

Francisco Javier SAYAS
C.V. & scientific activities – January 6, 2019

1 Personal data

Name: Sayas González, Francisco Javier.

Nationality: Spanish.

Date of birth: September 17, 1968.

Current address: Department of Mathematical Sciences, University of Delaware. Newark, 19716 DE, USA.

Visa status: Permanent resident of the United States

EDUCATION AND POSITIONS

2 Academic titles

1994: Doctor en Matemáticas (PhD in Mathematics). Universidad de Zaragoza (Spain). Title: *Asymptotic expansion of the error for some boundary element methods*. Advisor: Michel Crouzeix, Université de Rennes I (France). Doctoral program: Applied Mathematics, Universidad de Zaragoza. Defense: December 22, 1994 (apto cum laude).

1991: Licenciado en Matemáticas, especialidad Matemática Aplicada (Bachelor in Mathematics, speciality Applied Mathematics), Universidad de Zaragoza (Spain).

3 Positions

Since September 2013, Full Professor (with tenure), Department of Mathematical Sciences, University of Delaware.

September 2010 to August 2013, Associate Professor (tenure-track), Department of Mathematical Sciences, University of Delaware.

Since 1997: Tenured Associate Professor (Profesor Titular de Universidad), Department of Applied Mathematics, Polytechnic Center (CPS), University of Zaragoza. On leave since 2007.

October 1994 to January 1997: Assistant Professor, Department of Applied Mathematics, School of Sciences (Facultad de Ciencias), University of Zaragoza.

September to December 1992: Instructor, Department of Applied Mathematics, School of Sciences (Facultad de Ciencias), University of Zaragoza.

4 Awards and honors

Centennial Award of the Royal Academy of Sciences of Zaragoza, 2016.

Best paper prize of the Spanish Society of Applied Mathematics, 2015. For the paper *Variational views of Stokeslets and Stresslets* (coauthored with Virginia Selgas).

Premio de la Sociedad Española de Matemática al Joven Investigador (Young Researcher Prize of the Spanish Society of Applied Mathematics). 2001. This is a yearly prize given to only one Applied Mathematician in Spain under the age of 33 for his/her early research.

Scholarship from the Spanish Ministry of Science and Education (MEC) for a nine-month research visit to the University of Minnesota (2007/08).

Predocctoral scholarship of the Aragón Regional Government. From January 1993 to September 1994.

5 Editorial work

5.1 Editorial boards

Journal of Integral Equations and Applications. Published by the Rocky Mountain Mathematical Consortium. Since 2013.

SEMA Journal. Published by Springer. Since 2016.

Applicable Analysis. Published by Taylor & Francis. Since 2016.

Computers and Mathematics with Applications. Published by Elsevier. Since 2018.

5.2 Other editorial work

Editor of the *Boletín de la Sociedad Española de Matemática Aplicada, SEMA*, from November 1994 to June 1998. Editor of the book review section from 2000 to 2012.

Refereeing for:

Advances in Computational Mathematics, Applicable Analysis, Applied Mathematics and Computation, Applied Numerical Mathematics, Computational Mechanics, Computers and Mathematics with Applications, Computer Methods in Applied Mathematics and Engineering, Engineering Analysis with Boundary Elements, IMA Journal of Numerical Analysis, International Journal for Numerical Methods in Fluids, International Journal for Computational Methods in Engineering Science & Mechanics, International Journal of Numerical Analysis and Modeling, Journal of Engineering Mathematics, Journal of Computational and Applied Mathematics, Journal of Computational Physics, Journal of Integral Equations and Applications, Journal of Mathematical Analysis and Applications, Journal of Mathematical Imaging and Vision, Journal of Mathematical Physics, Journal of Scientific Computing, Lecture Notes in Computer Science, International Journal of Solids and Structures, Mathematics of Computation, M2AN. ESAIM: Mathematical Modelling and Numerical Analysis, Mathematical Models and Methods in the Applied Sciences, Mathematical Models in the Applied Sciences, Numerical Algorithms, Numerical Methods for Partial Differential Equations, Numerische Mathematik, Science China Mathematics, SEMA Journal, SIAM Journal of Applied Mathematics, SIAM Journal of Numerical Analysis, SIAM Journal of Scientific Computing

Reviewer for *Math Reviews* from 2007 to 2012.

Member of the editorial board of NASSARRE, Revista aragonesa de Musicología, edited by Institución Fernando el Católico (CSIC). 1996-2008.

Reviewer for W.H.Freeman & Company, editors (Marsden & Tromba's Vector Calculus), Pearson Publishing, and Springer Verlag

6 Visiting positions

May 1999. Maître de Conférences Invité (1 month), Université de Rennes I (France).

May/June 2006. Maître de Conférences Invité (1 month), Université de Rennes I (France).

October 2007. Maître de Conférences Invité (1 month), Université de Pau et des Pays de l'Adour (France).

November 2007 to August 2010. Visiting Associate Professor, University of Minnesota.

November 2017. Visiting professor, Graz University of Technology.

March-April 2018. IBM Visiting Professor, Division of Applied Mathematics, Brown University.

June 2018. Visiting research professor. Vienna University of Technology (TUW).

7 Languages

Spanish. Mother tongue.

English. Read, write and speak fluently. Aptitude certificate from the Official Language School, Spain (1990).

German. Read, write and speak well. Aptitude certificate from the Official Language School, Spain (1994).

French. Read, write and speak well.

Italian. Elementary knowledge.

RESEARCH FUNDING

8 Research grants

8.1 Principal investigator

Robust methods for convection dominated problems and simulation of the scattering of harmonic waves. Ministerio de Ciencia y Tecnología. Ref. BFM2001-2521. (8 researchers at the Universidad de Zaragoza) (2001/04: 30,000 euros).

Simulation and numerical analysis of evolution problems in solid and fluid mechanics. Ministerio de Educación y Ciencia. Ref. MTM2007-63204. (8 researchers at the Universidad de Zaragoza, Pública de Navarra and Politécnica de Madrid) (2007/09: 66,500 euros).

Numerical simulation and analysis of transient waves in unbounded domains. NSF DMS-1216356. (2012/2016: \$ 300,000)

Simulation and numerical analysis in elastodynamics. NSF DMS-1818867. (2018/2021: \$ 325,000)

Simons Foundation Collaboration Grant for Mathematicians. Award Number 573813. Awarded in May 2018. Renounced due to incompatibility with NSF grant.

8.2 Co-principal investigator

Design of covers for toxic wastes safe stockage. Construction of a numerical model for simulation of capillary barriers (P.I.: F. Lisbona). Comisión Interministerial de Ciencia y Tecnología. 1994/97. Ref. AMB94-396. (6 researchers at the Universidad de Zaragoza)

Numerical methods for singularly perturbed problems and development of boundary element methods (P.I.: F. Lisbona). Dirección General de Enseñanza Superior. 1998/2001. Ref. PB97-1013. (11 researchers at the Universidad de Zaragoza)

Characterization of heterogeneous materials by infrared radiometry (P.I.: R. Celorrio). Ministerio de Ciencia y Tecnología. Ref. MAT2002-04153-C02-02. (6 researchers in the Universidad de Zaragoza and U. del País Vasco (Bilbao)). 2002/05.

Simulation and modelling of fluid dynamics of fuel in wreckage through advanced supercomputing techniques. (P.I.: G. Hauke). Acciones estratégicas Vertidos marinos, Ministerio de Ciencia y Tecnología. Ref. VEM2003-269-C03-01. (13 researchers in the Universidad de Zaragoza, Politécnica de Cataluña (Barcelona) and Santiago de Compostela). 2003/06.

Inverse problems and stabilization of numerical methods in singular perturbation, poroelasticity and diffusion (P.I.: C. Clavero). Ref. MCYT/FEDER MTM2004-019051. (9 researchers at the Universidad de Zaragoza and Pública de Navarra). 2004/07.

8.3 Collaborator

Hybrid methods for bio- and nanosystems (P.I.: A. Carpio). Ref. MTM2014-56948-C2-1. (U. Complutense and U. Politécnica de Madrid). (42,800 euros). 2014/17.

8.4 Regional funding

Consolidated research group *Numerical methods for partial differential and integral equations*. Gobierno de Aragón. P.I.: F. Lisbona. Since 2002 (8 permanent members)

Projects of the Pyrenees Work Community (joint collaborations among French and Spanish universities in the Pyrenean area for the creation of thematic research nets):

Applications of mathematics to environmental problems. (P.I.: M. Madaune–Tort). CTP/99. Universidad Pública de Navarra, Université de Pau, Universidad de Zaragoza. (42 participants)

Application of mathematics to soil and underground problems (P.I.: M. Madaune–Tort). CTP 203/0496. Universidad Pública de Navarra, Université de Pau, Universidad de Zaragoza. (42 participants). 2003/2004.

Mathematics Applied to the Study of Propagation Phenomena. (P.I.: M. Madaune–Tort). CTP 203/0496. Universidad Pública de Navarra, Université de Pau, Universidad de Zaragoza. (42 participants). 2005/2006.

8.5 Industrial funding

Collaboration in the project *Modelling and simulation of capillary barriers* (P.I.: F. Lisbona), funded by Empresa Nacional de Residuos radiactivos S.A. (ENRESA). 1994–97

8.6 International funding

FONDECYT (Chilean Science and Technology Foundation) 7050209 (2005) & 7070104 (2007). Further applications of local discontinuous Galerkin methods to linear and nonlinear boundary problems. International cooperation project. P.I.: R. Bustinza.

Royal Society, U.K. (2005). Coupling of BEM and FEM in elasticity. P.I.: S. Funken.

London Mathematical Society. Research grant for a collaboration trip of one week. Awarded in June 2018. (with Lehel Banjai, Heriot-Watt University, £1200).

PUBLICATIONS

9 Research interests

Boundary element methods: numerical analysis and applications to diffusion problems, time-harmonic waves and transient waves.

Coupling of finite and boundary element methods

Numerical quadrature

Abstract numerical analysis

Inverse problems

Discontinuous Galerkin methods

10 Books

1. F.J. Sayas, *Retarded potentials and time domain boundary integral equations. A road map.* Springer Series in Computational Mathematics, Volume 50. 2016.
2. F.J.Sayas, T.S.Brown, M.E. Hassell, *Variational Techniques for Elliptic Partial Differential Equations. Theoretical Tools and Advanced Applications.* CRC Press. 2018.

11 Publications in refereed journals

1. F.J. Sayas, ‘A mathematical approach to music tuning systems’ (Spanish), *NASSARRE Revista aragonesa de Musicología*, XI (1995) 471-489.
2. F.J. Sayas, ‘Fully discrete Galerkin methods for systems of boundary integral equations’, *Journal of Computational and Applied Mathematics* **81** (2), 311-331 (1997).
3. M. Crouzeix, F.J. Sayas, ‘Asymptotic expansions of the error of spline Galerkin Boundary Element Methods’, *Numerische Mathematik* **78** (1998) 523–547.
4. F.J. Sayas, ‘A generalized Euler–Maclaurin formula on triangles’, *Journal of Computational and Applied Mathematics* **93** (2) (1998) 89–93.
5. R. Celorrio, F.J. Sayas, ‘The Euler–Maclaurin formula in presence of a logarithmic singularity’. *BIT Numerical Mathematics* **39** (4) (1998) 780–785.
6. F.J. Sayas, ‘The numerical solution of Symm’s equation on smooth open arcs by spline Galerkin methods’. *Computers and Mathematics with Applications* **38** (9–10) (1999) 87–99.
7. R. Celorrio, F.J. Sayas, ‘Full collocation methods for some boundary integral equations’. *Numerical Algorithms* **22** (3,4) (1999) 327–351.
8. S. Meddahi, F.J. Sayas, ‘A fully discrete BEM–FEM for the exterior Stokes problem in the plane’. *SIAM Journal on Numerical Analysis* **37** (6) (2000) 2082–2102.
9. R. Celorrio, F.J. Sayas, ‘Extrapolation techniques and the collocation method for a class of boundary integral equations’. *The Australia and New Zealand Industrial and Applied Mathematics Journal* **42** (2001) 413–437.
10. V. Domínguez, F.J. Sayas, ‘Full asymptotics of spline Petrov–Galerkin methods for periodic pseudodifferential equations’. *Advances in Computational Mathematics*. **14** (1) (2001) 75-101.
11. V. Domínguez, F.J. Sayas, ‘Local expansions of periodic spline interpolation with some applications’. *Mathematische Nachrichten*. **227** (2001) 43-62.

