universidad Politécnica de Madrid
Mikelic Andro	Université Claude Bernard Lyon I
Carlos Moreno González	UNED
Ricardo H. Nochetto	University of Maryland (EEUU)
María Victoria Otero Piñeiro	Universidade da Coruña
Rodolfo Rodríguez Alonso	Universidad de Concepción, Chile
Doina María Cioranescu	Laboratoire J. L. Lions - Paris VI
George Griso	Laboratoire J. L. Lions - Paris VI
Maurizio Falcone	Sapienza Università di Roma
M <sup>a</sup> Teresa Cao Rial	Centre de Recerca Matemàtica
Pablo Gamallo Ponte	Inspiralia Tecnologías Avanzadas (España)
Andrés Prieto Aneiros	Universidade da Coruña
Laura Saavedra Lago	Universidad Politécnica de Madrid
M <sup>a</sup> Teresa Sánchez Rúa	Centro Universitario de la Defensa (Zaragoza)

**RTD PROJECTS ( period: 2009 - 2013 )**

**Title:**

Las matemáticas como elemento 'innovador de la innovación' en la industria española

**Tipology:** (PN) Plan Nacional

**Duration:** 01/09/2012 - 31/08/2013

**Main investigator:** Quintela Estévez, Peregrina

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**Title:**

Consolidación e estruturación de unidades de investigación competitivas - REDES.

**Tipology:** (PG) Plan Galego

**Duration:** 17/06/2012 - 16/06/2014

**Main investigator:** Quintela Estévez, Peregrina

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**Title:**

Modelización, análisis y simulación numérica de problemas termomecánicos acoplados y su aplicación a incendios de estructuras y detección de daños.

**Tipology:** Plan Nacional

**Duration:** 01/01/2012 - 31/12/2014

**Main investigator:** Quintela Estévez, Peregrina

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**Title:**

Nuevas aportaciones a la modelización de flujos de frontera libre con volúmenes finitos (subproyecto).

**Tipology:** Plan Nacional

**Duration:** 01/01/2012 - 31/12/2014

**Main investigator:** Vázquez Cendón, María Elena

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**Title:**

Análise matemática e resolución numérica de problemas de difusión. Aplicacións ao modelado de colectores térmicos e compostos tensoactivos.

**Tipology:** Proxectos Xunta

**Duration:** 10/08/2010 - 30/09/2013

**Main investigator:** Muñiz Castiñeira, María del Carmen

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**Title:**

Convenio entre o CESGA e a USC para a realización dun código de software libre para a simulación numérica en acústica (referencia: COMP-C5-0310) do nodo CESGA incluído no proxecto Consolider Mathematica (2007/PC173)

**Tipology:** Plan Nacional

**Duration:** 26/02/2010 - 31/10/2011

**Main investigator:** Bermúdez de Castro López-Varela, Alfredo

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**Title:**

Ingenio matemática

**Tipology:** Outros Proxectos Nacionais

**Duration:** 18/01/2010 - 17/01/2012

**Main investigator:** Quintela Estévez, Peregrina

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**Title:**

Modelización análise matemática e simulación numérica en mecánica de sólidos. Aplicacións na enxeñaría civil

**Tipology:** Proxectos Xunta

**Duration:** 13/07/2009 - 01/12/2012

**Main investigator:** Quintela Estévez, Peregrina

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**Title:**

Simulación numérica de procesos termoeléctricos e magneto-mecánicos transitorios non lineares.  
Aplicacións industriais

**Tipology:** Proxectos Xunta

**Duration:** 13/07/2009 - 01/12/2012

**Main investigator:** Bermúdez de Castro López-Varela, Alfredo

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**Technological customers and partners**

- Aluminio Español, S.A.
- ENDESA Generación
- Ferroatlántica I+D
- Ferroatlántica, S.L.
- Fundación Centro Tecnolóxico de Supercomputación de Galicia
- Fundación Estatal Ciudad de la Energía
- GEKA Automación S.L.
- IMPULSO
- Regasificadora del Noroeste, S.A.
- Tecnologías Avanzadas Inspiralia, S.L.
- Universidad de Cantabria
- Uro Vehículos Especiales, S.A.
- Vasco Gallega de Consignaciones, S.L.

