CARMEN RODRIGO

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GOOGLE SCHOLAR

RESEARCH INTERESTS

My main area of research is numerical methods for partial differential equations, primarily the development and analysis of iterative methods for the solution of the systems of algebraic equations that are obtained after discretization. My research interests include the study of flow problems in rigid, deformable and fractured porous media, with an emphasis on stable discretizations and efficient solvers for this type of problems.

CURRENT POSITION

22nd July 2020 – Current
Associate Professor (Profesor Titular de Universidad), Department of Applied Mathematics, School of Engineering and Architecture, University of Zaragoza (Spain)

EDUCATION

2005 – Bachelor's Degree in Mathematics, University of Zaragoza

2007 – Doctoral Program in Computational Mechanics, University of Zaragoza

2010 – PhD in Applied Mathematics, University of Zaragoza

Title: Geometric Multigrid Methods on Semi-Structured Triangular Grids

Supervisors: Francisco J. Gaspar and Francisco J. Lisbona

Defense date: 29th October 2010

Mark: Sobresaliente Cum Laude (European Mention and Extraordinary Doctoral Award)

EXPERIENCE

1st February – 20th September, 2007

Part time assistant professor (6 hours/week), Department of Applied Mathematics, University School of Industrial Technical Engineering, University of Zaragoza.

1st September 2010 – 18th September 2011

Associate professor, University Center of Defense of Zaragoza, Militar Academy.

19th September 2011 – 18th September 2016

Assistant professor (Profesora Ayudante Doctor), Department of Applied Mathematics, School of Engineering and Architecture, University of Zaragoza.

19th September 2016 – 21st July 2020

Temporary associate professor (Profesora Contratado Doctor en regimen de Interinidad), Department of Applied Mathematics, School of Engineering and Architecture, University of Zaragoza.

AWARDS

PhD with distinction in the Science Section at the University of Zaragoza (Premio Extraordinario de Doctorado en la Macroárea de Ciencias de la Universidad de Zaragoza), academic year: 2010-2011.

Finalist of the 2010 ECCOMAS PhD Award, selected by SeMA (Spanish Society of Applied Mathematics).

XVIII "Antonio Valle" SeMA Award to Young Researchers (2015).

Best presentation award at the "2nd International Conference on Mathematics and Statistics 2015", IPN – IWNEST Conferences 2015, Ho Chi Minh, Vietnam, 2015.

RESEARCH STAYS

01/12/2005 – 31/05/2006 Université de Pau et des Pays de l'Adour, Pau, France.
08/06/2008 – 24/06/2008 Vilnius Gediminas Technical University, Vilnius, Lithuania.
15/11/2009 – 30/11/2009 Centrum Wiskunde & Informatica, Amsterdam, Netherlands.
06/02/2012 – 10/02/2012 Technion-Israel Institute of Technology, Haifa, Israel.
26/04/2012 – 27/05/2012 Technion-Israel Institute of Technology, Haifa, Israel.
30/05/2012 – 15/06/2012 Centrum Wiskunde & Informatica, Amsterdam, Netherlands.
12/03/2013 – 15/03/2013 University of Delaware, Newark, USA.
20/03/2013 – 17/05/2013 The Pennsylvania State University, State College, USA.
20/05/2013 – 24/05/2013 Vilnius Gediminas Technical University, Vilnius, Lithuania.
09/02/2014 – 09/05/2014 The Pennsylvania State University, State College, USA.
09/03/2014 – 11/03/2014 Tufts University, Medford, Boston, USA.
22/02/2015 – 12/03/2015 Tufts University, Medford, Boston, USA.
17/03/2015 – 21/03/2015 University of Nevada Las Vegas, Las Vegas, USA.
27/03/2015 – 11/05/2015 The Pennsylvania State University, State College, USA.
31/05/2015 – 05/06/2015 University of Bergen, Bergen, Norway.
14/08/2015 – 18/08/2015 Beijing Computational Science Research Center, China
11/08/2016 – 15/08/2016 Universidad Pública de Navarra, Pamplona, Spain.
03/03/2017 – 26/03/2017 Tufts University, Medford, Boston, USA.
11/02/2017 – 10/05/2017 The Pennsylvania State University, State College, USA.
30/04/2018 – 21/05/2018 Centrum Wiskunde & Informatica, Amsterdam, Netherlands.
20/02/2019 – 09/04/2019 Tufts University, Medford, Boston, USA.
11/04/2022 – 17/04/2022 Tufts University, Medford, Boston, USA.
19/04/2024 – 25/04/2024 Tufts University, Medford, Boston, USA.

PUBLICATIONS

BOOKS:

C. Rodrigo, F.J. Gaspar, F.J. Lisbona, "Geometric Multigrid Methods on Triangular Grids. Application to Semi-Structured Meshes", LAP Lambert Academic Publishing, Saarbrücken 2012, ISBN: 978-3-659-20957-4

RESEARCH PAPERS:

G. Aguilar, F. Gaspar, F. Lisbona y C. Rodrigo. "Numerical stabilization of Biot's consolidation model by a perturbation on the flow equation". International Journal for Numerical Methods in Engineering, 75 (2008) pp. 1282-1300.

R. Ciegis, F.J. Gaspar and C. Rodrigo. "On the parallel multiblock geometric multigrid algorithm", Computational Methods in Applied Mathematics, 8 (2008) pp. 223-236.

F.J. Gaspar, J.L. Gracia, F.J. Lisbona and C. Rodrigo. "On geometric multigrid methods for triangular grids using three-coarsening strategy", Applied Numerical Mathematics, 59 (2009) pp. 1693-1708.

F.J. Gaspar, J.L. Gracia, F.J. Lisbona, C. Rodrigo, "Efficient geometric multigrid implementation for triangular grids". Journal of Computational and Applied Mathematics, 234 (2009) pp. 1027-1035.

F.J. Gaspar, F.J. Lisbona, C. Rodrigo. "Multigrid Fourier Analysis on Semi-structured Anisotropic Meshes for Vector Problems". Mathematical Modelling and Analysis, 15 (2010) pp. 39-54.

F.J. Gaspar, J.L. Gracia, F.J. Lisbona, C.Rodrigo "Multigrid finite element methods on semi-structured triangular grids for planar elasticity". Numerical Linear Algebra with Applications, 17 (2010) pp. 473-493.

C. Rodrigo, F.J. Gaspar, C.W. Oosterlee, I. Yavneh. "Accuracy Measures and Fourier Analysis for the Full Multigrid Algorithm", SIAM Journal on Scientific Computing, 32 (2010) pp. 3108-3129.

C. Rodrigo, F.J. Gaspar, F.J. Lisbona. "Multicolor Fourier Analysis of the Multigrid Method for Quadratic FEM discretizations", Applied Mathematics and Computation, 218 (2012) pp. 11182-11195.

C. Rodrigo, F.J. Gaspar, F.J. Lisbona, "Multigrid Methods on Semi-Structured Grids", Archives of Computational Methods in Engineering, 19 (2012) pp. 499-538.

P. Salinas, C. Rodrigo, F.J. Gaspar, F.J. Lisbona, "An efficient cell-centered multigrid method for problems with discontinuous coefficients on semi-structured triangular grids", Computers & Mathematics with Applications, 65 (2013) pp. 1978-1989.

P. Salinas, C. Rodrigo, F.J. Gaspar, F.J. Lisbona, "Multigrid methods for cell-centered discretizations on triangular meshes", Numerical Linear Algebra with Applications, 20 (2013) pp. 626-644.

C. Rodrigo, P. Salinas, F.J. Gaspar, F.J. Lisbona, "Local Fourier analysis for cell-centered Multigrid methods on triangular grids", Journal of Computational and Applied Mathematics, 259 (2014) pp. 35-47.

F.J. Gaspar, C. Rodrigo, R. Ciegis, A. Mirinavicius, "Comparison of solvers for 2D Schrödinger problems", International Journal of Numerical Analysis and Modeling, 11 (2014) pp. 131-147.

F.J. Gaspar, Y. Notay, C.W. Oosterlee, C. Rodrigo, "A simple and efficient seggregated smoother for the discrete Stokes equations", SIAM Journal of Scientific Computing, 36 (2014) pp. 1187-1206.

F.J. Gaspar, C. Rodrigo, E. Heidenreich, "Geometric multigrid methods on structured triangular grids for incompressible Navier-Stokes equations at low Reynolds numbers", International Journal of Numerical Analysis and Modeling, 11 (2014) pp. 400-411.