12. M. Crouzeix, P. Féat, F.J. Sayas, ‘Theoretical and numerical study of a free boundary problem by boundary integral methods’. *Modelisation Mathématique et Analyse Numérique (M2AN)*. **35** (2001) 1137-1158.
13. R. Celorrio, V. Domínguez, F.J. Sayas, ‘An interior–exterior Schwarz algorithm and its convergence’. *Comptes Rendus de l’Académie des Sciences*. **334** (10) (2002) 923-926.
14. R. Celorrio, V. Domínguez, F.J. Sayas, ‘Periodic Dirac delta distributions in the boundary element method’. *Advances in Computational Mathematics*. **17** (3) (2002) 211-236.
15. F.J. Sayas, ‘Asymptotic series in the numerical analysis of boundary element methods’ (Spanish). *Boletín de la Sociedad Española de Matemática Aplicada*. **20** (2002) 77–96.
16. F.J. Sayas, ‘A nodal coupling of finite and boundary elements’. *Numerical Methods for Partial Differential Equations*. **19** (5) (2003) 555–570.
17. V. Domínguez, F.J. Sayas, ‘An asymptotic series approach to qualocation methods’. *Journal of Integral Equations and Applications* **15** (2) (2003) 113–151.
18. V. Domínguez, F.J. Sayas, ‘Stability of discrete liftings’. *Comptes Rendus Mathématiques* **337** (12) (2003) 805-808.
19. R. Celorrio, V. Domínguez, F.J. Sayas, ‘Overlapped BEM–FEM and some Schwarz iterations’. *Computational Methods in Applied Mathematics* **4** (1) (2004) 3-22.
20. F.J. Sayas, ‘Aubin–Nitsche estimates are equivalent to compact embeddings’. *BIT Numerical Mathematics* **44** (2) (2004) 287-290.
21. S. Meddahi, F.J. Sayas, ‘Analysis of a new BEM–FEM coupling for two dimensional fluid–solid interaction’. *Numerical Methods for Partial Differential Equations*. **21** (2005) 1017-1154.
22. T. Hohage, F.J. Sayas, ‘Numerical solution of a heat diffusion problem by boundary element methods using the Laplace transform’. *Numerische Mathematik* **102** (1) (2005) 67-92.
23. G.N. Gatica, F.J. Sayas, ‘A note on the local approximation properties of piecewise polynomials with applications to LDG methods’. *Complex Variables and Elliptic Equations* **51** (2) (2006) 109–117.
24. M.L. Rapún, F.J. Sayas, ‘Boundary integral approximation of a heat–diffusion problem in time–harmonic regime’. *Numerical algorithms* **41** (2) (2006) 127–160.
25. G. Hauke, M.H. Doweidar, D. Fuster, A. Gómez, F.J. Sayas, ‘Application of Variational a–Posteriori Multiscale Error Estimation to Higher–Order Elements’. *Computational Mechanics* **38** (4–5) (2006) 382–389.
26. G. Gatica, F.J. Sayas, ‘An a-priori error analysis for the coupling of local discontinuous Galerkin and boundary element methods’. *Mathematics of Computation* **75** (256)(2006) 1675–1696.
27. V. Domínguez, F.J. Sayas, ‘A BEM-FEM overlapping algorithm for the Stokes equation’. *Applied Mathematics and Computation* **182** (2006) 691–710.
28. S. Meddahi, F.J. Sayas, ‘BEM-FEM coupling for wave–structure interaction’. *Scientia. Series A: Mathematical Sciences* **13** (2006) 5–12.
29. M.L Rapún, F.J. Sayas, ‘A mixed-FEM and BEM coupling for the approximation of the scattering of thermal waves in locally non-homogeneous media’. *ESAIM: Mathematical Modelling and Numerical Analysis* **40** (5) (2006) 871–896.
30. T. Hohage, M-L. Rapún, F.J. Sayas, ‘Detecting collision using thermal measurements’. *Inverse problems* **23** (2007) 53–72 .
31. V. Domínguez, F.J. Sayas, ‘Overlapped BEM–FEM for some Helmholtz transmission problems’. *Applied Numerical Mathematics* **57** (2007) 131–146.

32. M.L. Rapún, F.J. Sayas, ‘Boundary Element Simulation of Thermal Waves’. *Archives of Computational Methods in Engineering* **14** (2007) 3–46.
33. R. Bustinza, G. Gatica, F.J. Sayas, ‘A look at how LDG and BEM can be coupled’. *ESAIM: Proceedings* **21** (2007) 88–97.
34. F.J. Sayas, ‘Infimum–supremum’. *Boletín de la Sociedad Española de Matemática Aplicada* **41** (2007) 19–40.
35. N. Boal, V. Domínguez, F.J. Sayas, ‘Asymptotic properties of some triangulations of the sphere’. *Journal of Computational and Applied Mathematics* **211** (2008) 11–22.
36. V. Domínguez, M.L. Rapún, F.J. Sayas, ‘Dirac delta methods for Helmholtz transmission problems’. *Advances in Computational Mathematics* **28** (2008) 119–139.
37. M.L. Rapún, F.J. Sayas, ‘Mixed boundary integral methods for Helmholtz transmission problems’. *Journal of Computational and Applied Mathematics* **214** (2008) 238–258.
38. R. Bustinza, G. Gatica, F.J. Sayas, ‘On the coupling of local discontinuous Galerkin and boundary element methods for nonlinear exterior transmission problems’. *IMA Journal of Numerical Analysis* **28** (2008) 225–244.
39. G. Gatica, F.J. Sayas, ‘Characterising the inf–sup condition on product spaces’. *Numerische Mathematik* **109** (2008) 209–231.
40. V. Domínguez, F.J. Sayas, ‘Algorithm 884: A simple Matlab implementation of the Argyris element’. *ACM Transactions on Mathematical Software* **35** Article 16 (2008).
41. N. Heuer, F.J. Sayas, ‘Crouzeix–Raviart Boundary Elements’. *Numerische Mathematik* **112** (2009) 381–401.
42. A. Laliena, F.J. Sayas, ‘Theoretical aspects of the application of convolution quadrature to scattering of acoustic waves’. *Numerische Mathematik* **112** (2009) 637–678.
43. Y. Jeon, F.J. Sayas. ‘The CBEM–BEM coupling for elliptic problems’. *Applied Numerical Mathematics* **59** (2009) 2374–2387.
44. A. Laliena, F.J. Sayas, ‘A distributional version of Kirchhoff’s formula’. *Journal of Mathematical Analysis and Applications* **359** (2009) 197–208.
45. A. Laliena, M.L. Rapún, F.J. Sayas, ‘Symmetric boundary integral formulations for Helmholtz transmission problems’. *Applied Numerical Mathematics* **59** (2009) 2814–2823.
46. F.J. Sayas. ‘The validity of Johnson–Nédélec’s BEM–FEM coupling for polygonal interfaces’. *SIAM Journal on Numerical Analysis* **47** (2009) 3451–3463.
47. G. Gatica, N. Heuer, F.J. Sayas, ‘A direct coupling of local discontinuous Galerkin and boundary element methods’. *Mathematics of Computation* **79** (2010) 1369–1394.
48. B. Cockburn, J. Gopalakrishnan, F.J. Sayas, ‘A projection–based error analysis of HDG methods’. *Mathematics of Computation* **79** (2010) 1351–1367.
49. S. Meddahi, F.J. Sayas, V. Selgás. ‘Non–symmetric coupling of BEM and mixed FEM on polyhedral interfaces’. *Mathematics of Computation* **80** (2011) 43–68.
50. B. Cockburn, J. Gopalakrishnan, N.C. Nguyen, J. Peraire, F.J. Sayas. ‘Analysis of HDG methods for Stokes flow’. *Mathematics of Computation* **80** (2011) 723–760.
51. G.N. Gatica, R. Oyarzúa, F.J. Sayas. ‘A residual–based a posteriori error estimator for a fully–mixed formulation of the Stokes–Darcy coupled problem’. *Computer Methods in Applied Mechanics and Engineering* **200** (2011) 1877–1891.

52. G.N. Gatica, R. Oyarzúa, F.J. Sayas. ‘Convergence of a family of Galerkin discretizations for the Stokes–Darcy coupled problem’. *Numerical Methods for Partial Differential Equations* **27** (2011) 721–748.
53. V. Domínguez, N. Heuer, F.J. Sayas. ‘Hilbert scales and Sobolev spaces defined by associated Legendre functions’. *Journal of Computational and Applied Mathematics* **235** (2011) 3481–3501.
54. G.N. Gatica, R. Oyarzúa, F.J. Sayas. ‘Analysis of fully–mixed finite element methods for the Stokes–Darcy coupled problem’. *Mathematics of Computation* **80** (2011) 1911–1948.
55. G.N. Gatica, G.C. Hsiao, F.J. Sayas. ‘Relaxing the hypotheses on Bielak–MacCamy’s BEM–FEM coupling’. *Numerische Mathematik* **120** (2012) 465–487.
56. B. Cockburn, F.J. Sayas, M. Solano. ‘Coupling at a distance HDG and BEM’. *SIAM Journal of Scientific Computing* **34** (2012) A28–A47.
57. B. Cockburn, F.J. Sayas. ‘The devising of symmetric couplings of boundary element and discontinuous Galerkin methods’. *IMA Journal of Numerical Analysis* **32** (2012) 765–794.
58. G.N. Gatica, R. Oyarzúa, F.J. Sayas. ‘A twofold saddle point approach for the coupling of fluid flow with nonlinear porous media flow’. *IMA Journal of Numerical Analysis* **32** (2012) 845–887.
59. R. Bustinza, F.J. Sayas. ‘Error estimates for an LDG method applied to Signorini type problems’. *Journal of Scientific Computing* **52** (2012) 322–339.
60. B. Cockburn, J. Guzmán, F.J. Sayas. ‘Coupling of Raviart–Thomas and Hybridizable Discontinuous Galerkin with BEM’. *SIAM Journal of Numerical Analysis* **50** (2012) 2778–2801.
61. F.J. Sayas. ‘Energy estimates for Galerkin semidiscretization of time domain boundary integral equations’. *Numerische Mathematik* **124** (2013) 121–149.
62. F.J. Sayas. ‘The validity of Johnson–Nédélec’s BEM–FEM coupling on polygonal interfaces’. *SIAM Review* **55** (2013) 131–146.
63. J. Guzmán, A. Salgado, F.J. Sayas. ‘A note on the Ladyzhenskaya–Babuška–Brezzi condition.’ *Journal of Scientific Computing* **56** (2013) 219–229.
64. G. Gatica, G.C. Hsiao, S. Meddahi, F.J. Sayas. ‘On the dual–mixed formulation for an exterior Stokes problem’. *Zeitschrift für Angewandte Mathematik und Mechanik* **93** (2013) 437–445.
65. O. Bruno, V. Domínguez, F.J. Sayas. ‘Convergence analysis of a high–order Nyström integral–equation method for surface scattering problems’. *Numerische Mathematik* **24** (2013) 603–645.
66. A. Márquez, S. Meddahi, F.J. Sayas. ‘A decoupled preconditioning technique for a mixed Stokes–Darcy model’. *Journal of Scientific Computing* **57** (2013) 174–192.
67. V. Domínguez, F.J. Sayas. ‘Some properties of layer potentials and boundary integral operators for the wave equation’. *Journal of Integral Equations and Applications*. **25** (2013) 253–294.
68. A. Lindsay, J. Lega, F.J. Sayas. ‘The quenching set of a MEMS capacitor in two–dimensional geometries.’ *Journal of Nonlinear Science* **23** (2013) 807–834.
69. F.J. Sayas, V. Selgas. ‘Variational views of stokeslets and stresslets’ *SEMA Journal* **63** (2014) 65–90.
70. V. Domínguez, S. Lu, F.J. Sayas. ‘A Nyström favored Calderón Calculus of order three for two dimensional waves.’ *Computers and Mathematics with Applications* **67** (2014) 217–236.
71. B. Cockburn, F.J. Sayas. ‘Divergence–conforming HDG methods for Stokes flow’. *Mathematics of Computation* **83** (2014) 1571–1598.
72. V. Domínguez, S. Lu, F.J. Sayas. ‘A fully discrete Calderón Calculus for two dimensional time harmonic waves.’ *International Journal of Numerical Analysis and Modeling* **11** (2014) 332–345.

