



Part A. PERSONAL INFORMATION

CV date	January 17, 2023
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First name	Tomás		
Family name	Chacón Rebollo		
Gender	Male	Birth date	29/11/1959
ID number			
e-mail	chacon@us.es	URL Web	https://investigacion.us.es/sisius/sis_showpub.php?idpers=902
Open Researcher and Contributor ID (ORCID)	0000-0002-0784-1174		

A.1. Current position

Position	Full Professor of Mathematical Analysis		
Initial date	28/05/1993		
Institution	University of Seville		
Department/Center	Departamento de Ecuaciones Diferenciales y Análisis Numérico		
Country	Spain	Tel. number	+34 95 455 79 89
Key words	Numerical Analysis, Mathematical Modeling, Fluid Mechanics		

A.2. Previous positions (research activity interruptions, art. 14.2.b))

Period	Position/Institution/Country/Interruption cause
01/09/1985-17/05/1992	Associate professor/University of Seville/Spain
01/01/1998-31/12/1998	Post-doctoral researcher/Courant Institute/ USA
01/02/1983-31/07/1985	Pre-doctoral researcher/INRIA-Rocquencourt/France

A.3. Education

PhD, Licensed, Graduate	University/Country	Year
Licensed in Mathematics	University of Seville/Spain	1981
Ph D in Mathematics	University of Seville/Spain	1984
Ph D 3 rd . Cycle in Numerical Analysis	University of Paris VI/Paris	1985

Part B. CV SUMMARY (max. 5000 characters, including spaces)

I am full professor of the Department of Differential Equations and Numerical Analysis at the University of Seville (US) since 1993, with doctorates in Mathematics from the US (1984) and from the University of Paris VI (1985). My scientific specialty is the numerical modeling in fluid mechanics and its applications. I have successively worked since my graduation in turbulence modelling, vortex methods, environmental flows modeling, stabilized methods for fluid flow, biomathematics and reduced order modeling.

My approach to mathematics has always been applied: I am interested in providing solutions to real problems with a view to improving the quality of life and the protection of the environment. These interests are sustained in the ability of mathematics to provide improvements to well-established industrial procedures or solutions unapproachable by other techniques. I am in awe of the ability of mathematics to faithfully reproduce the behavior of systems by a purely abstract process of mathematical and numerical modeling.

Research promotion

I am convinced of the importance of the promotion of research to achieve the services that mathematics may provide to the society. This interest has taken place in various ways, such

as the formation of a solid research group on numerical modeling of environmental flows in 1992, the promotion of research projects and scientific collaborations, the management of research centers in mathematics (BCAM at the Basque Country, IMUS and EDAN department at US), as well as the organization of congresses and scientific manifestations, among them the chairmanship of ICIAM-2019 Congress, with nearly 4000 participants.

Socio-economic impact of mathematics

My efforts have also been addressed to study and promote the socio-economic impact on mathematics. I was founder and director of the Master “Analysis Technologies for the Information Society” at the beginning of the 2000’s, intended to train the graduates in mathematics, physics and related disciplines to work in information technology companies. I have been coordinator of several studies on the socio-economic impact of mathematics in Spain (in 2016 and 2019), as well as of the “White Book of the Mathematics in Spain” (2020).

Main scientific achievements

- **Numerical analysis of solution of incompressible flows by Stabilized Methods.** Stabilized methods provide an alternative to the more classical mixed methods to solve incompressible flows, being computationally cheaper. I developed by 1998 a mathematical analysis theory in which both methods are analyzed under a unified abstract framework. This general theory has later yield several applications, in particular in oceanic flow modeling.
- **Derivation of a Smagorinski reduced order turbulence model.** Within the PhD thesis of Enrique Delgado Ávila by 2018 we built a reduced order model of turbulence of Smagorinsky type, that provides rates of reduction of computation time beyond 1000 for benchmark problems.
- **Characterization of Proper Generalized Decomposition (PGD) through Variational Principles.** The PGD is a reduction order technique widely used in engineering. It provides generalized expansions of eigenmodes to approximate on low-dimension varieties the solution of parametric PDEs. In a collaboration with Profs. Azaïez, Ben Belgacem Casado and Murat we have characterized the PGD modes as minima of certain variational problems, what has open the door to its mathematical understanding.