A. Arrarás, F.J. Gaspar, L. Portero, C. Rodrigo, "Domain decomposition multigrid methods for nonlinear reaction-diffusion problems", Communications in Nonlinear Science and Numerical Simulation, 20 (2015) pp. 699-710.

C. Rodrigo, F. Sanz, F.J. Gaspar, F.J. Lisbona, "Local Fourier analysis for edge-based discretizations on triangular grids", Numerical Mathematics-Theory, Methods and Applications, 8 (2015) pp. 78-96.

J. Brannick, X. Hu, C. Rodrigo, L. Zikatanov, "Local Fourier analysis of multigrid methods with polynomial smoothers and aggressive coarsening", Numerical Mathematics-Theory, Methods and Applications, 8 (2015) pp. 1-21.

C. Rodrigo, F.J. Gaspar, X. Hu, L. Zikatanov, "A finite element framework for some mimetic finite difference discretizations", Computers &. Mathematics with Applications, 70 (2015) pp. 2661-2673.

C. Rodrigo, F.J. Gaspar, X. Hu, L. Zikatanov, "Stability and monotonicity for some discretizations of the Biot's consolidation model", Computer Methods in Applied Mechanics and Engineering, 298 (2016) pp. 183-204.

C. Rodrigo, F.J. Gaspar, F.J. Lisbona, "On a local Fourier analysis for overlapping block smoothers on triangular grids", Applied Numerical Mathematics, 105 (2016) pp. 96-111.

C. Rodrigo, "Poroelasticity problem: numerical difficulties and efficient multigrid solution", SeMA Journal, 73 (2016) pp. 31-57.

M.A.V. Pinto, C. Rodrigo, F.J. Gaspar, C.W. Oosterlee, "On the robustness of ILU smoothers on triangular grids", Applied Numerical Mathematics, 106 (2016) pp. 37-52.

P. Luo, C. Rodrigo, F.J. Gaspar, C.W. Oosterlee, "Multigrid method for nonlinear poroelasticity equations", Computing and Visualization in Science, 17 (2016) pp. 255-265.

P. Luo, C. Rodrigo, F.J. Gaspar, C.W. Oosterlee, "Uzawa smoother in multigrid for the coupled porous medium and Stokes flow system", SIAM Journal on Scientific Computing, 39 (2017) pp. S633-S661.

A. Grebhahn, C. Rodrigo, N. Siegmund, F.J. Gaspar, S. Apel, "Performance-Influence Models of Multigrid Methods: A Case Study on Triangular Meshes", Concurrency and Computation-Practice & Experience, 29 (2017) pp. e4057 (13pp).

F.J. Gaspar, C. Rodrigo, "On the fixed-stress split scheme as smoother in multigrid methods for coupling flow and geomechanics", Computer Methods in Applied Mechanics and Engineering, 326 (2017) pp. 526-540.

P. Luo, C. Rodrigo, F.J. Gaspar, C.W. Oosterlee, "On an Uzawa smoother in multigrid for poroelasticity equations", Numerical Linear Algebra with Applications, 24 (2017) pp. e2074 (14 pp).

F.J. Gaspar, C. Rodrigo, "Multigrid waveform relaxation for the time-fractional heat equation", SIAM Journal on Scientific Computing, 39 (2017) pp. A1201-A1224.

X. Hu, C. Rodrigo, F.J. Gaspar, L. Zikatanov, "A nonconforming finite element method for the Biot's consolidation model in poroelasticity", Journal of Computational and Applied Mathematics, 310 (2017) pp. 143-154.

C. Rodrigo, X. Hu, P. Ohm, J.H. Adler, F.J. Gaspar, L.T. Zikatanov, "New stabilized discretizacions for poroelasticity and the Stokes' equations", Computer Methods in Applied Mechanics and Engineering, 341 (2018) pp. 467-484.

S.R. Franco, F.J. Gaspar, M.A. Villela Pinto, C. Rodrigo, "Multigrid method based on a space-time approach with standard coarsening for parabolic problems", Applied Mathematics and Computation, 317 (2018) pp. 1339-1351.

P. Luo, C. Rodrigo, F.J. Gaspar, C.W. Oosterlee, "Monolithic multigrid method for the coupled Stokes flow and deformable porous medium system", Journal of Computational Physics, 353 (2018) pp. 148-168.

M. Borregales, K. Kumar, F.A. Radu, C. Rodrigo, F.J. Gaspar, "A partially parallel-in-time fixed-stress splitting method for Biot's consolidation model", Computers & Mathematics with Applications, 77 (2018) pp. 1466-1478.

S.R. Franco, C. Rodrigo, F.J. Gaspar, M.A.V. Pinto, "A multigrid waveform relaxation method for solving the poroelasticity equations", Computational and Applied Mathematics, 37 (2018) pp. 4805-4820.

C. Rodrigo, F.J. Gaspar, L.T. Zikatanov, "On the validity of the local Fourier analysis", Journal of Computational Mathematics, 37 (2019) pp. 340-348.

P. Kumar, C. Rodrigo, F.J. Gaspar, C.W. Oosterlee, "On local Fourier analysis of multigrid methods for PDEs with jumping and random coefficients", SIAM Journal on Scientific Computing, 41 (2019) pp. A1385-A1413.

A. Arrarás, F.J. Gaspar, L. Portero, C. Rodrigo, "Mixed-dimensional geometric multigrid methods for single-phase flow in fractured porous media", SIAM Journal on Scientific Computing, 41 (2019) pp. B1082-B1114.

A. Arrarás, F.J. Gaspar, L. Portero, C. Rodrigo, "Geometric multigrid methods for Darcy-Forchheimer flow in fractured porous media", Computers & Mathematics with Applications, 78 (2019) pp. 3139-3151.

A. Pé de la Riva, C. Rodrigo, F.J. Gaspar, "A robust multigrid solver for isogeometric analysis based on multiplicative Schwarz smoothers", SIAM Journal on Scientific Computing, 41 (2019) pp. S321-S345.

P. Kumar, C. Rodrigo, F.J. Gaspar, C.W. Oosterlee, "A parametric acceleration of multilevel Monte Carlo convergence for nonlinear variably saturated flow", Computational Geosciences, 24 (2020) pp. 311-331.

A. Pé de la Riva, F.J. Gaspar, C. Rodrigo, "On the robust solution of an isogeometic discretization of bilaplacian equation by using multigrid methods", Computers & Mathematics with Applications, 80 (2020) pp. 386-394.

J.H. Adler, F.J. Gaspar, X. Hu, P. Ohm, C. Rodrigo, L.T. Zikatanov, "Robust preconditioners for a new stabilized discretization of the poroelastic equations", SIAM Journal on Scientific Computing, 42 (2020) pp. B761-B791.

X. Hu, C. Rodrigo, F.J. Gaspar, "Using hierarchical matrices in the solution of the time-fractional heat equation by multigrid waveform relaxation", Journal of Computational Physics, 416 (2020), 109540. DOI 10.1016/j.jcp.2020.109540.

A. Arrarás, F.J. Gaspar, L. Portero, C. Rodrigo, "Multigrid solvers for multipoint flux approximations of the Darcy problem on rough quadrilateral grids", Computational Geosciences, 25 (2021) pp. 715–730.

A. Pé de la Riva, C. Rodrigo, F.J. Gaspar, "A two-level method for isogeometric discretizations based on multiplicative Schwarz iterations", Computers & Mathematics with Applications, 100 (2021) pp. 41-50.

N. Habibi, A. Mesforoush, F.J. Gaspar, C. Rodrigo, "Semi-algebraic mode analysis for finite element discretisations of the heat equation", Computational methods for differential equations, 9 (2021) pp. 146-158.

M. Laís de Oliveira, M. A. Villela Pinto, C. Rodrigo, F.J. Gaspar, "Modified picard with multigrid method for two-phase flow problems in rigid porous media", International Journal for Numerical Methods in Engineering, 125 (2024) e7397.

C. Rodrigo, F.J. Gaspar, J. Adler, X. Hu, P. Ohm, L. Zikatanov, "Parameter-robust preconditioners for Biot's model", SEMA Journal, 81 (2024) pp. 51–80.

A. Pé de la Riva, C. Rodrigo, F.J. Gaspar, J. Adler, X. Hu, L. Zikatanov, "A local Fourier analysis for additive Schwarz smoothers", Computers & Mathematics with Applications, 158 (2024) pp. 13-20.

A. Pé de la Riva, F.J. Gaspar, X. Hu, J. Adler, C. Rodrigo, L.T. Zikatanov, "Oscillation-free numerical schemes for Biot's model and their iterative coupling solution", accepted to be published in SIAM Journal on Scientific Computing, 2025.