73. V. Domínguez, S. Lu, F.J. Sayas. ‘A Nyström method for the two dimensional Helmholtz hyper-singular equation.’ *Advances in Computational Mathematics* **40** (2014) 1121-1157.
74. N. Heuer, M. Karkulik, F.J. Sayas. ‘Note on discontinuous trace approximation in the practical DPG method.’ *Computers and Mathematics with Applications* **68** (2014) 1562-1568.
75. L. Banjai, C. Lubich, F.J. Sayas. ‘Stable numerical coupling of exterior and interior problems for the wave equation.’ *Numerische Mathematik* **129** (2014) 611-646.
76. L. Banjai, A. Laliena, F.J. Sayas. ‘Fully discrete Kirchhoff formulas with CQ-BEM.’ *IMA Journal of Numerical Analysis* **35** (2014) 859-884.
77. N. Heuer, F.J. Sayas. ‘Analysis of a non-symmetric coupling of Interior Penalty DG and BEM.’ *Mathematics of Computation* **84** (2015) 581-598.
78. A. Márquez, S. Meddahi, F.J. Sayas. ‘Strong coupling of finite element methods for the Stokes-Darcy problem.’ *IMA Journal of Numerical Analysis* **35** (2015) 969-988.
79. V. Domínguez, T. Sánchez-Vizuet, F.J. Sayas. ‘A fully discrete Calderón calculus for the two-dimensional elastic wave equation.’ *Computers and Mathematics with Applications* **69** (2015) 620-635.
80. Z. Fu, L.F. Gatica, F.J. Sayas. ‘Algorithm 949: MATLAB Tools for HDG in three dimensions.’ *ACM Transactions on Mathematical Software* **41** (2015), Article 20. (21 pages)
81. C. Bacuta, M. Hassell, G.C. Hsiao, F.J. Sayas. ‘Boundary integral solvers for an evolutionary exterior Stokes problem.’ *SIAM Journal of Numerical Analysis* **53** (2015) 1370-1392.
82. M. Ainsworth, J. Guzmán, F.J. Sayas. ‘Discrete extension operators for mixed finite element spaces on locally refined meshes.’ *Mathematics of Computation* **85** (2016) 2639-2650.
83. T. Qiu, F.J. Sayas. ‘The Costabel-Stephan system of boundary integral equations in the time domain.’ *Mathematics of Computation* **85** (2016) 2341-2364.
84. N. Heuer, S. Meddahi, F.J. Sayas. ‘Symmetric coupling of LDG-FEM and DG-BEM.’ *Journal of Scientific Computing* **68** (2016) 303-325.
85. G. Gatica, G.C. Hsiao, S. Meddahi, F.J. Sayas. ‘New developments on the coupling of mixed-FEM and BEM for the three-dimensional Stokes problem.’ *International Journal of Numerical Analysis and Modeling* **13** (2016) 457-492.
86. M. Hassell, F.J. Sayas. ‘A fully discrete BEM-FEM scheme for transient acoustic waves.’ *Computational Methods in Applied Mechanics and Engineering* **309** (2016) 106-130.
87. T. Sánchez-Vizuet, F.J. Sayas. ‘Symmetric Boundary-Finite Element discretization of time dependent acoustic scattering by elastic obstacles with piezoelectric behavior.’ *Journal of Scientific Computing* **70** (2017) 1290-1315.
88. C. Erath, G. Of, F.J. Sayas. ‘A non-symmetric coupling of the finite volume method and the boundary element method.’ *Numerische Mathematik* **135** (2017) 895-922.
89. B. Cockburn, G. Fu, F.J. Sayas. ‘Superconvergence by M-decompositions. Part I: General theory for HDG methods for diffusion.’ *Mathematics of Computation* **86** (2017) 1609-1641,
90. G.C. Hsiao, F.J. Sayas, R.J. Weinacht. ‘Time-dependent fluid-structure interaction.’ *Mathematical Models in Applied Science* **40** (2017) 486-500.
91. G.C. Hsiao, T. Sánchez-Vizuet, F.J. Sayas. ‘Boundary and coupled boundary-finite element methods for transient wave-structure interaction.’ *IMA Journal of Numerical Analysis* **37** (2017) 237-265.
92. T. Qiu, F.J. Sayas. ‘New mapping properties of the Time Domain Electric Field Integral Equation.’ *Mathematical Modeling and Numerical Analysis (M2AN)* **51** (2017) 1–15.

93. M. Hassell, T. Qiu, T. Sánchez-Vizuet, F.J. Sayas. ‘A new and improved analysis of the time domain boundary integral operators for acoustics.’ *Journal of Integral Equations and Applications* **29** (2017) 107-136.
94. V. Domínguez, N. Salles, F.J. Sayas. ‘Recent progress in time domain boundary integral equations.’ *Journal of Integral Equations and Applications* **29** (2017) 1-4.
95. Z. Fu, N. Heuer, F.J. Sayas. ‘A non-symmetric coupling of Boundary Elements with the Hybridizable Discontinuous Galerkin method.’ *Computers and Mathematics with Applications* **74** (2017) 2752-2768.
96. A. Hungria, D. Prada, F.J. Sayas. ‘HDG methods for elastodynamics.’ *Computers and Mathematics with Applications* **74** (2017) 2617-2690.
97. C. Bacuta, J. Jacavage, K. Qirko, F.J. Sayas. ‘Saddle point least squares iterative solvers for the time harmonic Maxwell equations’ *Computers and Mathematics with Applications* **74** (2017) 2915-2928.
98. B. Cockburn, Z. Fu, A. Hungria, L. Jia, M.A. Sanchez, F.J. Sayas. ‘Stormer-Numerov HDG methods for acoustic waves.’ *Journal of Scientific Computing* **75** (2018) 597-624.
99. T.S. Brown, S. Du, H. Eruslu, F.J. Sayas. ‘Analysis of models for viscoelastic wave propagation.’ *Applied Mathematics and Nonlinear Sciences* **3** (2018) 55-96.
100. T.S. Brown, T. Sánchez-Vizuet, F.J. Sayas. ‘Evolution of a semidiscrete system modeling the scattering of acoustic waves by a piezoelectric solid.’ *Mathematical Modeling and Numerical Analysis (M2AN)*. **52** (2018) 423-455.
101. G.C. Hsiao, T. Sánchez-Vizuet, F.J. Sayas, R. Weinacht. ‘A time-dependent wave-thermoelastic solid interaction.’ *IMA Journal of Numerical Analysis*.

12 Submitted

1. T. Qiu, A. Rieder, F.J. Sayas, S. Zhang. ‘Time-domain boundary integral equation modeling of heat transmission problems.’ *Numerische Mathematik*, in revision.
2. H. Antil, T.S. Brown, F.J. Sayas. ‘A problem in control of elastodynamics with piezoelectric effects.’

13 Chapters of books and proceedings

1. F. Lisbona, F.J. Sayas, ‘Deferred correction and Richardson extrapolation in a Finite Element Method’. M. Madaune-Tort, M.C. López de Silanes, M. San Miguel, eds.: *Actas de las III Jornadas Zaragoza-Pau de Matemática Aplicada*, Publ. Sem. García Galdeano, serie II, sección 3, **19** (1995) 427-435.
2. M. Crouzeix, F.J. Sayas, ‘First term of the asymptotic development in a Boundary Element Method: piecewise constant functions’. A.C. Casal, L. Gavete, C. Conde, J. Herranz, eds.: *Actas del III Congreso de Matemática Aplicada – XIII CEDYA*, Universidad Politécnica de Madrid (1995) 163-168.
3. G. Aguilar, R. Celorrio, F. Lisbona, F.J. Sayas, ‘A transmission problem with discontinuity and its numerical approximation’ (Spanish). M. Doblaré, J.M. Correas, E. Alarcón, L. Gavete, M. Pastor, eds.: *Actas del III Congreso de Métodos Numéricos en Ingeniería* **1**, Sociedad Española de Métodos Numéricos en Ingeniería, Barcelona (1996) 481-490.
4. F.J. Sayas, ‘Neumann Data from Dirichlet Data in Laplace’s Equation: a Numerical Algorithm’. M.C. López de Silanes, M. San Miguel, G. Sanz, M. Madaune-Tort, eds: *Actes des IV^{èmes} Journées Zaragoza-Pau de Mathématiques Appliquées*, Publications de l’Université de Pau (1997) 337-346.

5. F.J. Sayas, ‘Numerical approximation of hypersingular equations by Galerkin methods’. *Actas del V Congreso de Matemática Aplicada – XV CEDYA* Ed. Universidad de Vigo, Congresos **9** (1998) 873–877.
6. R. Celorrio, F. Lisbona, F.J. Sayas, ‘Integral models and their discretizations for unsaturated flow around a tunnel’ (Spanish). *Actas del V Congreso de Matemática Aplicada – XV CEDYA* Ed. Universidad de Vigo, Congresos **9** (1998) 655–660.
7. R. Celorrio, V. Domínguez, F.J. Sayas, ‘On the averaged delta method for some acoustic scattering problems’. F. Jacobsen, ed. *Proceedings of the 6th International Congress on Sound and Vibration*, IIAV (1999) 547–554
8. R. Celorrio, F.J. Sayas, ‘The collocation method for periodic integral equations of the second kind’. M. Madaune-Tort, M.C. López de Silanes, G. Sanz, M. San Miguel, eds: *Actas de las V Jornadas Zaragoza-Pau de Matemática Aplicada*, Publ. Sem. García Galdeano, serie II, sección 3, **20** (1999) 231–238.
9. V. Domínguez, F.J. Sayas. ‘Variantes del método de colocación para ecuaciones integrales de frontera’. R. Montenegro, G. Montero, G. Winter, eds: *Actas del XVI CEDYA/VI Congreso de Matemática Aplicada*, Ed. Universidad de Las Palmas de GC (1999) 1053–1060.
10. R. Celorrio, V. Domínguez, F.–J. Sayas. ‘Asymptotics of finite element Lagrange interpolation under the action of an integral operator’. M.C. López de Silanes, M. San Miguel, G. Sanz, M. Madaune-Tort, eds: *Actes des VI^{èmes} Journées Zaragoza-Pau de Mathématiques Appliquées*, (2001) 151–158.
11. R. Celorrio, V. Domínguez, F.J. Sayas. ‘An improved quadrature method for integral equations with logarithmic kernel’. M. Madaune–Tort, D. Trujillo, M.C. López de Silanes, M. Palacios, G. Sanz, eds: *Actas de las VII Jornadas Zaragoza-Pau de Matemática Aplicada y Estadística*. Monografías Seminario García de Galdeano **27** (2003) 185–192.
12. R. Celorrio, M.L. Rapún, F.J. Sayas. ‘An integral method for exterior transmission problems with applications to scattering of thermal waves’. M. Madaune–Tort, D. Trujillo, M.C. López de Silanes, M. Palacios, G. Sanz, eds: *Actas de las VII Jornadas Zaragoza-Pau de Matemática Aplicada y Estadística*. Monografías Seminario García de Galdeano **27** (2003) 193–200.
13. R. Celorrio, M.L. Rapún, F.J. Sayas. ‘A mixed boundary element method applied to scattering of thermal waves in composite materials’. C. Constanda, M. Ahues, A. Largillier, eds: *Integral Methods in Science and Engineering. Analytic and Numerical Techniques* Birkhäuser (2004) 31–36.
14. N. Boal, F.J. Sayas. ‘Adaptive numerical integration on spherical triangles’. M.C. López de Silanes, M. Palacios y G. Sanz, J.J. Torrens, M. Madaune–Tort, D. Trujillo, eds: *VIII Journées Zaragoza-Pau de Mathématiques Appliquées et de Statistiques*. Monografías Seminario García de Galdeano **31** (2004) 61–69.
15. T. Hohage, M.L. Rapún, F.J. Sayas, M.L. Sein-Echaluce, ‘Parameter determination in diffusive media via thermal waves.’ Proceedings of the WAVES 2005 conference, INRIA (2005) 299–300
16. R. Bustinza, G.N. Gatica, F.J. Sayas, ‘A LDG-BEM coupling for a Class of Nonlinear Exterior Transmission Problems’. A. Bermúdez de Castro, D. Gómez, P. Quintela, P. Salgado, eds: *Proceedings of ENUMATH 2005*. Springer (2006) 1129–1136.
17. M.L. Rapún, F.J. Sayas, ‘Indirect methods with Brakhage-Werner potentials for Helmholtz transmission problems’. A. Bermúdez de Castro, D. Gómez, P. Quintela, P. Salgado, eds: *Proceedings of ENUMATH 2005*. Springer (2006) 1146–1154.
18. F.J. Sayas, ‘Direct Boundary Element Method with discretization of all integral operators’. C. Constanda, S. Potapenko, eds: *Integral Methods in Science and Engineering. Techniques and Applications*. Birkhauser, Boston (2008) 217–226.