**SCIENTIFIC PRODUCTION ( period: 2007 - 2011 )**

**Articles in scientific journals**

**Article:**

A FEM/BEM for axisymmetric electromagnetic and thermal modelling of induction furnaces

**Journal:** INTERNATIONAL JOURNAL FOR NUMERICAL METHODS IN ENGINEERING, ISSN: 0029-5981  
2007

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**Article:**

An optimal perfectly matched layers with unbounded decay functions for time-harmonic acoustic scattering problems

**Journal:** JOURNAL OF COMPUTATIONAL PHYSICS, ISSN: 0021-9991  
2007

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**Article:**

Transient numerical simulation of a thermoelectrical problem in cylindrical induction heating furnaces.

**Journal:** ADVANCES IN COMPUTATIONAL MATHEMATICS, ISSN: 1019-7168  
2007

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**Article:**

Validation of acoustics models for time harmonic dissipative scattering problems

**Journal:** JOURNAL OF COMPUTATIONAL ACOUSTICS, ISSN: 0218-396X  
2007

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**Article:**

Mathematical analysis of a viscoelastic problem with temperature dependent coefficients. Part I: Existence and uniqueness

**Journal:** MATHEMATICAL METHODS IN THE APPLIED SCIENCES, ISSN: 0170-4214  
2007

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**Article:**

Mathematical Analysis of a viscoelastic problem with temperature dependent coefficients. Part II: Regularity

**Journal:** MATHEMATICAL METHODS IN THE APPLIED SCIENCES, ISSN: 0170-4214  
2007

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**Article:**

The modelling of the generation of volatiles, H<sub>2</sub> and CO, and their simultaneous diffusion controlled oxidation, in pulverised coal furnaces

**Journal:** COMBUSTION THEORY AND MODELLING, ISSN: 1364-7830  
2007

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**Article:**

Simulation of Rayleigh waves in cracked plates

**Journal:** MATHEMATICAL METHODS IN THE APPLIED SCIENCES, ISSN: 0170-4214  
2007

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**Article:**

Numerical solution of a time-dependent Signorini's contact problem

**Journal:** DISCRETE AND CONTINUOUS DYNAMICAL SYSTEMS, ISSN: 1078-0947  
2007

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**Article:**

An exact bounded perfectly matched layer for time-harmonic scattering problems

**Journal:** SIAM JOURNAL ON SCIENTIFIC COMPUTING, ISSN: 1064-8275  
2007

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**Article:**

On a Singular Perturbation Problem for a Class of Variational Inequalities

**Journal:** ZEITSCHRIFT FUR ANALYSIS UND IHRE ANWENDUNGEN, ISSN: 0232-2064  
2008

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**Article:**

A finite element method for the magnetostatic problem in terms of scalar potentials

**Journal:** SIAM JOURNAL ON NUMERICAL ANALYSIS, ISSN: 0036-1429  
2008

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**Article:**

A symmetric BEM-FEM coupling for the three-dimensional magnetostatic problem using scalar potentials

**Journal:** ENGINEERING ANALYSIS WITH BOUNDARY ELEMENTS, ISSN: 0955-7997  
2008

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**Article:**

Eddy-Current Losses in Laminated Cores and the Computation of an Equivalent Conductivity

**Journal:** IEEE TRANSACTIONS ON MAGNETICS, ISSN: 0018-9464  
2008

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**Article:**

Numerical simulation of a thermo-electromagneto-hydrodynamic problem in an induction heating furnace

**Journal:** APPLIED NUMERICAL MATHEMATICS, ISSN: 0168-9274

2008

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**Article:**

Perfectly matched layers for modelling seismic oceanography experiments

**Journal:** JOURNAL OF SOUND AND VIBRATION, ISSN: 0022-460X

2008

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**Article:**

Modelling of materials with long memory

**Journal:** INTERNATIONAL JOURNAL OF SOLIDS AND STRUCTURES, ISSN: 0020-7683

2008

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**Article:**

Numerical analysis of a finite element method for the axisymmetric eddy current model of an induction furnace.

**Journal:** IMA JOURNAL OF NUMERICAL ANALYSIS, ISSN: 0272-4979

2009

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**Article:**

Improved successive constraint method based a posteriori error estimate for reduced basis approximation of 2D Maxwell's problem.

**Journal:** ESAIM-MATHEMATICAL MODELLING AND NUMERICAL ANALYSIS-MODELISATION MATHEMATIQUE

2009

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**Article:**

Optimized higher order time discretization of second order hyperbolic problems: Construction and numerical study.