J. Zaratiegui, C. Rodrigo, A. Arrarás, L. Portero, "Multipoint flux mixed finite element discretizations for a dual-porosity flow model in fractured reservoirs and its efficient solution by multigrid methods.", submitted 2024.

J. Zaratiegui, C. Rodrigo, A. Arrarás, L. Portero, "A multigrid solver for the elasticity problem on quadrilateral meses", submitted 2024.

J. Zaratiegui, C. Rodrigo, A. Arrarás, L. Portero, "A multigrid method for the Biot system of poroelasticity on logically rectangular meshes", submitted 2024.

BOOK CHAPTERS:

R. Ciegis, F.J. Gaspar and C. Rodrigo. "Parallel Multiblock Multigrid Algorithms for Poroelastic Models", Chapter of the book: "Parallel Scientific Computing and Optimization: Advances and Applications", Springer, 2009. ISBN: 978-0-387-09706-0.

F.J. Gaspar, J.L. Gracia, F.J. Lisbona, C. Rodrigo. "Development of efficient geometric Multigrid algorithms by LFA for systems of partial differential equations on triangular grids", Chapter of the book: "Monografías del Seminario Matemático García de Galdeano", volume 35, 2010. ISSN/ISBN: 978-84-15031-53-6.

F.J. Gaspar, F.J. Lisbona and C. Rodrigo. "Multigrid Finite Element Method on Semi-Structured Grids for the Poroelasticity Problem", Chapter of the book: "Numerical Mathematics and Advanced Applications", Springer, 2010. ISBN: 978-3-642-11794-7.

F.J. Gaspar, F.J. Lisbona, C. Rodrigo, "Efficient implementation of box-relaxation multigrid methods for the poroelasticity problem on semi-structured grids", Chapter of the book: Monografías de la Real Academia de Ciencias Exactas, Físicas, Químicas y Naturales de Zaragoza, volumen 33, 2010.

J.H. Adler, F.J. Gaspar, X. Hu, C. Rodrigo, L.T. Zikatanov, "Robust block preconditioners for Biot's model", Chapter of the book: Lecture Notes in Computational Science and Engineering 125, 2018.

F.J. Gaspar, C. Rodrigo, X. Hu, P. Ohm, J. Adler, L. Zikatanov, "New stabilized discretizations for poroelasticity equations", Chapter of the book: Lecture Notes in Computer Science 11189 LNCS, pp. 3-14, 2019.

A. Arrarás, F.J. Gaspar, L. Portero, C. Rodrigo, "Space-time parallel methods for evolutionary reaction-diffusion problems", in: S.C. Brenner, E.T. Shun Chung, A. Klawonn, F. Kwok, J. Xu, J. Zou (Eds.), Domain Decomposition Methods in Science and Engineering XXVI, Lecture Notes in Computational Science and Engineering 145 (2023), pp. 605-613, Springer Cham. Published online at https://link.springer.com/book/9783030950248.

OTHER PUBLICATIONS:

C.Clavero, J.L. Gracia, F. Lisbona, C. Rodrigo. "Efficient resolution of singularly perturbed coupled systems: Equations of reaction-diffusion type". Electronic Proceedings of the conference CEDYA 2007 (Sevilla, Spain)
F.J. Gaspar, J.L. Gracia, F.J. Lisbona, C. Rodrigo. "Multigrid finite element methods on semi-structured triangular grids". Electronic Proceedings of the conference CEDYA 2009 (Ciudad Real, Spain). ISSN/ISBN: 978-84-692-6473-7

P. Luo, C. Rodrigo, F.J. Gaspar, C.W. Oosterlee, "On a multigrid method for the coupled Stokes and porous media flow problem".AIP Conference Proceedings 1863 (2017) pp. 560023 (5pp). ISSN 0094-243X

C. Rodrigo, F.J. Gaspar, M. Borregales, K. Kumar, F. Radu, "New approaches to the fixed-stress Split scheme for solving Biot's model", Mathematisches Forschungsinstitut Oberwolfach Report No. 39/2018, Reactive Flows in Deformable, Complex Media (2018) pp. 2421-2424.

RESEARCH PROJECTS AND GRANTS

LOCAL AND REGIONAL PROJECTS:

"Development of a geometric multigrid code on triangular grids and its application to poroelasticity", University of Zaragoza, 01/01/2007-31/12/2007, Funding: 7000€, Principal Investigator: Francisco J. Gaspar, Role: researcher.

"Visión Matemática de la Evolución de los Recursos Naturales (Análisis y Simulación)", Gobierno de Aragón, 01/01/2008-31/12/2009, Funding: 6000€, Principal Investigator: Mª Cruz López de Silanes, Role: collaborator.

"Problemas Matemáticos en la Explotación de Recursos Naturales y Análisis del Impacto Ecológico", Gobierno de Aragón, 01/01/2011- 31/12/2012, Funding: 6000€, Principal Investigator: Mª Cruz López de Silanes, Role: collaborator.

Campus Iberus movility grant, Campus Iberus. 08/11/2013 – 31/12/2014. Funding: 3359€. Principal Investigator: Carmen Rodrigo.

"UZCUD2014CIE-15 Diseño de métodos numéricos eficientes para el problema de la poroelasticidad no lineal. Aplicaciones en geofísica y ciencia de los materiales", Centro Universitario de la Defensa de Zaragoza, Academia General Militar, 30/09/2014 – 29/06/2015, Funding: 2000€, Principal Investigator: Carmen Rodrigo.

"UZCUD2015-CIE-03 Simulación numérica en medios porosos deformables. Aplicaciones en geofísica, ciencia de los materiales y oncología", Centro Universitario de la Defensa de Zaragoza, Academia General Militar. 1/09/2015 – 31/08/2016, Funding: 3295,92€, Principal Investigator: Carmen Rodrigo.

"Métodos Numéricos en Ecuaciones en Derivadas Parciales e Integrales", Funded Research Group (Grupo de Investigación Consolidado reconocido por el Gobierno de Aragón), Diputación General de Aragón. 01/01/2008 – 31/12/2010. Funding: 38226€, Principal Investigator: Francisco J. Lisbona. Role: group member.

"Métodos Numéricos en Ecuaciones en Derivadas Parciales e Integrales", Funded Research Group (Grupo de Investigación Consolidado reconocido por el Gobierno de Aragón), Diputación General de Aragón. 01/01/2011 – 31/12/2012. Funding: 16686€, Principal Investigator: Francisco J. Lisbona. Role: group member.

"Métodos Numéricos en Ecuaciones en Derivadas Parciales e Integrales", Funded Research Group (Grupo de Investigación Consolidado reconocido por el Gobierno de Aragón), Diputación General de Aragón. 01/01/2013 – 31/12/2013. Funding: 5978€, Principal Investigator: Francisco J. Lisbona. Role: group member.

"Métodos Numéricos en Ecuaciones en Derivadas Parciales e Integrales", Funded Research Group (Grupo de Investigación Consolidado reconocido por el Gobierno de Aragón), Diputación General de Aragón. 01/01/2014 – 31/12/2014. Funding: 8353€, Principal Investigator: Francisco J. Lisbona. Role: group member.

"Métodos Numéricos en Ecuaciones en Derivadas Parciales e Integrales", Funded Research Group (Grupo de Investigación Consolidado reconocido por el Gobierno de Aragón), Diputación General de Aragón. 01/01/2015 – 31/12/2015. Funding: 7146€, Principal Investigator: Francisco J. Lisbona. Role: group member.

"Métodos Numéricos en Ecuaciones en Derivadas Parciales e Integrales", Funded Research Group (Grupo de Investigación Consolidado reconocido por el Gobierno de Aragón), Diputación General de Aragón. 01/01/2016 – 31/12/2016. Funding: 6590€, Principal Investigator: Francisco J. Lisbona. Role: group member.

"UZCUD2019-CIE-04 Métodos Numéricos para el análisis de modelos biológicos: In Silico Lab", Centro Universitario de la Defensa de Zaragoza, Academia General Militar. 1/10/2019 – 30/09/2020, Funding: 2150,17€, Principal Investigator: Carmen Rodrigo (UZ) and Álvaro Lozano (CUD).

"APEDIF (APlicaciones de Ecuaciones DIFerenciales)", Funded Research Group (Grupo de Investigación de referencia, reconocido por el Gobierno de Aragón), Diputación General de Aragón. 01/01/2017 – 31/12/2019. Funding: 45130€, Principal Investigator: Antonio Elipe. Role: group member.