19. M.L. Rapún, F.J. Sayas, ‘Exterior Dirichlet and Neumann problems for the Helmholtz equation as limits of transmission problems’. C. Constanda, S. Potapenko, eds: *Integral Methods in Science and Engineering. Techniques and Applications*. Birkhauser, Boston (2008) 207–216.
20. A. Laliena, F.J. Sayas, ‘Theoretical challenges in the application of convolution quadrature and BEM for transient waves.’ Mathematisches Forschung Institut Oberwolfach. Report 19/2008 (2018), pp. 30-32.
21. F.J. Sayas, ‘Energy estimates for space discretizations of Time-Domain Integral Equations.’ Mathematisches Forschung Institut Oberwolfach. Report 10/2010 (2010), pp. 80-82.
22. F.J. Sayas, ‘A mathematical toolkit for TDBIE.’ Mathematisches Forschung Institut Oberwolfach. Report 03/2013 (2013), pp. 96-100.
23. M. Hassell, F.J. Sayas. ‘Convolution Quadrature for Wave Simulations.’ I. Higuera, J.J. Torrens, eds. *Numerical Simulation in Physics and Engineering*. SEMA-SIMAI Springer Series **9** (2016) 71-159.
24. C. Erath, C. Of, F.J. Sayas. ‘A non symmetric FVM-BEM coupling method.’ *Proceedings of Applied Mathematics and Mechanics (PAMM)* **16** (2016) 743-744.
25. T.S. Brown, S. Du, H. Eruslu, F.J. Sayas, ‘Discrete waves in viscoelastic media.’ Mathematisches Forschung Institut Oberwolfach. Report 15/2017 (2017), pp. 927-930.
26. M. Costabel, F.J. Sayas. ‘Time-Dependent Problems with the Boundary Integral Equation Method.’ To appear in E. Stein, R. De Borst, T.J.R. Hughes, eds. *Encyclopedia of Computational Mechanics, 2nd edition*.
27. F.J. Sayas. ‘The mathematical and numerical life of the single layer potential, from Coulomb to Huygens.’ *Monographs of the Real Academia de Ciencias de Zaragoza* **41** (2017) 11-36.

14 Electronic proceedings

1. F.J. Sayas, ‘On the numerical integration of an exterior problem for Laplace’s equation with boundary element methods’, (Spanish) Actas del XIV C.E.D.Y.A./IV C.M.A.
www-ma1.upc.es/cedya/comu.html
2. R. Celorrio, V. Domínguez, F.J. Sayas, ‘Point source methods in simulation of acoustic scattering problems’ (Spanish). R. Abascal, J. Domínguez, G. Bugeda, eds.: *Métodos numéricos en ingeniería* (Actas del IV Congreso de Métodos Numéricos en Ingeniería), SEMNI (1999). CD-ROM.
3. R. Celorrio, F.J. Sayas, ‘Multiple scattering in thermal diffusion: iteration and preconditioning’. L Ferragut, A. Santos, eds, Actas del XVII C.E.D.Y.A./VII C.M.A (2001). CD-ROM. (ISBN: 84-699-6144-6)
4. V. Domínguez, F.J. Sayas, ‘Boundary integral equations for the heat equation’. L Ferragut, A. Santos, eds, Actas del XVII C.E.D.Y.A./VII C.M.A (2001). CD-ROM. (ISBN: 84-699-6144-6)
5. R. Celorrio, M.L. Rapún, F.J. Sayas. ‘A boundary element model with close neighbors for scattering of thermal waves’ (Spanish). J. M. Goicolea, C. Mota Soares, M. Pastor, G. Bugeda, eds.: *Métodos numéricos en ingeniería*. SEMNI, 2002. CD-ROM.
6. V. Domínguez, M.L. Rapún, F.J. Sayas. ‘Quadrature methods for systems of integral equations in the study of transmission problems’ (Spanish). J.M. Jornet, J.M. López, C. Olivé, R. Ramírez, eds.: *Actas del XVIII Congreso de Ecuaciones Diferenciales y Aplicaciones/VIII Congreso de Matemática Aplicada*. Universitat Rovira i Virgili, 2003. CD-ROM. (ISBN: 84-930923-2-0)

15 Publications with limited diffusion

1. S. Meddahi, F.J. Sayas, 'Introduction to domain decomposition methods' (Spanish). Publ. Sem. García Galdeano, serie II, sección 3, **19** (1995) (42 pages).
2. F.J. Sayas, R. Celorrio, 'Boundary element methods' (Spanish). Lecture notes of the IXth French–Spanish Fall School on Numerical Simulation in Science and Engineering (2000). (110 pages).
3. F.J. Gaspar, F.J. Sayas, N. Boal, 'Programming the finite difference method' (Spanish). ISBN 84–699–3401–5. Servicio de Publicaciones, Universidad de Zaragoza.

PRESENTATIONS AND SEMINARS

16 Invited presentations in meetings

1. R. Celorrio, V. Domínguez, F.J. Sayas. *Overlapping of finite and boundary elements*. Foundations of Computational Mathematics. Minneapolis, USA. August 2002. (Minisymposium on *Foundations of Computational PDEs*)
2. V. Domínguez, F.J. Sayas. *BEM removal of cracks and obstacles in some finite element computations*. MAFELAP 2003. Uxbridge, UK. June 2003. (Minisymposium on *FEM, BEM and FEM/BEM coupling in continuum mechanics and electromagnetism*)
3. F.J. Sayas. *Boundary elements and Laplace transform for some diffusion problems*. Valparaíso Numérico. Workshop on Numerical Analysis of PDE. Valparaíso, Chile. January 2005. (Invited speaker)
4. T. Hohage, M.L. Rapún, F.J. Sayas. *Boundary elements and Laplace transform for some diffusion problems*. MAT.ES 2005. Valencia, Spain. January 2005. (Minisymposium on *Numerical Analysis and Applications*)
5. M.L. Rapún, F.J. Sayas. *Mixed FEM and BEM for the scattering of thermal waves*. BICOM–Workshop on Boundary Element Methods. Uxbridge, UK. June 2005. (Invited speaker)
6. N. Boal, V. Domínguez, F.J. Sayas. *Triangulation of spherical polygons and applications*. Foundations of Computational Mathematics. Santander, Spain. July 2005. (Minisymposium on *Approximation theory*).
7. D. Garzón, A. Laliena, F.J. Sayas. *Convolution Quadrature for Kirchhof’s formula*. MAFELAP 2006. Uxbridge, UK. June 2006. (Minisymposium on *Boundary element methods*)
8. F.J. Sayas, R. Bustinza, G. Gatica. *Coupling of Boundary Elements and Discontinuous Galerkin Methods*. Functional and Numerical Analysis Days (in honor of Professor Michel Crouzeix). Guidel-Plages, France. June 2006. (**Plenary speaker**)
9. F.J. Sayas, A. Laliena. *Theoretical challenges in the application of convolution quadrature and BEM to scattering of acoustics waves*. Analysis of Boundary Element Methods, Oberwolfach, Germany. April 2008. (Invited speaker)
10. B. Cockburn, F.J. Sayas. *Discrete Steklov–Poincaré operators using DG methods & How to couple DG and BEM by matching their Steklov–Poincaré operators*. Workshop on Numerical Methods for PDE and Computations: present and future, Ajou University, Suwon, Korea. September 2008. (Invited speaker)
11. B. Cockburn, F.J. Sayas. *Coupled HDG–BEM*. MAFELAP 2009. Uxbridge, UK. June 2009. (Minisymposium on *Theoretical and computational aspects of Discontinuous Galerkin Methods*)
12. F.J. Sayas. *New results on non-symmetric BEM–FEM coupling schemes*. MAFELAP 2009. Uxbridge, UK. June 2009. (Minisymposium on *Boundary Elements: theory and applications*)
13. F.J. Sayas. *The hidden ellipticity of the non-symmetric BEM–FEM coupling*. Sevilla Numérica 2009. Sevilla, Spain, June 2009. (Invited speaker)
14. F.J. Sayas, G. Gatica, G. Hsiao. *Quasi-symmetric coupling of finite and boundary elements*. Advances in Boundary Integral Equations and Related Topics. A conference in honor of G.C. Hsiao’s 75th birthday. Newark, Delaware, USA. August 2009. (Invited speaker)

15. F.J. Sayas. *Energy estimates for space discretizations of Time–Domain Integral Equations*. Computational Electromagnetism and Acoustics, Oberwolfach, Germany. February 2010. (Invited speaker)
16. A. Laliena, F.J. Sayas. *Acoustic wave propagation with Convolution Quadrature and BEM*. AMS 2010 Spring Central Section Meeting, St. Paul, Minnesota, USA. April 2010. (Special session on *Differential Equations and Applications*)
17. F.J. Sayas. *Energy estimates in semidiscrete time–domain boundary integral equations*. Santiago Numérico II, Santiago, Chile. December 2010. (Plenary talk)
18. L. Banjai, A. Laliena, F.J. Sayas. *A template for the analysis of CQ–BEM*. Time Domain Boundary Integral Equations: Algorithms, Analysis, Applications. Leipzig, Germany. May 2011.
19. F.J. Sayas. *Energy estimates in semidiscrete time–domain boundary integral equations*. Frontiers in Computational and Applied Mathematics, Newark, NJ. June 2011. (Invited speaker)
20. S. Meddahi, F.J. Sayas. *Weak and strong (discrete) Darcy boundary conditions for Stokes flow*. AMP 2011– Numerical methods for incompressible fluid flow. Vancouver, Canada. July 2011. (Invited speaker)
21. B. Cockburn, F.J. Sayas. *Hybridizable DG methods for the Stokes problem and some of their limits*. ICIAM 2011. Vancouver, Canada. July 2011. (Minisymposium on *Discontinuous Galerkin methods for PDE*).
22. N. Heuer, F.J. Sayas. *Non-symmetric coupling of Interior Penalty and Boundary Element Methods*. AMS 2012 Spring Southeastern Section Meeting. University of South Florida, Tampa, FL, March 2012. (Special session on *Recent developments of finite element methods for partial differential equations*)
23. F.J. Sayas *Retarded potentials, time domain Calderón calculus and BEM for the wave equation*. NSF Workshop on the BEM: bridging education and industrial applications. Minneapolis, MN. April 2012. (Invited speaker)
24. F.J. Sayas, V. Domínguez, S. Lu. *A fully discrete Calderón Calculus for two dimensional waves in the frequency domain*. Eigenvalues/singular values and fast PDE algorithms: acceleration, conditioning, and stability. Banff International Research Station, Banff, Alberta, Canada. June 2012. (Invited speaker)
25. V. Domínguez, S. Lu, F.J. Sayas. *A fully discrete Calderón Calculus for two dimensional waves in the frequency domain*. Numerical Methods for Ordinary and Partial Differential Equations and Applications (dedicated to the 65th birthday of Professor Francisco J. Lisbona). Zaragoza, Spain. September 3-5, 2012. (Invited speaker)
26. F.J. Sayas. *Discrete Huygens Potentials, a.k.a. time-domain acoustics with BEM*. WONAPDE 2013. Fourth Chilean Workshop on Numerical Analysis of Partial Differential Equations. Concepcion, Chile. January 2013. (**Plenary speaker**)
27. F.J. Sayas. *A mathematical toolkit for TDBIE*. Oberwolfach Workshop on Computational Electromagnetism and Acoustics. MFO, Germany. January 20-26, 2013. (Invited survey talk)
28. F.J. Sayas. *Time domain analysis of time domain integral equations*. WAVES 2013. The 11th International Conference on Mathematical and Numerical Aspects of Waves. Tunisia. June 2013. (**Plenary speaker**)
29. L. Banjai, A. Laliena, F.J. Sayas. *A fully discrete Kirchhoff formula based on CQ and BEM*. MAFELAP 2013. Uxbridge, UK. June 2013. (Minisymposium on *Time Domain Boundary Integral Equations*)