Some detailed data

- Author of over 120 publications in scientific journals and conference proceedings with review committee (93 in Scopus database, with 888 citations). Also, of 3 research books, of which I highlight “Mathematical and numerical foundations of turbulence models and applications” (Birkhäuser), co-authored with R. Lewandowski (191 citations in Academic Google).
- Editor of M2AN, Sema Journal and European Journal of Physics Plus, 1st. volume of ICIAM2019 SEMA SIMAI Springer Series.
- Supervisor of 14 Ph. D. Thesis, currently supervising 2. Three of my former Ph D students are senior workers in technology companies in France and USA, while other 9 are researchers at various career stages in France and Spain.
- Experience of over 35 years in undergraduate and graduate teaching at the universities of Paris VI, Seville, Versailles and at the Pôle Universitaire Leonard de Vinci: Mathematics for the Graduation in mathematics and other sciences. Post-graduate courses on numerical analysis of Navier-Stokes equations, vortex methods, numerical approximation of elliptic, parabolic and hyperbolic equations and mathematical modelling of continuous systems.
- Responsible of 9 mathematical technology transfer projects with several companies since 2017 (2 active at the present moment), dealing on environmental applications of Data Analysis techniques within cities, and on reduced order modeling applied to renewable energies.

Part C. RELEVANT MERITS *(sorted by typology)*

C.1. Selected Publications

1. Chacón Rebollo, Tomás; Delgado Ávila, Enrique; Gómez Mármol, Macarena; *On a certified VMS-Smagorinsky reduced basis model with LPS pressure stabilisation*. Appl. Numer. Math. 185 (2023), 365–385.
2. Chacón Rebollo, Tomás; Rubino, Samuele; Oulghelou, Mourad; Allery, Cyrille. *Error analysis of a residual-based stabilization-motivated POD-ROM for incompressible flows*. Comput. Methods Appl. Mech. Engrg. 401 (2022), part B, Paper No. 115627, 25 pp.
3. Azañez, M.; Chacón Rebollo, T.; Gómez Mármol, M.; Perracchione, E.; Rincón Casado, A.; Vega, J. M. *Data-driven reduced order modeling based on tensor decompositions and its application to air-wall heat transfer in buildings*. SeMA J. 78 (2021), no. 2, 213–232.
4. Azañez, M.; Chacón Rebollo, T.; Rubino, S.: *A cure for instabilities due to advection-dominance in POD solution to advection-diffusion-reaction equations*. Journal of Computational Physics 425, nº 1, 27 pp. (2021).
5. Chacón Rebollo, T.; Gómez Mármol, M.; Hecht, F.; Rubino, S.; Sánchez Muñoz, I.; *A High-Order Local Projection Stabilization Method for Natural Convection Problems*. J. Sci. Comput. 74 (2018), no. 2, 667–692.
6. Azañez, M., Ben Belgacem, F., Casado-Díaz, J., Chacón Rebollo, T., Murat, F.: *A new algorithm of proper generalized decomposition for parametric symmetric elliptic problems*. SIAM Journal on Mathematical Analysis, 50(5), pp. 5426–5445 (2018).
7. Ahmed, N., Chacón Rebollo, T., John, V., Rubino, S. *Analysis of a Full Space-Time Discretization of the Navier-Stokes Equations by a Local Projection Stabilization Method*. IMA Journal of Numerical Analysis, 37(3), pp. 1437–1467 (2017).
8. Chacón Rebollo, Tomás; Delgado Ávila, Enrique; Gómez Mármol, Macarena; Ballarin, Francesco; Rozza, Gianluigi: *On a certified Smagorinsky reduced basis turbulence model*. SIAM J. Numer. Anal. 55 (2017), no. 6, 3047–3067.
9. Ahmed, Naveed; Chacón Rebollo, Tomás; John, Volker; Rubino, Samuele; *A Review of Variational Multiscale Methods for the Simulation of Turbulent Incompressible Flows*. Arch. Comput. Methods Eng. 24 (2017), no. 1, 115–164.
10. Chacón Rebollo, T., Gómez Mármol, M., Girault, V., Sánchez Muñoz, I.: *A high order term-by-term stabilization solver for incompressible flow problems*. IMA J. Numer. Anal. 33 (2013), no. 3, 974–1007

C.2. Congresses

Contributions to 28 international and 29 national congresses since 2012.