"APEDIF (APlicaciones de Ecuaciones DIFerenciales)", Funded Research Group (Grupo de Investigación de referencia, reconocido por el Gobierno de Aragón), Diputación General de Aragón. 01/01/2020 – 31/12/2022. Funding: 25404€, Principal Investigator: Antonio Elipe. Role: group member.

"APEDIF (APlicaciones de Ecuaciones DIFerenciales)", Funded Research Group (Grupo de Investigación de referencia, reconocido por el Gobierno de Aragón), Diputación General de Aragón. 01/01/2023 – 31/12/2025. Funding: 54899,81€, Principal Investigator: Antonio Elipe. Role: group member.

NATIONAL PROJECTS:

"MTM2007-63204 Simulación y análisis numérico de problemas evolutivos en mecánica de sólidos y fluidos", Ministerio de Ciencia y Tecnología, 01/10/2007- 30/09/2010, Funding: 80465€, Principal Investigator: Francisco J. Sayas, Role: researcher and technical support.

"MTM2010-16917 Estabilización y Convergencia de Métodos Numéricos para algunos Problemas con Capa Límite. Diseño e Implementación de Métodos Multimalla sobre Mallas Semi-estructuradas", Ministerio de Ciencia y Tecnología, 01/01/2011-31/12/2013, Funding: 80344€, Principal Investigator: Francisco J. Gaspar, Role: researcher.

"MTM2013-40842. Diseño de métodos numéricos muy eficientes para problemas de interés en geofísica. Aplicación al almacenamiento de CO2 y a la prospección sísmica", Ministerio de Economía y Competitividad- Programa Estatal de Fomento de la Investigación Científica y Técnica de Excelencia, 01/01/2014-31/12/2016, Funding: 60775€, Principal Investigator: Francisco J. Gaspar, Role: researcher.

"MTM2016-75139. Modelización y simulación numérica en medios porosos. Aplicación al desarrollo de materiales autorreparables y al almacenamiento de dióxido de carbono", Ministerio de Economía y Competitividad- Programa Estatal de Fomento de la Investigación Científica y Técnica de Excelencia, 30/12/2016-31/12/2018, Funding: 35816€, Principal Investigator: Etelvina Javierre, Role: researcher.

"PGC2018-099536-A-I00 Simulación numérica de flujo en medios porosos fracturados", Agencia Estatal de Investigación/Fondos FEDER. 01/01/2019-30/09/2022, Funding: 29403€, Principal Investigator: Carmen Rodrigo and Andrés Arrarás.

"PID2022-140108NB-I00: Métodos de resolución espacio-tiempo para problemas en medios porosos", Agencia Estatal de Investigación/Fondos FEDER. 01/09/2023-31/08/2027, Funding: 170000€, Principal Investigator: Carmen Rodrigo.

EUROPEAN PROJECTS:

"Numerical simulation in deformable porous media. Application to carbon dioxide storage". European Economic Area. NILS Science and Sustainability Abel coordinate mobility (involved institutions: University of Zaragoza and Bergen University), 01/04/2014-01/11/2015, Funding: 19150€, Principal Investigator: Francisco J. Gaspar, Role: researcher.

ORGANIZATION OF I+D+I ACTIVITIES

International conference "BAIL 2010 Boundary and Interior Layers – Computational & Asymptotic Methods", Zaragoza (Spain), 04/07/2010 – 08/07/2010.

International workshop "Numerical Methods for Ordinary and Partial Differential Equations and Applications", Zaragoza (Spain), 03/09/2012 – 05/09/2012.

International series of courses "Lectures on Numerical Mathematics and Applications", Zaragoza (Spain), 03/06/2013 – 04/06/2013.

"IUMA day on Porous Media and Applications in Geomechanics", Zaragoza (Spain), 21/07/2014.

Minisymposium "Numerical Simulations in Poromechanics" organized at the "8th International Congress on Industrial and Applied Mathematics", Beijing (China), 09/08/2015 – 13/08/2015.

International workshop "Flow in Deformable Porous Media", Zaragoza (Spain), 23/11/2015 – 25/11/2015.

Minisymposium "Discretizations and solvers for multiphysics problems", organized at the "European Conference on Numerical Mathematics and Advanced Applications, ENUMATH 2017", Voss (Norway) 25/09/2017 – 29/09/2017.

International workshop "The Computational Mathematics Aspects of Porous Media and Fluid Flow" organized at the Lorentz Center in Leiden University (Netherlands), 22/05/2018 – 25/05/2018 (competitive call).

Minisymposium "Recent advances in porous media flow", organized at the "8th International Conference Computational Methods in Applied Mathematics, CMAM-8", Minsk (Bielorrusia), 02/07/2018 - 06/07/2018.

Minisymposium "Recent Advances in Numerical Methods for Flow in Deformable Porous Media", organized at the "12th International Conference on Large-Scale Scientific Computations (LSSC'19)", Sozopol (Bulgaria), 10/06/2019 – 14/06/2019.

Minisymposium "Recent Advances in Multigrid Methods and their Applications", organized at the "International conference on Preconditioning Techniques for Scientific and Industrial Applications (Preconditioning 2019)", Minnesota (USA), 01/07/2019 – 03/07/2019.

Minisymposium "Robust solvers for multiphysics problems", organized at the "26th International Domain Decomposition Conference (DD XXVI)", Hong Kong (China), 07/12/2020 – 12/12/2020.

Minisymposium "Multiphysics Processes in Fractured Media" organized at the "SIAM Conference on Mathematical & Computational Issues in the Geosciences (GS21)", Milan (Italy), 21/06/2021-24/06/2021.

VI ECCOMAS Young Investigators Conference (YIC 2021), organized at the Universitat Politècnica de València, Valencia (Spain), 07/07/2021-09/07/2021 (competitive call).

Minisymposium "Flow and mechanics in porous media", organized at the "VI ECCOMAS Young Investigators Conference (YIC 2021)", Valencia (Spain), 07/07/2021-09/07/2021.

Minisymposium "Métodos Numéricos para la física y la ingeniería", organized at the "Congreso Bienal de la Real Sociedad Matemática Española", Ciudad Real (Spain), 17/01/2022-21/01/2022.

Curso y encuentro de análisis numérico Zaragoza Numérica 2022, organized at the University of Zaragoza, Zaragoza (Spain), 14/07/2022-15/07/2022.

Minisymposium "Efficient solvers for large sparse linear systems", organized at the "XXVII Congreso de ecuaciones diferenciales y aplicaciones/XVII Congreso de matemática aplicada", Zaragoza (Spain), 18/07/2022-22/07/2022.

Workshop "IUMA day on Numerical Methods for Porous Media Problems (Bergen-Zaragoza students meeting)" organized at the University of Zaragoza, Zaragoza (Spain), 10/01/2024.

Minisymposium "Advanced numerical techniques for the solution of differential problems", organized at the "Congreso Bienal de la Real Sociedad Española", Pamplona (Spain), 22/01/2024-26/01/2024.

Minisymposium "Efficient solvers for differential equations", organized at the XXVIII CEDYA / XVIII CMA, Bilbao (Spain), 24/06/2024-28/06/2024.

Minisymposium "Mathematical modelling and numerical techniques for porous media applications", organized at the "Seventeenth International Conference Zaragoza-Pau on Mathematics and its Applications", Jaca, Huesca (Spain), 04/09/2024-06/09/2024.

SUPERVISION OF STUDENTS

BACHELOR'S THESIS:

Álvaro Pé de la Riva, "Simulación numérica en registro de imágenes". Supervisors: Francisco J. Gaspar and Carmen Rodrigo. July 2016.

Beatriz Malo Polo, "Simulación numérica en problemas de contaminación". Supervisors: Francisco J. Gaspar and Carmen Rodrigo. July 2016.

Ángela Hernández López, "Estudio numérico de un modelo de propagación de enfermedades infecciosas". Supervisors: Francisco J. Gaspar and Carmen Rodrigo. July 2016.

Estefanía Bueno Sancho, "Cálculo de Variaciones para el procesamiento de imágenes". Supervisors: Francisco J. Gaspar and Carmen Rodrigo. December 2016.

Ana Carmen Mainer Tricas, "Un esquema numérico para la simulación de crecimiento de tumores". Supervisors: Francisco J. Gaspar and Carmen Rodrigo. September 2019.

Carmen Mayora Cebollero, "Numerical resolution of inpainting methods". Supervisors: Francisco J. Gaspar and Carmen Rodrigo. July 2020.