30. N. Heuer, Z. Fu, F.J. Sayas. *Double layer potential Boundary Conditions for the Hybridizable Discontinuous Galerkin method*. MAFELAP 2013. Uxbridge, UK. June 2013. (Minisymposium on Finite Element Methods for Multiphysics Problems)
31. F.J.Sayas, V.Domínguez, S. Lu. *A meccano set for two dimensional waves*. XIX Congreso Colombiano de Matemáticas. Barranquilla, Colombia. July 2013.(Semiplenary talk)
32. F.J.Sayas, V.Domínguez, S. Lu. *A meccano set for two dimensional waves*.Journées Singulières Augmentées 2013. Conférence en l'honneur de Martin Costabel pour ses 65 ans. Rennes, France. August 2013.
33. F.J. Sayas, T. Qiu. *Transient acoustic waves scattered by penetrable obstacles*. DelMar Numerics Day 2014. University of Maryland Baltimore County. May 2014.
34. F.J. Sayas, T. Qiu. *Acoustic transmission problems in the time domain*. Workshop on Boundary Integral Equations. Analysis and Computation. ICMS, Edinburgh UK. May 2014.
35. F.J. Sayas, T. Qiu. *Scattering of acoustic waves by homogeneous penetrable obstacles*. 10th AIMS Conference on Dynamical Systems, Differential Equations and Applications. Madrid, Spain. July 2014. (Workshop on Direct and Inverse problems in wave propagation.)
36. N. Heuer, F.J. Sayas. *Coupling of DG methods with one integral equation*. 11th World Conference on Computational Mechanics. Barcelona, Spain. July 2014. (Workshop on Discontinuous Galerkin Methods: New trends and applications.)
37. F.J. Sayas. *Scattering of transient waves by penetrable obstacles*. Foundations of Computational Mathematics. Montevideo, Uruguay. December 2014. (Workshop on Foundations of Numerical PDEs.)
38. M. Hassell, F.J.Sayas. *Interfacing FEM and BEM for transient acoustic equations*. SIAM Computational Science and Engineering 2015. Salt Lake City, UT. March 2015. (Minisymposium on Recent Advances in Numerical Methods for Interface Problems.)
39. *Time-domain BEM-FEM for transient acoustic scattering*. SIAM Central States Sectional Meeting. Missouri University of Science and Technology. Rolla, MO. April 2015. (Workshop on Algorithms and Analysis for Efficient Simulation of Wave Propagation Models.)
40. *Time domain coupling of finite and boundary elements*. CEDYA-CMA (Spanish National Congress on Applied Mathematics). Cadiz, Spain. June 2015. (Special session on Evolution models with non-local terms: theory and numerical approximation.)
41. *Variational views of Stokeslets and Stresslets*. CEDYA-CMA (Spanish National Congress on Applied Mathematics). Cadiz, Spain. June 2015. (Award talk for the SEMA Prize for best paper in SEMA Journal 2015.)
42. *Hybridizable Discontinuous Galerkin Method for elastodynamics*. Workshop on Advances in discontinuous Galerkin Methods and related topics. IWH Heidelberg, Germany. December 2015. (Invited speaker)
43. *Hybridizable Discontinuous Galerkin Method for elastodynamics*. WONAPDE 2016. Fifth Chilean Workshop on Numerical Analysis of Partial Differential Equations. Concepcion, Chile. January 2016. (Minisymposium on Recent advances in discontinuous Galerkin methods)
44. *Techniques and estimates to analyze TDBIE*. Banff Workshop on Computational and Numerical Analysis of Transient problems in Acoustics, Elasticity, and Electromagnetism. BIRS, Banff, Canada. January 2016.
45. *Hybridizable Discontinuous Galerkin Methods for Elastodynamics*. International Conference on Computational Mathematics and Inverse Problems (Peter Monk's 16 Birthday Conference). Houghton, MI. August 2016.

46. *Scattering of transient waves by piecewise homogeneous obstacles*. RICAM Workshop on Space-Time Methods for PDEs. Linz, Austria. November 2016.
47. *Exotic transmission problems for wave equations and how they really are semidiscrete integral equations*. Joint Mathematics Meetings. Atlanta, GA. January 2017. (Special session on Advances in Numerical Analysis for PDE.)
48. *Scattering of transient waves by piecewise homogeneous obstacles*. SIAM Computational Science and Engineering. Atlanta, GA. February-March 2017. (Minisymposium on Numerical methods for wave propagation and its applications.)
49. *Discrete waves in viscoelastic media*. Oberwolfach workshop on Space-time methods for evolutionary partial differential equations. Oberwolfach, Germany. March 2017.
50. *Crossing physical barriers with discrete layer potentials*. 25 CEDYA, 15 CMA (Congress of Differential Equations and Applications, Congress on Applied Mathematics). Cartagena, Spain. June 2017. (Plenary talk.)
51. *Waves in viscoelastic media*. IMA Workshop on Recent advances and challenges in Discontinuous Galerkin Methods and related approaches. Minneapolis, MN. June 2017. (Invited talk.)
52. *Scattering of waves by thermoelastic media*. SCICADE 2017 (Scientific Computation and Differential Equations). Bath, United Kingdom. September 2017. (Minisymposium on Time domain boundary integral and partial differential equations.)
53. *Waves in viscoelastic media*. Conference in honor of Abderrahmane Bendali. Pau, France. December 2017. (Invited talk.)
54. *Discrete waves in viscoelastic media*. Symposium Numerical PDE. Institute of Mathematical and Computational Engineering, PUC. Santiago, Chile. January 2017. (Invited talk.)
55. *Discrete waves in viscoelastic media*. 42nd SIAM Southeastern Atlantic Sectional Conference. UNC Chapel Hill, NC. March 2018. (Minisymposium talk.)
56. *Finite elements for wave propagation in viscoelastic solids*. Frontiers in Applied & Computational Mathematics. NJIT, Newark, NJ. August 2018. (Invited talk.)

17 Summer courses, workshops, and invited courses

1. *Workshop on numerical simulation in acoustics and fluid-structure interaction*. Vigo, Spain. July, 1998. Two invited seminars: (a) *Boundary element methods for numerical solution of partial differential equations* (b) *Coupling of finite and boundary element methods*.
2. *IX French-Spanish School on Numerical Simulation in Physics and Engineering*. Laredo, Spain. September 2000. Course: *Boundary element methods* (5 hours).
3. *Zaragoza Numérica*, Departamento de Matemática Aplicada, Universidad de Zaragoza, Spain. June 2003. Course: *Stability: the inf-sup condition and beyond* (7 hours).
4. *3rd Summer School, Universidad de Concepción (2006)*. Concepción, Chile. January 2006. Course: *Boundary element methods* (6 hours).
5. *Workshop in the mark of the Special Trimester on Inverse Problems and Scattering Theory*. La Coruña, Spain. July 2011. Course: *Retarded boundary integral equations and applications* (5 hours).
6. *Cádiz Numérica 2013*. Cádiz, Spain. June 2013. Course: *From Raviart-Thomas to HDG* (6 hours).
7. *XVI J.L.Lions Spanish-French School on Numerical Simulation in Physics and Engineering*. Pamplona, Spain. September 2014. Course: *Convolution quadrature for wave simulations* (4 hours).

8. *Technische Universität Graz*. Graz, Austria. Course: *Time Domain Boundary Integral Equations* (30 hours).

18 Contributed presentations

1. F. Lisbona, F.J. Sayas. *Extrapolation and deferred correction in a finite element method*. III Jornadas Zaragoza-Pau de Matemática Aplicada. Jaca, Spain. September 1993.
2. M. Crouzeix, F.J. Sayas. *Primer término del desarrollo asintótico de un método de elementos de contorno: funciones constantes a trozos*. XIII Congreso de Ecuaciones Diferenciales y Aplicaciones/III Congreso de Matemática Aplicada. Madrid, Spain. September 1993.
3. F.J. Sayas. *Neumann Data from Dirichlet Data in Laplace's equation: a Numerical Algorithm*. IV Jornadas Zaragoza-Pau de Matemática Aplicada. Jaca, Spain. September 1995.
4. M. Crouzeix, F.J. Sayas. *On the integration of an exterior problem for Laplace's equation with a Boundary Element Method*. XIV Congreso de Ecuaciones Diferenciales y Aplicaciones/IV Congreso de Matemática Aplicada. Vic, Spain. September 1995.
5. G. Aguilar, R. Celorrio, F. Lisbona, F.J. Sayas. *Un problema de transmisión con discontinuidad y su aproximación numérica*. III Congreso de Métodos Numéricos en Ingeniería. Zaragoza, Spain. June 1996.
6. F.J. Sayas. *The numerical solution of Symm's equation on smooth open arcs by spline Galerkin methods*. Numerical Methods and Computational Mechanics in Science and Engineering. Miskolc Hungary. July 1996.
7. R. Celorrio, F.J. Sayas. *Extrapolation techniques and the collocation method for some boundary integral equations*. Conference on Numerical Mathematics (celebrating the 60th Birthday of M.J.D. Powell). Cambridge, UK. July 1996.
8. F.J. Sayas, *Aproximación numérica de ecuaciones hipersingulares por métodos de Galerkin*. XV Congreso de Ecuaciones Diferenciales y Aplicaciones/V Congreso de Matemática Aplicada. Vigo, Spain. September 1997.
9. R. Celorrio, F.J. Sayas. *Full collocation methods for boundary integral equations*. IMA Conference on Boundary Integral Methods: Theory and Applications. University of Salford, Manchester, UK. September 1997.
10. R. Celorrio, V. Domínguez, F.J. Sayas. *On the averaged delta method for some acoustic scattering problems*. 6th International Congress on Sound and Vibration. Copenhagen, Denmark. July 1999.
11. V. Domínguez, F.J. Sayas. *On spline Galerkin methods for singular and hypersingular integral equations*. ENUMATH'99, 3rd European Congress on Numerical Methods and Advanced Applications. Jyväskylä, Finland. July 1999.
12. M. Crouzeix, P. Féat, F.J. Sayas. *Approximation of a free boundary problem by collocation on spline curves*. 2nd IMA Conference on Boundary Integral Methods: Theory and Applications. Bath, UK. September 2000.
13. R. Celorrio, V. Domínguez, F.J. Sayas. *Spaces of Dirac delta distributions applied to boundary integral equations*. ENUMATH 2001, 4th European Congress on Numerical Methods and Advanced Applications. Ischia, Italy. July 2001.
14. A. Márquez, S. Meddahi, F.J. Sayas. *Nodal coupling of finite and boundary elements in some problems of fluid dynamics*. VII Jornadas Zaragoza-Pau de Matemática Aplicada. Jaca, Spain. September 2001.