**Journal:** JOURNAL OF COMPUTATIONAL AND APPLIED MATHEMATICS, ISSN: 0377-0427

2009

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**Article:**

Numerical simulation of a thermo-electromagneto-hydrodynamic problem in an induction heating furnace.

**Journal:** APPLIED NUMERICAL MATHEMATICS, ISSN: 0168-9274

2009

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**Article:**

Existence and uniqueness of positive solution for singular BVPs on time scales

**Journal:** Advances in Difference Equations, ISSN: 1687-1839

2009

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**Article:**

About the solution of the even parity formulation of the transient radiative transfer equations

**Journal:** Revista de la Real Academia de Ciencias Exactas Físicas y Naturales Serie A-Matemáticas, ISSN: 1578-73

2010

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**Article:**

Optimized higher order time discretization of second order hyperbolic problems: Construction and numerical study

**Journal:** JOURNAL OF COMPUTATIONAL AND APPLIED MATHEMATICS, ISSN: 0377-0427

2010

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**Article:**

Certified Reduced Basis Methods and Output Bounds for the Harmonic Maxwell's Equations

**Journal:** SIAM JOURNAL ON SCIENTIFIC COMPUTING, ISSN: 1064-8275  
2010

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**Article:**

Equivalence between two finite element methods for the eddy current problem

**Journal:** COMPTES RENDUS MATHEMATIQUE, ISSN: 1631-073X  
2010

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**Article:**

Numerical analysis of a finite-element method for the axisymmetric eddy current model of an induction furnace

**Journal:** IMA JOURNAL OF NUMERICAL ANALYSIS, ISSN: 0272-4979  
2010

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**Article:**

Analysis of two stationary magnetohydrodynamics systems of equations including Joule heating

**Journal:** JOURNAL OF MATHEMATICAL ANALYSIS AND APPLICATIONS, ISSN: 0022-247X  
2010

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**Article:**

Numerical simulation of passive-active cells with microperforated plates or porous veils

**Journal:** JOURNAL OF SOUND AND VIBRATION, ISSN: 0022-460X  
2010

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**Article:**

Perfectly Matched Layers for Time-Harmonic Second Order Elliptic Problems

**Journal:** ARCHIVES OF COMPUTATIONAL METHODS IN ENGINEERING, ISSN: 1134-3060  
2010

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**Article:**

Experimental and numerical investigation of a flat-plate solar collector

**Journal:** ENERGY, ISSN: 0360-5442  
2010

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**Article:**

Existence of infinitely many solutions for second-order singular initial value problems with an application to nonlinear massive gravity.

**Journal:** NONLINEAR ANALYSIS-REAL WORLD APPLICATIONS, ISSN: 1468-1218  
2011

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**Article:**

Galerkin lumped parameter methods for transient problems

**Journal:** INTERNATIONAL JOURNAL FOR NUMERICAL METHODS IN ENGINEERING, ISSN: 0029-5981  
2011

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**Article:**

Numerical simulation of group combustion of pulverized coal

**Journal:** COMBUSTION AND FLAME, ISSN: 0010-2180  
2011

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**Article:**

Three-point bending experiments. Part II: Mathematical study and numerical simulation.

**Journal:** MATHEMATICAL METHODS IN THE APPLIED SCIENCES, ISSN: 0170-4214  
2011

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**Article:**

Three-point bending experiments. Part I: Asymptotic analysis.

**Journal:** MATHEMATICAL METHODS IN THE APPLIED SCIENCES, ISSN: 0170-4214  
2011

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**Article:**

Coupling discontinuous Galerkin methods and retarded potentials for transient wave propagation on unbounded domains.

**Journal:** JOURNAL OF COMPUTATIONAL PHYSICS, ISSN: 0021-9991  
2011

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**Article:**

A thermo-electrical problem with a nonlocal radiation boundary condition

**Journal:** MATHEMATICAL AND COMPUTER MODELLING, ISSN: 0895-7177  
2011

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**Article:**

Numerical analysis of surfactant dynamics at air-water interface using the Henry isotherm

**Journal:** JOURNAL OF MATHEMATICAL CHEMISTRY, ISSN: 0259-9791  
2011

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**Article:**

Study of a variational inequality with a singular perturbation term

**Journal:** INTERNATIONAL JOURNAL OF COMPUTER MATHEMATICS, ISSN: 0020-7160  
2011

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**Article:**

A fictitious domain method for the numerical two-dimensional simulation of potential flows past sails