Antonio Torralba Gallego, "Resolución analítica y numérica del modelo Black-Scholes". Supervisors: Francisco J. Gaspar and Carmen Rodrigo. September 2021.

Inés Baldellou Brosed, "Estudio numérico de un modelo de propagación de enfermedades infecciosas", Supervisors: Francisco J. Gaspar and Carmen Rodrigo. September2022.

Adrián Aurensanz Crespo, "Estudio del modelo de crecimiento económico de Solow-Swan con el modelo poblacional de Zhang", Supervisors: Francisco J. Gaspar and Carmen Rodrigo. June 2023.

María del Pilar Ros Moliner, "Ecuaciones en derivadas parciales como modelos en propagación de enfermedades infecciosas", Supervisors: Francisco J. Gaspar and Carmen Rodrigo. June 2023.

Luis Medrano Navarro, "El método de los elementos finitos para problemas de mecánica de fluidos", Supervisors: Francisco J. Gaspar and Carmen Rodrigo. September 2023.

Inés Clavero Elena, "Estudio de un modelo de transporte de contaminantes en el aire", Supervisors: Francisco J. Gaspar and Carmen Rodrigo. June 2024.

César Miravete Zarazaga, "La transformación Wavelet y sus aplicaciones en el procesamiento de imágenes", Supervisors: Francisco J. Gaspar and Carmen Rodrigo. July 2024.

Marina Ainaga Sancho, "La transformada wavelet", Supervisors: Francisco J. Gaspar and Carmen Rodrigo. July 2024.

Blanca Sayas Ladaga, "Métodos iterativos en Krylov", Supervisors: Francisco J. Gaspar and Carmen Rodrigo. July 2024.

MASTER'S THESIS:

Álvaro Pé de la Riva, TFM "Elementos finitos para problemas de punto silla". Directores: Francisco José Gaspar Lorenz y Carmen Rodrigo Cardiel. Octubre 2017. Sobresaliente.

PHD THESIS:

Michely Laís de Oliveira, "Métodos de resolución eficientes para problemas multifásicos en medios porosos deformables: una aplicación en crecimiento tumoral". Programa de Postgrado en Métodos Numéricos en Ingeniería en la Universidade Federal do Paraná (Brasil). Supervisors: Marcio Villela Pinto and Carmen Rodrigo. Defended on1st September 2022.

Álvaro Pé de la Riva (grant from the Gobierno de Aragón), "Robust and efficient multigrid solvers for isogeometric analysis". Doctoral Program in Mathematics and Statistics, University of Zaragoza. Supervisors: Francisco J. Gaspar and Carmen Rodrigo. Defended on 12th April 2023.

Javier Zaratiegui Urdín, "Efficient solvers for flow problems in fractured poroelastic media". Doctoral Program in Mathematics and Statistics, University of Zaragoza. Supervisors: Carmen Rodrigo and Andrés Arrarás. In process, estimated defense date: 2025.

PRESENTATIONS IN CONFERENCES

PLENARY AND SEMI-PLENARY TALKS:

C. Rodrigo, X. Hu, F.J. Gaspar, L. Zikatanov, "Relation between mimetic finite difference schemes and finite element methods for some model problems in H(curl) and H(div)". 20th International Conference on Mathematical Modelling and Analysis, Sigulda, Latvia, 2015.

C. Rodrigo, F.J. Gaspar, X. Hu, F.J. Lisbona, L. Zikatanov, "Flow in deformable porous media", Ciudad Real Numérica, Ciudad Real, Spain, 2015.

C. Rodrigo, "Numerical difficulties in the simulation of flow in deformable porous media", IV Congreso de Jóvenes Investigadores de la Real Sociedad Matemática Española, Valencia, Spain, 2017.

C. Rodrigo, F.J. Gaspar, "Multigrid with Space-Time Concurrency for Solving Parabolic PDEs. Application to the Time-Fractional Heat Equation", 23rd International Conference on Mathematical Modelling and Analysis, Sigulda, Latvia, 2018.

C. Rodrigo, F.J. Gaspar, "Robust discretizations for fluid-flow problems in deformable porous media", International Society for Porous Media (InterPore) Annual Meeting, Valencia, Spain, 2019.

C. Rodrigo, F.J. Gaspar, "Multigrid waveform relaxation for the solution of the time-fractional heat equation", Advanced parallel-in-time algorithms for computer simulations in physical sciences, social sciences and engineering, Bielefeld, Germany, 2019.

C. Rodrigo, F.J. Gaspar, "Robust Discretizations and Solvers for Poromechanics", 12th International Conference on Large-Scale Scientific Computations, Sozopol, Bulgaria, 2019.

C. Rodrigo, F.J. Gaspar, X. Hu, P. Ohm, J. Adler, L. Zikatanov, "Robust Preconditioners for Biot's Consolidation Model", International Conference on Preconditioning Techniques for Scientific and Industrial Applications (Preconditioning 2019), Minnesota, USA, 2019.

C. Rodrigo, F.J. Gaspar, A. Arrarás, L. Portero, "Monolithic Solution of Mixed-dimensional Models in Fractured Porous Media by Multigrid Methods", 5th ECCOMAS Young Investigators Conference (YIC 2019), Krakow, Poland, 2019.

C. Rodrigo, "Mathematics of Porous Media", Workshop Maths in Society, Munich, Germany, 2021.

C. Rodrigo, "Robust preconditioners for poromechanics", ECCOMAS Congress 2022, 8th European Congress on Computational Methods in Applied Sciences and Engineering, Oslo, Norway, 2022.

C. Rodrigo, "Numerical simulation of flow problems in deformable porous media", XXVII Congreso de ecuaciones diferenciales y aplicaciones/XVII Congreso de matemática aplicada, Zaragoza, Spain, 2022.

INVITED TALKS:

F.J. Gaspar, F.J. Lisbona, C. Rodrigo, "An efficient solver for the poroelasticity problem". Workshop Maths & Earth, Zaragoza, Spain, 2011.

C. Rodrigo, F.J. Gaspar, F.J. Lisbona, "Geometric multigrid methods on semi-structured triangular grids". 7th GRACM International Congress on Computational Mechanics / 1st PhD ECCOMAS Olympiad, Athens, Greece, 2011.

C. Rodrigo, F.J. Gaspar, F.J. Lisbona, "Efficient block-wise geometric multigrid methods on triangular grids". 1st Joint Conference of the Belgian, Royal Spanish and Luxembourg Mathematical Societies, Liège, Belgium, 2012.

F.J. Gaspar, C. Rodrigo, P. Salinas, "Efficient cell-centered multigrid methods on semi-structured triangular grids". Numerical Methods for Ordinary and Partial Differential Equations and Applications, Zaragoza, Spain, 2012.

F.J. Gaspar, F.J. Lisbona, C. Rodrigo, "Multigrid methods based on distributive smoothers for vector problems on semi-structured triangular grids". Weizmann Workshop 2013 on Multilevel computational methods and optimization, Rehovot, Israel, 2013.

C. Rodrigo, F.J. Gaspar, "Stable discretizations for the Biot consolidation model". IUMA day on Porous Media and Applications in Geomechanics, Zaragoza, Spain, 2014.

C. Rodrigo, F.J. Gaspar, "Multigrid solution of the poroelasticity problem". IUMA day on Porous Media and Applications in Geomechanics, Zaragoza, Spain, 2014.

F.J. Gaspar, X. Hu, C. Rodrigo, L. Zikatanov, "Multigrid methods for mimetic finite difference discretizations". Eight International Conference on Numerical Methods and Applications, Borovets, Bulgaria, 2014.

C. Rodrigo, F.J. Gaspar, "Poroelasticity: stable numerical discretization and multi-grid solution". 6th International Conference on Computational Methods in Applied Mathematics, Strobl, Austria, 2014.

C. Rodrigo, F.J. Gaspar, P. Luo, C.W. Oosterlee, "About some smoothers for saddle-point problems". 2015 SIAM Conference on Computational Science and Engineering (CSE15), Salt Lake City, Utah, USA, 2015.

F.J. Gaspar, F.J. Lisbona, C. Rodrigo, "Designing Geometric Multigrid Methods on Semi-Structured Grids by using Local Fourier Analysis". Dagstuhl Seminar "Advanced Stencil-Code Engineering", Schloss Dagstuhl, Germany, 2015.

C. Rodrigo, "Stability and monotonicity for some discretizations of the Biot's consolidation model", (invitación para recoger el Premio SEMA "Antonio Valle" al Joven Investigador 2015). XXIV Congress on Differential Equations and Applications / XIV Congress on Applied Mathematics, Cádiz, Spain, 2015.