15. R. Celorrio, V. Domínguez, F.J. Sayas, *Superposition d'éléments finis et éléments finis de frontière*. CANUM 2002. 34 Congrès National d'Analyse Numérique. Anglet, France. May 2002.
16. R. Celorrio, V. Domínguez, M.L. Rapún, F.J. Sayas. *Overlapping of finite and boundary element methods for transmission problems in scattering of thermal waves*. Poster. LMS Durham Symposium Computational method for wave propagation in direct scattering. Durham, UK. July 2002.
17. R. Celorrio, T. Hohage, F.J. Sayas. *Boundary element solution of some heat diffusion problems in the Laplace domain*. WONAPDE 2004. Concepción, Chile. January 2004.
18. R. Bustinza, G. Gatica, F.J. Sayas. *Coupling BEM and LDG Methods*. 3rd IMA Conference on Boundary Integral Methods: Theory and Applications. Reading, UK. September 2004.
19. T. Hohage, M.L. Rapún, F.J. Sayas, M.L. Sein Echaluze. *Parameter determination in diffusive media via thermal waves*. WAVES'05. 7th International Conference on Mathematical and Numerical Aspects of Wave Propagation. Providence, USA. July 2005.
20. F.J. Sayas. *Direct Boundary Element Method with discretization of all integral operators*. IMSE'2006. Niagara Falls, Canada. July 2006.
21. D.A. Garzón, A. Laliena, F.J. Sayas. *Numerical scattering of transient waves with convolution quadrature and delta distributions*. WONAPDE 2007. Concepción, Chile. January 2007.
22. A. Laliena, F.J. Sayas. *Time-stepping methods with BEM for scattering of waves: algorithms and a hint of the theory*. First French-Spanish Congress of Mathematics. Zaragoza, Spain. July 2007.
23. A. Laliena, F.J. Sayas. *Time stepping methods with BEM for waves*. XVII Congreso de Matemáticas Capricornio (COMCA07), Copiapó, Chile. August 2007.
24. B. Cockburn, F.J. Sayas. *Algorithms for coupling DG and BEM*. FEMTEC 2009. Lake Tahoe, USA. January 2009.
25. F.J. Sayas. *BEM-FEM coupling: back to the beginning*. Santiago Numérico 2009. Santiago, Chile. January 2009.
26. F.J. Sayas. *BEM-FEM: an new theorem for an old method*. Finite Element Circus. University of Delaware, USA. April 2009.
27. F.J. Sayas. *Getting Darcy flows ready for coupling*. Finite Element Circus. University of Tennessee, Knoxville, USA. October 2009.
28. G. Gatica, G. Hsiao, F.J. Sayas. *The ultimate proof of stability of the Johnson-Nédélec BEM-FEM coupling*. WONAPDE 2010. Concepción, Chile. January 2010.
29. S. Meddahi, F.J. Sayas. *Tight Finite Elements for Stokes-Darcy Flow*. Finite Element Circus. University of Connecticut, Avery Point, USA. October 2011.
30. N. Heuer, F.J. Sayas. *IP+BEM*. Finite Element Circus. Rutgers University, Piscataway, NJ, USA. April 2012.
31. F.J. Sayas, J. Guzmán, S. Meddahi, V. Selgás. *Transparent Boundary Conditions and the Gap Condition for Stokes Elements*. 2012 SIAM Annual Meeting. Minneapolis, MN. July 2012. Minisymposium on Numerical Approximation of Viscous Flows. (Minisymposium organizer and speaker)
32. Z. Fu, N. Heuer, F.J. Sayas. *Double layer boundary conditions for HDG*. Finite Element Circus. University of Pittsburgh, PA, USA. October 2012.
33. C. Bacuta, G.C. Hsiao, F.J. Sayas. *News from the single layer potential for the transient Stokes problem*. IABEM 2013. Santiago de Chile. January 9-11, 2013.

34. M. Hassell, F.J. Sayas. *Interfacing FEM and BEM for transient acoustic equations*. Finite Element Circus. George Mason University, Fairfax, VA. March 2015.
35. M. Hassell, F.J. Sayas. *Interfacing FEM and BEM for transient acoustic equations*. Cascade RAIN Conference. Vancouver, WA. April 2016.
36. F.J. Sayas, T.S. Brown, S. Du, H. Eruslu. *Discrete waves on viscoelastic media*. Finite element circus, Rutgers. April 2017.
37. F.J. Sayas, S. Du, A. Hungria. *Some new HDG projections and their use for streamlined analysis of HDG methods*. 30 Chemnitz FEM Symposium. Strobl, Austria. September 2017.
38. F.J. Sayas, A. Rieder. *Time Domain Boundary Integral Equations for scattering by obstacles with locally homogeneous material properties*. IABEM2018. Symposium of the International Association for Boundary Element Methods. Paris, France. June 2018.

19 Seminar talks and colloquia

1. *Representación de un problema del potencial en la frontera: métodos de contorno*. Seminario de Matemática Aplicada. Universidad de Zaragoza, Spain. June 1992.
2. *Extrapolación de Richardson en un método de elementos de contorno*. Seminario de Matemática Aplicada. Universidad de Zaragoza, Spain. March 1994.
3. *Asymptotic expansion of the error in a Boundary Finite Element Method*, Séminaire d'Analyse Numérique et Mécanique. Institut Mathématique de Rennes, France. June de 1994.
4. *Representación integral de un problema de potencial y su aproximación numérica*. Seminario Rubio de Francia. Universidad de Zaragoza, Spain. December 1994.
5. *Representación integral de un problema de potencial y su aproximación numérica*. Seminario de Matemática Aplicada. Universidad de Oviedo, Spain. March 1995.
6. *La ecuación de Symm en arcos abiertos: teoría y análisis numérico*. Seminario de Matemática Aplicada. Universidad de Zaragoza, Spain. January 1996.
7. *Generalizaciones bidimensionales de la fórmula de Euler-Maclaurin*. Seminario Rubio de Francia. Universidad de Zaragoza, Spain. January 1997.
8. *Développement asymptotique de l'erreur pour des méthodes de collocation avec des noyaux logarithmiques*. Séminaire d'Analyse Numérique et Mécanique. Institut Mathématique de Rennes, France. May 1998.
9. *Quelques variantes de la méthode de collocation*. Séminaire d'Analyse Numérique et Mécanique. Institut Mathématique de Rennes, France. May 1999.
10. *Elementos de Frontera Libre en un Problema de Electromagnetismo*. Seminario Rubio de Francia. Universidad de Zaragoza, Spain. January 2000.
11. *Elementos de Frontera Libre en un Problema de Electromagnetismo*. Departamento de Matemática y Computación. Universidad Pública de Navarra, Spain. November 2000.
12. *Dispersión de ondas por obstáculos múltiples: problemas directos e inversos*. Seminarios A. Centro Politécnico Superior. Universidad de Zaragoza, Spain. March 2001.
13. *An interior–exterior Schwarz algorithm: theory and numerics*. Séminaire d'Analyse Numérique. Université de Pau, France. December 2001.
14. *Acotaciones desde la frontera para problemas de Dirichlet*. Seminario de Matemática Aplicada. Universidad de Zaragoza, Spain. June 2002.
15. *Levantamientos de trazas de espacios de elementos finitos*. Departamento de Matemática y Computación. Universidad Pública de Navarra, Spain. May 2003.

16. *Numerical approximation of thermal waves in locally nonhomogenous media*. Kolloquium über Angewandte Mathematik. Universität Göttingen, Germany. October 2003.
17. *Difusión en el dominio transformado de Laplace*. Departamento de Matemática y Computación. Universidad Pública de Navarra, Spain. March 2004.
18. *Acoplamiento de métodos LDG y BEM*. Departamento de Matemática y Computación. Universidad Pública de Navarra, Spain. November 2004.
19. *Convolution Quadrature for Waves Around Obstacles*. University of Crete, Heraklion, Greece. November 2006.
20. *Convolution Quadrature for Waves Around Obstacles*. Kolloquium über Angewandte Mathematik. Universität Göttingen, Germany. December 2006.
21. *Dispersión numérica de ondas con cuadratura de convolución y distribuciones delta*. Seminario de Ingeniería Matemática e Informática. Universidad Pública de Navarra, Spain. February 2007.
22. *Redes neuronales: qué son y cómo se usan*. Zaragoza Numérica, curso y encuentro de Análisis Numérica. Zaragoza, Spain. June 2007.
23. *Potenciales retardados y principio de Huygens*. Universidad Católica de la Santísima Concepción, Chile. August 2007.
24. *Potenciales retardados y principio de Huygens*. Universidad de Concepción, Chile. August 2007.
25. *Introduction à l'Analyse Mathématique des potentiels retardés*. Séminaire de Mathématiques, Université de Pau, France. October 2007.
26. *BEM-FEM operators in the resolvent set of the Laplacian and scattering of transient waves*. Numerical Analysis Seminar, Texas A&M University, USA. May 2008.
27. *BEM-FEM operators in the resolvent set of the Laplacian and scattering of transient waves*. Applied Mathematics Seminar, University of Delaware, USA. May 2008.
28. *Boundary integral scattering in the frequency, Laplace and time domains*. Department of Mathematics, Yonsei University, Seoul, Korea. September 2008.
29. *Numerical integral scattering*. Departamento de Matemáticas, Pontificia Universidad Católica, Santiago, Chile. October 2008.
30. *Boundary integral scattering*. McGill/CRM Applied Mathematics Seminar, Montreal, Canada. October 2008.
31. *Boundary integral methods for transient waves*. Applied Mathematics Seminar, University of Minnesota, Minneapolis, MN, USA. November 2008.
32. *Boundary integral scattering*. SCAIM Seminar, University of British Columbia, Vancouver, Canada. March 2009.
33. *Boundary integral scattering*. Scientific Computing Seminar, Simon Fraser University, Vancouver, Canada. March 2009.
34. *Boundary integral scattering*. Scientific Computing Seminar, Brown University, Providence, RI, USA. April 2009.
35. *Numerical coupling of models and methods*. Special seminar, College of Arts and Science, University of Delaware, Newark, DE, USA. March 2010.
36. *Non symmetric coupling of Finite and Boundary Elements*. ICES Seminar, University of Texas at Austin, TX, USA. April 2010.
37. *Non symmetric coupling of FEM and BEM: 30 years after*. Kolloquium Institut NAM. Universität Göttingen, Germany. May 2010.

38. *Acoplamiento no simétrico de elementos finitos y elementos de frontera: 30 años después*. Seminario Rubio de Francia, Universidad de Zaragoza, Spain. June 2010.
39. *Non symmetric coupling of FEM and BEM: 30 years after*. Analysis & PDE Seminar. University of Delaware, USA. September 2010.
40. *A boundary integral biased introduction to transparent boundary conditions for waves*. Applied Mathematics Seminar. University of Delaware, USA. November 2010.
41. *A boundary integral biased introduction to transparent boundary conditions for waves*. School of Aerospace Engineering, Universidad Politécnica de Madrid, Spain. January 2011.
42. *Energy estimates in semidiscrete time–domain boundary integral equations*. Numerical Analysis Seminar, University of Maryland at College Park, MD, USA. February 2011.
43. *Integral Absorbing Boundary Conditions in the Time Domain*. Applied and Computational Mathematics Colloquium, California Institute of Technology, Pasadena, CA, USA. March 2011.
44. *Energy estimates in semidiscrete time–domain boundary integral equations*. Analysis Seminar, University of Southern California, Los Angeles, CA, USA. March 2011.
45. *Mathematical sound: propagation and scattering*. Colloquium Department of Mathematics and Statistics, James Madison University, Harrisonburg, VA, USA. April 2011.
46. *Mathematical sound: propagation and scattering*. Applied Mathematics Lecture Series, Shippensburg University, Shippensburg, PA, USA. September 2011.
47. *Integral Absorbing Boundary Conditions in the Time Domain*. Applied Mathematics Colloquium, NJIT, Newark, NJ, USA. January 2012.
48. *Integral Absorbing Boundary Conditions in the Time Domain*. Applied Mathematics Colloquium, Delaware State University. Dover, DE. March 2012.
49. *Old and new problems on the discretization of the Stokes equation*. Applied Math Colloquium, UMBC, Baltimore, MD. April 2012.
50. *Retarded potentials and time domain Calderón Calculus*. Mathematics Colloquium, University of Connecticut, Storrs, CT. October 2012.
51. *Old and new problems on the discretization of the Stokes equation*. Computational Mathematics Seminar, University of Pittsburgh, Pittsburgh, PA, USA. November 2012.
52. *Old and new problems on the discretization of the Stokes equation*. Computational and Applied Mathematics Colloquium, Penn State University, State College, PA, USA. December 2012.
53. *Old and new problems on the discretization of the Stokes equation*. Seminar at the Center for Research in Mathematics, Barcelona. December 2012.
54. *Interactions of confined Stokes flow*. Computational seminar talk. Clemson University. May 2013.
55. *A meccano set for two dimensional waves*. NAIS Seminar, Heriot-Watt University. January 2014.
56. *A meccano set for two dimensional waves*. Scientific Computing Seminar, Brown University. February 2014.
57. *Discrete two-dimensional waves: from integrals to sources*. Computational Science Seminar, University of Massachusetts, Dartmouth. March 2014.
58. *Transient transmission problems with integral methods*. Applied and Computational Math Seminar. George Mason University. August 29, 2014.