**Journal:** ESAIM-MATHEMATICAL MODELLING AND NUMERICAL ANALYSIS-MODELISATION MATHEMATIQUE  
2011

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**Article:**

A second order characteristics finite element scheme for natural convection problems

**Journal:** JOURNAL OF COMPUTATIONAL AND APPLIED MATHEMATICS, ISSN: 0377-0427  
2011

---

**Article:**

An a posteriori error analysis for dynamic viscoelastic problems

**Journal:** ESAIM-MATHEMATICAL MODELLING AND NUMERICAL ANALYSIS-MODELISATION MATHEMATIQUE  
2011

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**Book:**

**Title:**

TransMATH Demand: i-MATH Map of Company Demand for Mathematical Technology  
(978-84-693-1704-4) Publicación: 2010

**Editorial:**NINO-Centro de Impresión Digital

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**Chapter:**

**Title:**

Fluid-structure acoustic interaction

**Book:**

Computational Acoustics of Noise Propagation in Fluids. Finite and Boundary Element Methods

(978-3-540-77447-1)Publicación: 2008

**Editorial:**Springer-Verlag

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**Title:**

Perfectly matched layers

**Book:**

Computational Acoustics of Noise Propagation in Fluids. Finite and Boundary Element Methods

(978-3-540-77447-1)Publicación: 2008

**Editorial:**Springer-Verlag

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**Title:**

Numerical Modelling of Industrial Induction

**Book:**

Advances in Induction and Microwave Heating of Mineral and Organic Materials

(978-953-307-522-8)Publicación: 2011

**Editorial:**InTech

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**Doctoral theses:**

**Title:**

Some contributions in time-harmonic dissipative acoustic problems

**Date of dissertation:** 04/06/2007

**Director:** Alfredo Bermúdez de Castro López-Varela, Luis Maria Hervella Nieto, Rofolfo Rodríguez Alonso

**Author:** Andrés Prieto Aneiros

---

**Title:**

Contributions to the mathematical study of some problems in Magnetohydrodynamics and induction heating

**Date of dissertation:** 19/12/2008

**Director:** Rafael Muñoz Sola, Alfredo Bermúdez de Castro López-Varela

**Author:** Rafael Vázquez Hernández

---

**Title:**

Análise matemática e simulación numérica dalgúns problemas non lineais en mecánica de sólidos

**Date of dissertation:** 11/12/2009

**Director:** Patricia Barral Rodiño, Peregrina Quintela Estévez

**Author:** M<sup>a</sup> Teresa Sánchez Rúa

---

**Title:**

Simulación numérica de algunos problemas de mecánica de fluidos con frontera libre

**Date of dissertation:** 17/12/2009

**Director:** Peregrina Quintela Estévez

**Author:** JERONIMO DEL CARMEN PAREDES CACERES

---

**Title:**

Métodos numéricos para problemas de convección difusión. Aplicación á convección natural.

**Date of dissertation:** 02/12/2009

**Director:** Alfredo Bermúdez de Castro López-Varela

**Author:** Marta Benítez García

---

**Title:**

Resolución numérica de modelos de calidad de aguas : aplicación a cierres de minas a cielo abierto.

**Date of dissertation:** 02/02/2010

**Director:** Alfredo Bermúdez de Castro López-Varela, Peregrina Quintela Estévez

**Author:** Luz M<sup>a</sup> García García

---

**Title:**

Modelamiento numérico de problemas de electromagnetismo en metalurgia

**Date of dissertation:** 31/03/2010

**Director:** Alfredo Bermúdez de Castro López-Varela, María del Pilar Salgado Rodríguez, RODOLFO RODRIGUEZ

**Author:** Carlos Alberto Reales Martínez

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**Title:**

Problemas de contacto en elasticidade dinámica con XFEM

**Date of dissertation:** 10/10/2011

**Director:** Peregrina Quintela Estévez, Moreno González, Carlos

**Author:** M<sup>a</sup> Teresa Cao Rial

---

**Title:**

Modelado numérico de un colector solar térmico aplicado a buques de crucero y ferrys

**Date of dissertation:** 29/11/2011

**Director:** María del Carmen Muñiz Castiñeira, Luis Miguel Varela Cabo, José Manuel García Fernández

**Author:** Ana Álvarez García

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