C. Rodrigo, F.J. Gaspar, F.J. Lisbona, P. Luo, C.W. Oosterlee, "Multigrid solvers for the Biot's consolidation problem". 10th International Conference on Large-Scale Scientific Computations, Sozopol, Bulgaria, 2015.

C. Rodrigo, X. Hu, F.J. Gaspar, L. Zikatanov, "Solution of Stable Discretizations of the Biot's Consolidation Problem by Monolithic Multigrid Solvers". 8th International Congress on Industrial and Applied Mathematics (ICIAM 2015), Beijing, China, 2015.

C. Rodrigo, F.J. Gaspar, "On the local Fourier analysis for multigrid methods. Application to Biot's model". Workshop Biot equations and A posteriori error estimates, Voss, Norway, 2016.

C. Rodrigo, F.J. Gaspar, "Space-time concurrency for solving time-dependent partial differential equations", Congreso Bienal de la Real Sociedad Matemática Española, Zaragoza, Spain, 2017.

C. Rodrigo, F.J. Gaspar, P. Luo, C.W. Oosterlee, "Monolithic multigrid method for the coupled Darcy-Stokes problem", XXIV International Conference on Domain Decomposition Methods, Svalbard, Norway, 2017.

C. Rodrigo, F.J. Gaspar, X. Hu, J. Adler, L. Zikatanov, "Mimetic finite difference schemes for Maxwell equations", SIAM Conference on Computational Science and Engineering 2017, Atlanta, USA, 2017.

C. Rodrigo, F.J. Gaspar, "Efficient solvers for the linear thermo-poroelasticity problem", European Conference on Numerical Mathematics and Advanced Applications ENUMATH2017, Voss, Norway, 2017.

C. Rodrigo, F.J. Gaspar, "Stable discretizations and fast solvers based on multigrid methods on semi-structured grids", International Workshop on Flow in Deformable Porous Media: Numerics and Benchmarks, Hamburg, Germany, 2017.

C. Rodrigo, F.J. Gaspar, M. Borregales, K. Kumar, F. Radu, "On new approaches to the fixed-stress Split scheme for solving flow problems in deformable porous media", 6th European Conference on Computational Mechanics (Solids, Structures and Coupled Problems) (ECCM 6) and 7th European Conference on Computational Fluid Dynamics (ECFD 7), Glasgow, United Kingdom, 2018.

C. Rodrigo, F.J. Gaspar, M. Borregales, K. Kumar, F. Radu, "New approaches to the fixed-stress Split scheme for solving Biot's model", Oberwolfach Workshop "Reactive Flows in Deformable, Complex Media", Oberwolfach Germany, 2018.

C. Rodrigo, F.J. Gaspar, P. Luo, C.W. Oosterlee, "Efficient solution of coupled flow and porous media problems by monolithic multigrid methods", SIAM Conference on Mathematical and Computational Issues in the Geosciences (GS19), Houston, USA, 2019.

A. Arrarás, F.J. Gaspar, L. Portero, C. Rodrigo, "Monolithic mixed-dimensional multigrid method for fluid-flow problems in fractured porous media", AMS 2019 Spring Central and Western Joint Sectional Meeting, Honolulu, Hawaii, USA, 2019.

C. Rodrigo, F.J. Gaspar, P. Luo, C.W. Oosterlee, "An efficient multigrid solver for the coupled Stokes flow and deformable porous medium system", 9th International Congress on Industrial and Applied Mathematics (ICIAM), Valencia, Spain, 2019.

C. Rodrigo, F.J. Gaspar, X. Hu, J. Adler, L. Zikatanov, P. Ohm, "Robust Preconditioners for Biot's Consolidation Model", 14th WCCM & ECCOMAS Congress 2020, Virtual Conference, 2021.

C. Rodrigo, F.J. Gaspar, "Efficient and Robust Solvers for the Biot's Consolidation Model", SIAM Conference on Computational Science and Engineering (CSE21), Virtual Conference, 2021.

C. Rodrigo, A. Pé de la Riva, F.J. Gaspar, "On Isogeometric Analysis of Poroelasticity", SIAM Conference on Mathematical & Computational Issues in the Geosciences (GS21), Politecnico di Milano, Milan, Italy (virtual conference), 2021.

C. Rodrigo, A. Pé de la Riva, F.J. Gaspar, "Efficient Solution Methods for Isogeometric Analysis", SIAM Annual Meeting (AN21), Virtual Conference, 2021.

A. Pé de la Riva, F.J. Gaspar, C. Rodrigo, X. Hu, L. Zikatanov, "A new stabilization of Biot's consolidation model", ECCOMAS Congress 2022, 8th European Congress on Computational Methods in Applied Sciences and Engineering, Oslo, Norway, 2022.

C. Rodrigo, F.J. Gaspar, A. Arrarás, L. Portero, "Monolithic multigrid solution of mixed-dimensional models in fractured porous media", Workshop on Computational Mechanics Models on Domains on Heterogeneous Dimensionality, Split, Croacia, 2022.

C. Rodrigo, A. Pé de la Riva, F.J. Gaspar, X. Hu, J. Adler, L. Zikatanov, "On a stabilized scheme for Biot's model", SIAM Conference on Computational Science and Engineering (CSE23), Amsterdam, The Netherlands, 2023.

C. Rodrigo, A. Pé de la Riva, F.J. Gaspar, X. Hu, J. Adler, L. Zikatanov, "Oscillation-free numerical scheme for the Biot's model", Algoritmy 2024 – Central European Conference on Scientific Computing, High Tatra Mountains, Slovakia, 2024.

A. Pé de la Riva, F.J. Gaspar, C. Rodrigo, X. Hu, J. Adler, L. Zikatanov, "Iterative coupling solution of a novel stabilization scheme for Biot's model", XXVIII CEDYA / XVIII CMA conference, Bilbao, Spain, 2024.

CONTRIBUTED TALKS:

G. Aguilar, F.J. Gaspar, F.J. Lisbona, C. Rodrigo. "A stabilized difference scheme for deformable porous media and its numerical resolution on block-structured grids by multigrid methods". XX CEDYA / X CMA, Sevilla, Spain, 2007.

F. J. Gaspar, J. L. Gracia, F. J. Lisbona, C. Rodrigo. "Geometric multigrid methods for systems of partial differential equations on triangular grids". 13th International Conference on Mathematical Modelling and Analysis and the 3rd International Conference on Approximation Methods and Orthogonal Expansions, Kääriku, Estonia, 2008.

F.J.Gaspar, J.L.Gracia, F.J.Lisbona, C.Rodrigo. "Development of efficient geometric multigrid algorithms by LFA for systems of partial differential equaions on triangular grids". Tenth International Conference Zaragoza-Pau on Applied Mathematics and Statistics, Jaca, Spain, 2008.

F.J. Gaspar, J.L. Gracia, F.J. Lisbona, C. Rodrigo. "Vector Fourier analysis on triangular grids for planar elasticity". 14th Cooper Mountain Conference on Multigrid Methods. Colorado, USA, 2009.

F.J. Gaspar, F.J. Lisbona, C. Rodrigo. "Efficient Multigrid Method on Hierarchical Triangular Grids for the Biot's Consolidation Problem". 14th International Conference on Mathematical Modelling and Analysis, Daugavpils, Latvia, 2009.

F.J. Gaspar, F.J. Lisbona, C. Rodrigo. "Multigrid Finite Element Method on Semi-structured Grids for the Poro-elasticity Problem". 8th European Conference on Numerical Mathematics and Advanced Applications (ENUMATH), Uppsala, Sweden, 2009.

F.J. Gaspar, J.L. Gracia, F.J. Lisbona, C. Rodrigo. "Multigrid Finite Element Methods on Semi-structured Triangular Grids". XXI CEDYA, XI CMA, Ciudad Real, Spain, 2009.

C. Rodrigo, F.J. Gaspar, C.W. Oosterlee, I. Yavneh. "About Full-Multigrid Method". 15th International Conference on Mathematical Modelling and Analysis, Druskininkai, Lithuania, 2010.

F.J. Gaspar, F.J. Lisbona, C. Rodrigo. "On the stabilization of linear finite element methods for the poroelasticity problem and its resolution by coupled-relaxation based multigrid". 11th International Conference Zaragoza-Pau on Applied Mathematics and Statistics, Jaca, Huesca, Spain, 2010.