59. *Transient transmission problems with integral methods*. Applied Mathematics and Statistics Colloquium. Colorado School of Mines. October 3, 2014.
60. *Interfacing FEM and BEM for transient acoustic equations*. Numerical Analysis Seminar. Texas A & M University. April 1, 2015.
61. *Interfacing FEM and BEM for transient acoustic equations*. Karlsruher PDE Seminar. Faculty of Mathematics, Karlsruhe Institute of Technology. June 2015.
62. *A guided tour of retarded potentials, from analysis to simulation*. Mathematics Colloquium at Temple University. October 19, 2015.
63. *Hybridizable Discontinuous Galerkin Methods for Elastodynamics*. Numerical Analysis Seminar, Old Dominion University. February 2016.
64. *A guided tour of retarded potentials, from analysis to simulation*. Mathematics colloquium, Portland State University. April 2016.
65. *Hybridizable Discontinuous Galerkin Methods for Elastodynamics*. CCT Seminar, Louisiana State University. April 2016.
66. *La vida matemática y numérica de los potenciales de capa simple, de Coulomb a Huygens*. Royal Academy of Sciences of Zaragoza. November 2016.
67. *The mathematical and numerical life of single layer potentials, from Coulomb to Huygens*. Electrical and Computer Engineering Seminar, University of Delaware. December 2016.
68. *The mathematical and numerical life of single layer potentials, from Coulomb to Huygens*. Mathematical Sciences Colloquium, University of Delaware. May 2017.
69. *Discrete waves in viscoelastic media*. Numerical Analysis Seminar. University of Maryland College Park. September 2017.
70. *Crossing physical barriers with discrete layer potentials*. Colloquium Department of Mathematics, University of Buenos Aires, Argentina. February 2018.
71. *Discrete waves in viscoelastic media*. Seminar George Mason University. February 2018.
72. *Finite elements for wave propagation in viscoelastic solids*. Scientific Computing Seminar, Brown University. April 2018.
73. *Crossing physical barriers with discrete layer potentials*. Colloquium Worcester Polytechnic Institute. April 2018.
74. *Wave propagation in viscoelastic solids*. Seminario Rubio de Francia, University of Zaragoza, Spain. May 2018.
75. *Waves in viscoelastic solids*. Applied and Computational Mathematics Seminar, Rutgers University. October 2018.

20 Future engagements

1. Seminar at Rice University. January 2019.
2. Talk in WONAPDE 2019. January 2019.

RESEARCH ACTIVITIES

21 Organization of meetings

1. *Xth French–Spanish Autumn School on Numerical Simulation in Physics and Engineering*. Jaca, Spain. September 23–27, 2002. Organisers: M. Bernadou (INRIA, France), F. Lisbona (U. Zaragoza), F.–J. Sayas. Participants: 78.
2. *Zaragoza Numérica. Course and encounter on Numerical Analysis*. Zaragoza, Spain. June 9–13, 2003. Organizers: R. Celorrio (U. Zaragoza), F.J. Sayas.
3. *Zaragoza Numérica. Course and encounter on Numerical Analysis*. Zaragoza, Spain. June 6–10, 2005. Organizers: S. Meddahi (U. Oviedo), F.J. Sayas.
4. *Zaragoza Numérica. Course and encounter on Numerical Analysis*. Zaragoza, June 18–22, 2007. Organizers: S. Meddahi, F.J. Sayas.
5. *Ciudad Real Numérica. Summer school on Numerical Analysis*. Ciudad Real, Spain. June 29–July 2, 2015. Organizers: E. Aranda, J.C. Bellido, M. Gómez, F.J. Sayas.
6. Organization of minisymposia:
 - *Approximation techniques with boundary elements* (with S. Meddahi) in WONAPDE 2004, Concepción, Chile, January 2004.
 - *Numerical waves, transient and time harmonic* (with S. Meddahi) in WONAPDE 2007, Concepción, Chile, January 2007.
 - *Propagation and transport phenomena: theory and numerics* (with M. Madaune–Tort, U. Pau, France) in ICHFM07, Zaragoza, Spain, July 2007.
 - *Boundary elements* in WONAPDE2010, Concepción, Chile, January 2010.
 - *Numerical approximation of viscous flows* in SIAM Annual Meeting, Minneapolis, USA, July 2012.
 - *Boundary elements in theory and practice* (with N. Heuer) in WONAPDE 2013, Concepción, Chile, January 2013.
 - *Direct and inverse problems for wave propagation* (with F. Cakoni) in AIMS Conference on Dynamical Systems, Differential Equations and Applications, Madrid, Spain, July 2014.
 - *Advances in Time-Domain Boundary Integral Equations* (with N. Salles) in SIAM Conference on Computational Science and Engineering, Salt Lake City, Utah, March 2015.
 - *Numerical Acoustics* in XXIV CEDYA/XIV CMA, Cádiz, Spain, June 2015.
 - *Advances in Finite and Boundary Elements* (with M. Neilan) in WONAPDE 2016, Concepción, Chile, January 2016.
 - *Conforming and non-conforming methods for waves* (with L.M. Imbert-Gerard) in WONAPDE 2019, Concepción, Chile, January 2019.
7. *Time Domain Boundary Integral Equations. Algorithms, Analysis, Applications*. Max-Planck-Institut, Leipzig, Germany. May 4–6 2011. Organizers: L. Banjai, F.J. Sayas.
8. *DelMar Numerics Day*. Annual workshop on computational mathematics. Organizers: R. Nochetto, T. von Petersdorff, P. Plechac, F.J. Sayas.
 - Newark, DE, April 2012.
 - College Park, MD, May 2013.
 - UMBC Baltimore, MD, May 2014.
 - US Naval Academy, Annapolis, MD, May 2015.

- George Mason University, VA. May 2016.
 - Newark, DE, May 2018.
9. *Finite Element Circus, Fall 2013*. University of Delaware. Organizers: C. Bacuta, P. Monk, F.J. Sayas.
 10. *Finite Element Circus, Fall 2018*. University of Delaware. Organizers: C. Bacuta, P. Monk, F.J. Sayas.
 11. Scientific committees:
 - Sevilla Numérica 2011. Sevilla, Spain. June 2011.
 - IABEM 2013. Santiago de Chile. January 2013.
 - Cádiz Numérica 2013. Cádiz, Spain. June 2013.
 - XXIV CEDYA-XIV CMA (Congress of Differential Equations and Applications – Congress on Applied Mathematics). Cádiz, Spain. June 2015.
 12. *Valencia Numérica 2017. Summer school on Numerical Analysis*. Valencia, Spain. July 2017.

22 Supervision

22.1 Doctoral dissertations

1. Ricardo Celorrio, *Boundary element methods for a problem of steady–state flow around a tunnel*. Co–supervised with F. Lisbona. Universidad de Zaragoza, Spain. Defended on 09/05/1997.
2. Víctor Domínguez. *Asymptotic study of projection method for boundary integral equations*. Defended on 01/11/2001. Universidad de Zaragoza, Spain.
3. María Luisa Rapún. *Numerical methods for scattering of thermal waves*. Defended on 06/29/2004. Universidad de Zaragoza, Spain.
4. Ricardo Oyarzúa. *Mixed Finite Element Methods for the coupled Stokes–Darcy problem*. Co–supervised with G. Gatica. Universidad de Concepción, Chile. Defended on 12/15/2010.
5. Antonio Laliena. *Theoretical and algorithmic aspects of the Convolution Quadrature method applied to scattering of acoustic waves*. Universidad de Zaragoza, Spain. Defended on 01/27/2011.
6. Zhixing Fu. *Contributions to the study of the Hybridizable Discontinuous Galerkin Method*. University of Delaware. Defended on 05/14/2013.
7. Sijiang Lu. *Delta BEM discretization of transient and harmonic waves*. University of Delaware. Defended on 05/20/2013.
8. Tonatiuh Sánchez-Vizuet. *Integral and coupled integral-volume methods for transient problems in wave-structure interaction*. University of Delaware, 2016.
9. Tianyu Qiu. *Time domain boundary integral equation methods in acoustics, heat diffusion and electromagnetism*. University of Delaware, 2016.
10. Matthew Hassell. *Some applications of integral equations to the solution of transient partial differential equations*. University of Delaware, 2016.
11. Thomas Brown. *Transient elastic waves in piezoelectric materials and their numerical discretization*. University of Delaware, 2018.
12. Allan Hungria. Expected 2019.
13. Shukai Du. Expected 2020.
14. Hasan Eruslu. Expected 2020.
15. Hugo Díaz-Norambuena. Expected 2022.

22.2 Master and undergraduate theses

1. José María Fabre, *Implicit methods with front-tracking for an infiltration problem*. Tesina de Licenciatura de Matemáticas. Defense: 04/25/1996.
2. Pedro José Miana, *Generalised integral operators on periodic Sobolev spaces*. Tesina de Licenciatura de Matemáticas. Defense: 06/04/1997.
3. Víctor Domínguez Báguena, *Analytic and numerical study of integral equations with logarithmic kernel*. Tesina de licenciatura de Matemáticas. Defense: 09/09/1998.
4. Miguel Angel Delgado, *Computational simulation of a metal shaping process by magnetic induction*. Proyecto fin de carrera de Ingeniería industrial. Defense: 12/20/1999.
5. Humberto Casado, *Simulation of inverse problems in metal shaping processes by magnetic induction*. Proyecto fin de carrera de Ingeniería industrial. Defense: 02/08/2002.

22.3 Undergraduate research

The GEMS Project (Groups Exploring the Mathematical Sciences), Summer 2012, University of Delaware. Team: Yucong Weng (undergraduate, U.Delaware), Chris Flores (undergraduate, Kean U), Michael DePersio (first year graduate, U.Delaware)

The GEMS Project (Groups Exploring the Mathematical Sciences), Summer 2013, University of Delaware. Team: Andrea Carosso (undergraduate, U.Delaware), Douglas Freeman (first year graduate, U.Delaware)

The GEMS Project (Groups Exploring the Mathematical Sciences), Summer 2014, University of Delaware. Team: Kathlyn Levin (undergraduate, U.Delaware), Allan Hungria (first year graduate, U.Delaware)

The GEMS Project (Groups Exploring the Mathematical Sciences), Summer 2015, University of Delaware. Team: Jaspal Nijjar (undergraduate, U.Delaware), Kevin Cotter (first year graduate, U.Delaware)

The GEMS Project (Groups Exploring the Mathematical Sciences), Summer 2016, University of Delaware. Team: Guanyu Hou (undergraduate, U.Delaware), Shukai Du, Hasan Eruslu (first year graduate, U.Delaware)

Undergraduate research, Summer 2017, University of Delaware. Team: Connor Swalm (undergraduate, U. Delaware), Hugo Díaz (undergraduate, U. Concepción)

The GEMS Project (Groups Exploring the Mathematical Sciences), Summer 2018, University of Delaware. Team: Dong Li (undergraduate, U.Delaware), Boyang Xu (first year graduate, U.Delaware). Extended summer collaboration: José Manuel Pena (graduate student, Polytechnical University of Madrid – five months stay)

23 Visiting positions

Institut de Recherche Mathématique de Rennes (IRMAR), University of Rennes I, France. April-May 1998 and May 1999.