9 Plenary conferences in congresses and 28 Seminar talks by invitation. The five most recent:

- Reduced Order Methods at Work: Industry and Medicine. Bordeaux, 2022.
- New Bridges between mathematics and Data Science Workshop. Valladolid, Spain, 2022.
- Jeddah-Ryadh-Dammam-Tunis Applied Mathematics Seminar. Saudi Arabia, 2021.
- Mathematics of Covid-19 Seminar. Institute of Mathematics. Seville, Spain, 2020.
- MorTech 2017. Sevilla, Spain, 2017.

C.3. Research projects (active in the last 10 years)

Accurate Reducer Order Models for Industrial Applications. ARIA. Reference: 872442. EU – RISE Project. Funding: 105.800€. Duration: 12/2019-10/2022. Role: PI of Work Package 2 (Reduced Order Models for Incompressible Unsteady and Turbulent Flows),

Reduced order models applied to incompressible flows and brain neuronal networks. PID2021-123153OB-C21. Spanish Government I+D+i Plan. Funding 108.900,00 €. Duration: 01/2022-12/2025. Role: PI.

Reduced Order Modeling Optimization for Architecture and Design. Reference: RTI2018-093521-B-C31, Spanish Government I+D+i Plan. Funding: 70.059€. Duration: 01/2019-12/2021. Role: PI.

Reduced Order Modeling of Subgrid Components in Variational Multi-scale Methods. Reference: US-1254587. Andalusia Regional Government – EU Feder Fund grant. Funding: 80.000€. Duration: 01/2020 to 12/2021. Role: PI.

Reduced Order Modelling oriented to the eco-design of buildings. Spanish Government I+D+i Plan, 2016-2018. Ref: MTM2015-645577-C. Duration: 01/2016-12/2019. Funding: 66.000€. Role: PI.

Development of Reduced Numerical Models for aero-thermal flows in buildings. Spanish Government I+D+i Plan, 2013-2015. Ref. MTM2012-36124-C. Duration: 01/2013-12/2015. Funding: 53.820€. Role: PI.

Numerical Modelling of Turbulent Hydrodynamic Flows with Free Surface. Andalucía Excellence Grant. Duration: 01/2014-07/2019. Funding: 135.944€. Role: PI.

C.4. Contracts, technological or transfer merits

Mathematical technology transfer contracts:

With VirtualMechanics, spin-off of the University of Sevilla, dealing with renewable energies:

- Renewable energies for energy storage based upon new photovoltaic-thermal systems (2021-22). Role: co-PI.

With Imesapi, company dealing with conservation and exploitation of infrastructures. Seven projects since 2017 dealing with sustainable smart cities. The most recent:

- Development of a joint model of traffic, noise and environmental pollution, based on artificial intelligence techniques, in the framework of the Smart City. Role: PI (2022-24).
- Development of a mathematical algorithm to calculate the progress of corrosion over time in metallic supports. Role: PI (2020-22).
- Analysis and study to determine facial recognition distances from a gender perspective, using Big Data techniques. Role: PI (2020).

Equipment projects

- **Acquisition of Scientific-Technical Equipment for the Institute of Mathematics of Andalusia.** EQC2018. National I+D+I Program, Infrastructures Funding Program, Ministry of Science, Innovation and Universities, 23/10/2018-31/12/2021, 230.000€. Role: Technical Director.
- **Strengthening of the Institute of Mathematics of Andalusia.** SOMM17/6111/USE. Andalusia Regional Government Research Program (PAIDI), 01/01/2019-31/05/2021. 612.716,30 €. Role: Technical Director.
- **Qualifica award to iMAT Unit:** Aid program for complementary R+D+i actions. Andalusia Regional Government, 01/05/22-31/04/2025, 682.525€. Role: Technical Director.

Studies on social and economic impact of mathematics: Co-ordinator of

- Study of socio-economic impact of mathematics in Spain and in Andalusia. Spanish Strategic Network in Mathematics and Institute of Mathematics of Andalusia, 2019-2021 (http://www.iamat.es/sites/default/files/AFI_IAMAT_FINAL_DIST.pdf).
- White Book of Mathematics in Spain. Royal Spanish Society of Mathematics, 2020 (<https://www.fundacionareces.es/fundacionareces/es/publicaciones/libro-blanco-de-las-matematicas.html>).