C. Rodrigo, F.J. Gaspar, C.W. Oosterlee, I. Yavneh. "Accuracy Measures and Fourier Analysis for the Full Multigrid Method". 10th European Multigrid Conference, Isola d'Ischia, Italy, 2010.

F.J. Gaspar, F.J. Lisbona, C. Rodrigo. "About a stabilized finite element method for the poro-elasticity problem and its resolution by multigrid". International Conference Boundary and Interior Layers, Computational & Asymptotic Methods, Zaragoza, Spain, 2010.

F.J. Gaspar, F.J. Lisbona, C. Rodrigo. "Multicolor Fourier analysis of the multigrid method for quadratic FEM discretizations". 15th Copper Mountain Conference on Multigrid Methods, Colorado, USA, 2011.

C. Rodrigo, F.J. Gaspar, F.J. Lisbona, "Design of geometric multigrid methods for quadratic FEM discretizations on semi-structured grids". 16th International Conference on Mathematical Modelling and Analysis, Sigulda, Latvia, 2011.

C. Rodrigo, F.J. Gaspar, C.W. Oosterlee, I. Yavneh, "Full-Multigrid (FMG): the most efficient multigrid algorithm". XXII Congreso de Ecuaciones Diferenciales y Applicaciones, XII Congreso de Matemática Aplicada, Palma de Mallorca, Spain, 2011.

C. Rodrigo, F.J. Gaspar, F.J. Lisbona, P. Salinas, "Local Fourier analysis for multigrid methods on semi-structured triangular grids". 2012 SIAM Conference on Applied Linear Algebra, Valencia, Spain, 2012.

C. Rodrigo, F.J. Gaspar, F.J. Lisbona, P. Salinas, "Designing cell-centered multigrid methods on semi-structured triangular grids by local Fourier analysis". International Congress on Computational and Applied Mathematics (ICCAM), Ghent, Belgium, 2012.

C. Rodrigo, F.J. Gaspar, I. Yavneh, C.W. Oosterlee, "A fast solver for a new discretization with complex coefficients of the Helmholtz equation". European Multigrid Conference 2012, Schwetzingen Castle, Germany, 2012.

F.J. Gaspar, F.J. Lisbona C. Rodrigo, "An efficient multigrid algorithm for finite difference discretizations on triangular grids". 16th Copper Mountain Conference on Multigrid Methods, Copper Mountain, Colorado, USA, 2013.

F.J. Gaspar, Y. Notay, C.W. Oosterlee, C. Rodrigo, "Analysis of a smoother of Uzawa type for the generalized Stokes equations". 18th International Conference on Mathematical Modelling and Analysis, Tartu, Estonia, 2013.

C. Rodrigo, F.J. Gaspar, F.J. Lisbona, "Design of efficient geometric multigrid methods for saddle point problems with applications in poroelasticity". 6th Workshop on Analysis and Advanced Numerical Methods for Partial Differential Equations, Strobl, Austria, 2013.

F.J. Gaspar, F.J. Lisbona, C. Rodrigo, "Designing efficient multigrid algorithms for vector problems on triangular grids". XXIII Congreso de Ecuaciones Diferenciales y Aplicaciones / XIII Congreso de Matemática Aplicada, Castellón, Spain, 2013.

C. Rodrigo, F.J. Gaspar, F.J. Lisbona, P. Salinas, "Block-wise geometric multigrid for cell-centered discretizations in semi-structured triangular grids". 19th International Conference on Mathematical Modelling and Analysis, Druskininkai, Lithuania, 2014.

C. Rodrigo, F.J. Gaspar, X. Hu, L. Zikatanov, "Finite element multigrid framework for mimetic finite difference discretizations". 2014 European Multigrid Conference, Leuven, Belgium, 2014.

C. Rodrigo, F.J. Gaspar, X. Hu, L. Zikatanov, "Design of a multigrid solver for mimetic finite differences by using a finite element framework". 13th International Conference Zaragoza-Pau on Mathematics and its Applications, Jaca, Spain, 2014.

C. Rodrigo, X. Hu, F.J. Gaspar, L. Zikatanov, "On the design of a finite element multigrid solver for mimetic finite difference schemes". Copper Mountain Conference on Multigrid Methods, Copper Mountain, Colorado, USA, 2015.

C. Rodrigo, F.J. Gaspar, F.J. Lisbona, "Local Fourier analysis of Vanka smoother based multigrid for staggered discretization of Biot's consolidation problem", 2nd International Conference on Mathematics and Statistics 2015, Ho Chi Minh, Vietnam, 2015.

C. Rodrigo, F.J. Gaspar, "Multigrid waveform relaxation for solving the time-fractional heat equation", 18th Copper Mountain Conference on Multigrid Methods, Copper Mountain, Colorado, USA, 2017.

C. Rodrigo, F.J. Gaspar, P. Luo, C.W. Oosterlee, "Monolithic multigrid solvers for coupled flow and porous media problems", 4th ECCOMAS Young Investigators Conference YIC2017, Milan, Italy, 2017.

C. Rodrigo, F.J. Gaspar, X. Hu, "Multigrid with space-time concurrency for solving the time-fractional heat equation", 9th International Conference on Numerical Methods and Applications NM&A'18, Borovets, Bulgaria, 2018.

A. Arrarás, F.J. Gaspar, L. Portero, C. Rodrigo, "A monolithic mixed-dimensional multigrid method for single-phase flow in fractured porous media", 19th Copper Mountain Conference on Multigrid Methods, Copper Mountain, Colorado, USA, 2019.

C. Rodrigo, A. Pé de la Riva, F.J. Gaspar, X. Hu, J. Adler, L. Zikatanov, " A new decoupled solution method for a novel oscillation-free numerical scheme for Biot's model", 18th Copper Mountain Conference on Iterative Methods, Copper Mountain, Colorado, USA, 2024.

POSTERS:

F.J. Gaspar, X. Hu, C. Rodrigo, L. Zikatanov, "Stable discretizations and Multigrid Solution of Biot's consolidation problem". Workshop on Advanced Numerical Methods in the Mathematical Sciences, Texas A&M, College Station, Texas, USA, 2015.

ATTENDANCE (without being speaker):

9th European Multigrid Conference and Symposium Fast Solvers, Bad Herrenalb, Germany, 2008

ESF OPTPDE Workshop "Fast Solvers for Simulation, Inversion, and Control of Wave Propagation Problems", Würzburg, Germany, 2011.

Worshop "Robust discretizations for elasticity and poroelasticity", Finse, Norway, 2015.

Valencia Numérica, Valencia, Spain, 2017.

Lorentz Center workshop "The Computational Mathematics Aspects of Porous Media, and Fluid Flow", Lorentz Center, Leiden University, Netherlands, 2018.

8th International Conference Computational Methods in Applied Mathematics (CMAM-8), Minsk, Bielorusia, 2018.

Fifteenth International Conference Zaragoza-Pau on Mathematics and its Applications, Jaca, Huesca, Spain, 2018.

Algoritmy 2020 – Conference on Scientific Computing, Podbanské, Slovakia, 2020.

26th International Domain Decomposition Conference (DD XXVI), Hong Kong, China (virtual Conference) 2021.

20th Copper Mountain Conference on Multigrid Methods, Copper Mountain, Colorado (virtual conference), 2021.

13th International Conference on Large-Scale Scientific Computations (LSSC21), Sozopol, Bulgaria, 2021.

VI ECCOMAS Young Investigators Conference (YIC 2021), Valencia (Spain), 2021.

Congreso Bienal de la Real Sociedad Matemática Española, Ciudad Real (Spain), 2022.

Curso y encuentro de análisis numérico Zaragoza Numérica 2022, Zaragoza (Spain), 2022.

Congreso Bienal de la Real Sociedad Matemática Española, Pamplona (Spain), 2024.

INVITED SEMINARS AND COURSES

INVITED SEMINARS:

"Geometric multigrid methods for systems of partial differential equations on triangular grids", 17th June, 2008, Vilnius Gediminas Technical University, Lithuania.

"Design of efficient multigrid finite element methods on semi-structured triangular grids", 17th November, 2009, Centrum Wiskunde & Informatica (CWI), Amsterdam, The Netherlands.

"Design of efficient multigrid finite element methods on semi-structured triangular grids", 26th November, 2009, Delft University of Technology, The Netherlands.

"On the application of geometric multigrid methods on semi-structured triangular grids", 14th March, 2013, Delaware University, Newark, USA.

"Designing geometric multigrid methods on semi-structured triangular grids", 26th March, 2013, The Pennsylvania State University, State College, Pennsylvania, USA.

"Multigrid methods based on distributive smoothers for grad-div dominating problems on semi-structured triangular grids", 23rd May, 2013, Vilnius Gediminas Technical University, Vilnius, Lithuania.

"Numerical solution of a poroelasticity problem by stabilized finite element method and multigrid", 17th March, 2014, The Pennsylvania State University, State College, Pennsylvania, USA.

"On the numerical solution of the Biot's consolidation model", 10th March, 2014, Tufts University, Medford, Boston, USA.

"Numerical difficulties and efficient multigrid solution of poroelasticity models", 19th March, 2015, University of Nevada Las Vegas, Las Vegas, Nevada, USA.

"Finite elements and mimetic finite differences for some problems in H(div) and H(curl) and their multigrid solution", 1st May, 2015, The Pennsylvania State University, State College, Pennsylvania, USA.

"Stability and monotonicity for some discretizations of the Biot's consolidation model", 3rd June, 2015, Bergen University, Bergen, Norway.

"Local Fourier analysis based design of geometric multigrid methods on semi-structured triangular grids", 18th August, 2015, Beijing Computational Science Research Center, Beijing, China.

"Numerical difficulties in the simulation of flow in deformable porous media", 17th March, 2017, Tufts University, Medford, Boston, USA.

"Efficient solvers for the time-fractional heat equation based on multigrid waveform relaxation", 24th April, 2017, The Pennsylvania State University, State College, USA.

"Resolución numérica del problema de Biot por elementos finitos", Seminario Rubio de Francia (SRF), 15th February, 2018, University of Zaragoza, Spain.

"Robust multigrid solver for mixed-dimensional models for flow in fractured porous media", 4th March, 2019, Tufts University, Medford, Boston, USA.

"Numerical Simulation of Biot's model. Efficient multigrid solvers", 14th October 2020, CERFACS (virtual).

"Robust discretizations and solvers for poroelastic problems", 12 August 2021, Irish Numerical Analysis Forum seminar (virtual).

INVITED COURSES:

Invited lecture (1 hour and half): "Basics of Multigrid Methods and Local Fourier Analysis", within the series of international courses "Lectures on Numerical Mathematics and Applications", held at Würzburg University, Germany, 27-28 August 2014.

Tutorial (1 hour) on "Local Fourier analysis" at Tufts University, Boston, USA, 8th March, 2015.

Invited lecture (1 hour) on "Monolithic multigrid solvers for flow problems in porous media" at the Summer School: Solving large systems efficiently in Multiphysics numerical simulation, Centre de recherches mathématiques (CRM), 9th June 2021.

Invited lecture (1 hour) on "Basics to Multigrid Methods. Application to saddle point problems" at Tudela Numérica: curso y encuentro de análisis numérico Francisco Javier Sayas, Tudela, 11th-14th June 2024.

EDITOR AND REVIEWER TASKS

Associate Editor of SIAM Journal of Scientific Computing (2021-2023).

Guess editor of the special issue: International Journal of Numerical Analysis & Modeling, Volume 11, Number 2 (2014). Dedicated to Professor Francisco J. Lisbona on the occasion of his 65th Birthday.

Guess editor at the "2019 Multigrid Copper Mountain Special Issue" in "Numerical Linear Algebra with Applications".

Guess editor of the special issue "Computational Mathematics Aspects of Flow and Mechanics of Porous Media" in the journal "Computational Geosciences: Volume 25, issue 2, April 2021.

Guess editor at the "SISC special issue devoted to the Copper Mountain Conference on Iterative Methods 2020".

Reviewer at the following journals: SIAM Journal on Scientific Computing, Computer Methods in Applied Mechanics and Engineering, Applied Mathematics and Computation (AMC), Journal of Computational Physics, Computers & Mathematics with Applications, SIAM Journal on Matrix Analysis and Applications, Journal of Computational and Applied Mathematics, BIT Numerical Mathematics, Numerical Linear Algebra with Applications (NLAA), International Journal of Computer Mathematics, GEM – International Journal on Geomathematics.

PARTICIPATION IN SCIENTIFIC COMMITTEES

Program Committee Member of the "Copper Mountain Conference on Multigrid Methods", since 2019.

Program Committee Member of the "Copper Mountain Conference on Iterative Methods", since 2020.

Scientific Committee Member of the "12th International Conference on Large-Scale Scientific Computations", Sozopol, Bulgaria, 2019.

Scientific Committee Member of the "ECCOMAS Young Investigators Conference 2019 (YIC 2019)", Krakow, Poland.

Scientific Committee Member of the "13th International Conference on Large-Scale Scientific Computations", Sozopol, Bulgaria, 2021.

Scientific Committee Member of the "XXVIII Congreso de ecuaciones diferenciales y aplicaciones / XVIII Congreso de matemática aplicada (CEDYA/CMA)", Bilbao, Spain, 2024.

EVALUATION TASKS

Committee Member at the PhD of Pablo Salinas Cortés, "Semi-Structured multigrid methods on Voronoi meshes to the resolution of the Darcy-Oberbeck-Boussinesq model", celebrated on the 4th November 2013 at the University of Zaragoza (Spain).

Committee Member for the selection of the SEMA "Antonio Valle" Award for young researchers 2016.

Committee Member for the selection of the PhD thesis selected by SEMA as finalist at the "ECCOMAS Awards for the two best PhD thesis on Computational Methods in Applied Sciences and Engineering", since 2016 (every year).

Evaluator of projects at the MIUR (Ministero dell'Istruzione, dell'Università e della Ricerca), Italy, since 2018.

Evaluator of projects at the ISF (Israel Science Foundation), Israel, since 2019.

Evaluator at the AEI (Agencia Estatal de Investigación), Spain, since 2019.

Committee Member at the "Candidacy Exam" of the predoctoral student Casey Cavanaugh of the Mathematics Department of Tufts University (Medford, Boston,USA), 2019.

Evaluator for the "Memorial University's President's Award for Outstanding Research 2019", at the Memorial University of Newfoundland, Canada.

Member of the Evaluation Committee for a researcher temporary (12 months) employment, and a researcher permanent position, at the University of Bergen, 2019.

Committee Member for the selection of the "ECCOMAS Medals and Awards 2020" (Ritz-Galerkin medal, Prandtl medal, Euler medal, Young Investigator Awards).

Evaluator of the PhD thesis of Matteo Frigo, "Efficient Solvers for Numerical Models in Coupled Poromechanics" at the University of Padova (Italy), 2020.

Committee Member at the PhD of Menel Rahrah, "Mathematical modelling of Fast, High Volume Infiltration in poroelastic media using finite elements", celebrated on the 3rd November 2020 at Delft University of Technology (Netherlands).

Committee Member at the PhD of Pierre Matalon, "Fast solvers for robust discretizations in computational fluid dynamics", celebrated on the 15th October 2021 at Université de Montpellier (France).

Committee Member at the PhD of Casey Cavanaugh, "Structure-preserving discretizations for partial differential equations", celebrated on the 13th April 2022 at Tufts University (USA).

Committee Member at the PhD of Sohely Sharmin, "Upscaling of two-phase porous-media flows with evolving fluid-fluid interface at the pore scale", celebrated on the 17th November 2022 at University of Hasselt (Belgium).

Committee Member at the PhD of Ana Ordonez, "Scalable linear solver for thermos-hydro-mechanics with a second gradient of dilation regularization problems" celebrated on the 25th November 2022 at CERFACS, Toulouse (France).

Committee Member (First opponent) at the PhD of Eleonora Piersanti, "Parameter-robust formulation and preconditioning of poroelasticity equations for brain modelling", celebrated on the 10th February 2023 at University of Oslo / Simula Research Laboratory (Norway).

Reviewer of the Habilitation Thesis of Maria Lymbery "On the fast, efficient and robust numerical solution of partial differential equations in poro- and solid mechanics" (Universität Duisburg-Essen, Germany), June 2023.

Committee Member at the Habilitation of Paul Mycek "Hierarchical methods for deterministic and stochastic Partial differential equations" (Univeristé de Bordeaux, France), February 2024.

External reviewer for tenure and promotion to Associate Professor of Dr. Junyuan (Joanne) Lin, Assistant Professor of Mathematics in the Frank R. Seaver College of Science and Engineering at Loyola Marymount University (LMU), USA.

OTHER RELEVANT MERITS

Representantive of SEMA (Spanish Society of Applied Mathematics) at the ECCOMAS Young Investigators Committee (EYIC) (see https://www.eccomas.org/comittees/eyic/), from to 2017 to 2021 (four year term plus one year because YIC organizing team).