Departamento de Ingeniería Matemática, University of Concepción, Chile. January 2004, January 2005, January 2006, January 2007, July-August 2007.

Laboratoire de Mathématiques Appliquées, Université de Pau et des Pays de l'Adour. October 2007.

School of Mathematics, University of Minnesota, Minneapolis, USA. November 2007–August 2010.

Technical University of Graz, Graz, Austria. October 2017.

Division of Applied Mathematics, Brown University. March-April 2018.

Technical University of Vienna, Vienna, Austria. June 2018.

24 Short research visits (one or two weeks)

Institut de Recherche Mathématique de Rennes (IRMAR), University of Rennes I, France.

May 1992 (two weeks), September 1993 (two weeks), June 1994 (one week), May 1995 (one week), April-May 1996 (two weeks), June 2006 (one week).

Institut für Numerische und Angewandte Mathematik (NAM), Georg-August-Universität Göttingen, Germany.

October 2003 (two weeks), April 2004 (one week), March 2005 (one week), December 2006 (one week).

Department of Mathematical Sciences, Brunel University, Uxbridge, UK.

August 2005 (two weeks), April 2007 (one week).

Department of Applied Mathematics, University of Crete, Heraklion, Greece. November 2006 (one week).

25 Attendance to courses

VII French-Spanish Fall School on Numerical Simulation in Physics and Engineering. Oviedo, Spain. September 1996.

NSF/CBMS Regional Conference in the Mathematical Sciences ‘Using Spectral Data to Solve Inverse Problems’, The University of Texas-Pan American, Edinburg, TX, USA. December 14-18, 2001.

École des ondes: problèmes directs et inverses en diffraction, INRIA Rocquencourt, France. January 27-31, 2003.

NSF/CBMS Regional Conference in the Mathematical Sciences ‘Finite Element Exterior Calculus’, Brown University, Providence, RI, USA. June 11-15, 2013.

NSF/CBMS Regional Conference in the Mathematical Sciences ‘Fast direct solvers for elliptic PDEs’, Dartmouth College, Hanover, NH, USA. June 23-29, 2014.

SERVICE ACTIVITIES

26 Administrative positions

Director of Graduate Studies. Department of Mathematical Sciences, University of Delaware. September 2014-August 2017.

27 Seminar organization

Applied Mathematics Seminar, University of Zaragoza. May 1998 to September 2007.

Analysis & PDE Seminar, University of Delaware. Fall 2010 and Spring 2011.

Numerical analysis & PDE Seminar, University of Delaware, Since Fall 2011.

28 Project evaluation

ANEP. Agencia Nacional de Evaluación y Prospectiva, Spain

CONYCIT. Comisión Nacional de Investigación en Ciencia y Tecnología, Chile

ETF. Estonian Science Foundation, Estonia.

FONCYT. Fondo para la Investigación Científica y Tecnológica, Argentina.

SSF. Swiss Science Foundation

ANR. Agence National de la Recherche, France

NSERC. Natural Sciences and Engineering Research Council of Canada.

NSF. National Science Foundation.

ECOS-Sud.

29 Committees

Department of Mathematical Sciences, University of Delaware:

Colloquium committee, 2010/11.

Undergraduate committee, 2011/12.

Graduate committee, 2012/13, 2013/14.

Math Website Redesign Committee, Fall 2012.

Ad-hoc committee for revision of the graduate curriculum, Spring 2014

Ad-hoc committee for revision of MATH243 (Summer 2014) and for textbook selection (Spring 2015)

Chair of the Development committee, 2018/19.

Other activities at Department of Mathematical Sciences, University of Delaware:

Grade grievance panel, College of Arts and Sciences. February 2011.

Candidacy exam committee: Zhixing Fu (Fall 2010), Sijiang Lu (Fall 2010), Fan Yang (Spring 2011), Shixu Meng (Spring 2013), Michael DePersio (Spring 2013), Tao Yuan (Spring 2013), Tonatiuh Sánchez-Vizuet (Spring 2013), Matthew Hassell (Fall 2013), Tianyu Qiu (Fall 2013), Ryan Evans (Fall 2013), Michael Stapf (Fall 2013), Jacob Rezac (Spring 2014), Irene de Teresa (Spring 2014), Klajdi Qirko (Spring 2014), Allan Hungria (Spring 2015), Lan Zhong (Fall 2015), Jacob Jacavage (Fall 2016), Benjamin Civiletti (Fall 2016), Shukai Du (Spring 2017), Hasan Eruslu (Spring 2017), Samuel Cogar (Spring 2017)

Premilinary exams in Linear Algebra and Analysis: February 2012 (A), February 2013 (A), August 2013 (A), February 2014 (LA), February 2015 (LA), August 2015 (LA), February 2016 (A), August 2018 (A).

Member of the jury of the *5th International Competition for University Students in Mathematics*,
Blaegovgrad, Bulgaria, 07/29/1998 to 08/03/1998.

Thesis committees:

Pablo Pérez Riera, Universidad de Oviedo, Spain, 1995
José Luis Gracia Lozano, Universidad de Zaragoza, Spain, 1999
María González Taboada, Universidad de Oviedo, Spain, 2000
José Román Galo Sánchez, Universidad de Sevilla, Spain, 2002
Lucía Agud Albesa, Mathematical Analysis, Universidad de Zaragoza, Spain, 2004
Mohamed Hamdy Doweidar, Fluid Mechanics, Universidad de Zaragoza, Spain 2005
María López Fernández, Universidad de Valladolid, Spain, 2005
Isabel Sánchez Muñoz, Universidad de Sevilla, Spain, 2005
Virginia Selgas, Universidad de Oviedo, Spain, 2006
Lu Shu, University of Delaware, 2013.
Matthias Taus, University of Texas, Austin, 2015.
Klajdi Qirko, University of Delaware, 2017.
Haiyang Qi, New Jersey Institute of Technology, 2017.
Alexander Rieder (reporter), Technical University of Vienna, Austria, 2017.
Patrick Vega (reporter), University of Concepción, Chile.

Member of Mathematical Societies:

Sociedad Española de Matemática Aplicada, SEMA. Since 1994.
Society for Industrial Mathematics and Applications, SIAM. Since 2000.

TEACHING

30 Teaching (USA)

30.1 Undergraduate courses (University of Delaware)

MATH 243. *Analytical Geometry and Calculus C*. Fall 2014.

MATH 353. *Engineering Mathematics III*. Spring 2014 & Spring 2013.

MATH 508. *Introduction to Complex Variables and Applications*. Spring 2012.

MATH 535. *Introduction to Partial Differential Equations*. Spring 2011.

30.2 Graduate courses (University of Delaware)

MATH 600. *Fundamentals of real analysis*. Fall 2016 & Fall 2018.

MATH 611. *Introduction to numerical discretization*. Spring 2019.

MATH 612. *Numerical methods for equation solving and function minimization*. Spring 2014.

MATH 616. *Introduction to Applied Mathematics I*. Fall 2011.

MATH 617. *Introduction to Applied Mathematics II*. Spring 2012.

MATH 667. *Projects in imaging, networks, and signals*. Spring 2016. (Experimental course)

MATH 672. *Vector spaces*. Fall 2013.

MATH 806. *Functional analysis*. Fall 2015.

MATH 817. *Introduction to Numerical Methods for Partial Differential Equations*. Fall 2010.

MATH 835. *Evolutionary Partial Differential Equations*. Fall 2012.

MATH 836. *Elliptic Partial Differential Equations*. Spring 2013 & Spring 2017.

MATH 838. *Finite Element and Boundary Element methods*. Spring 2015.

30.3 Undergraduate courses (University of Minnesota)

MATH 2374. *IT Multivariable calculus and vector analysis*. Fall 2009, Spring 2009, Fall 2008.
(Course coordinator & instructor)

MATH 4242. *Applied linear algebra*. Fall 2008.

MATH 5486. *Introduction to Numerical Methods II*. Spring 2010.

30.4 Graduate and master courses (Minnesota)

FM 5012. *Mathematical Background for Finance II*. Master of Financial Mathematics. Spring 2009.

MATH 8446. *Numerical Analysis of Differential Equations*. Spring 2008.

31 Teaching (Spain)

All undergraduate courses taught at the University of Zaragoza (Spain)

31.1 Freshman and sophomore courses

Mathematics I (School of Chemistry). 92/93. Assistant: 94/95, 95/96.

Mathematics II (School of Chemistry). 96/97.

Numerical methods (School of Mathematics). Computer laboratory. 92/93, 94/95, 95/96, 96/97.

Algebra (Industrial engineering). Fall'97, Fall'98, Fall'01, Fall'02.

Numerical methods (Chemical engineering). Fall'97, Fall'98, Fall'99, Fall'00.

Logic (Computer Science). Spring'02, Spring'04, Spring'05, Spring'06, Spring'07.

Differential equations (Chemical engineering). Spring'04, Spring'05, Spring'06, Spring'07.

31.2 Junior and senior courses

Partial differential equations (School of Mathematics). 94/95, 95/96, 99/00.

Mathematical models. (Industrial engineering). Spring'00, Spring'02, Spring'04, Spring'06.

Advanced numerical methods. (Industrial engineering). Spring'01, Spring'03, Spring'05.

Discrete Mathematics and Optimization (Industrial engineering). Spring'07.

31.3 Graduate courses

MA=Departamento de Matemática Aplicada; IM=Departamento de Ingeniería Mecánica; DM=Departamento de Matemáticas

Boundary integral equations. Doctoral program: *Applied Mathematics*. Dept: MA (Zaragoza). 96/97, 97/98.

Fundamentals of the Boundary Element Method. Doctoral program: *Computational Mechanics*. Dept: IM (Zaragoza). 96/97, 97/98 (collaborator).

Coupling of finite and boundary element methods. Doctoral program: *Mathematical modelling and numerical simulation*. Dept: Mathematics (Universidad de Oviedo). 97/98 (collaborator).

Pseudodifferential equations and their numerical approximation. Doctoral program: *Applied Mathematics*. Dept: MA (Zaragoza). 98/99.

Advanced finite elements. Doctoral program: *Computational Mechanics*. Depts: MA, IM (Zaragoza). 98/99 (collaborator).

Advanced finite elements. Doctoral program: *Computational Mechanics*. Depts: MA, IM (Zaragoza). 99/00, 00/01, 01/02, 02/03, 03/04, 04/05, 05/06, 06/07.

Mathematical models in PDE Doctoral programs:

Applied Mathematics. Dept: MA (Zaragoza). (99/00, 00/01)

Mathematical Methods and their Applications. Depts: DM, MA, Métodos Estadísticos (Zaragoza). (01/02, 02/03)

Computational Mechanics. Dept: MA, IM (Zaragoza). (02/03)

Mathematical models in Mechanics. Doctoral program: *Computational Mechanics*. Depts: MA, IM (Zaragoza). 03/04, 04/05, 05/06, 06/07.

Implementation and use of the FEM. Doctoral program: *Computational mechanics*. Depts: MA, IM (Zaragoza). 03/04, 04/05, 05/06, 06/07 (collaborator).

Signal theory. Doctoral program: *Mathematical Methods and their Applications*. Depts: MA, IM, Métodos Estadísticos (Zaragoza). 01/02, 02/03, 03/04, 04/05 (collaborator).

32 Teaching innovation

32.1 Projects

Group F.M.I.: Formación Matemática en Ingeniería. Coordinated by María Luisa Sein–Echaluze. 2003.

ALINGE (Algebra in Engineering). 2003.

MATLAB learning guides for students and instructors. ICE Projects 51/2004, Universidad de Zaragoza.

The access to Engineering Schools: detection of weaknesses in mathematical knowledge. ICE Projects 31/2004, Universidad de Zaragoza. Coordinated by Dolores Lerís.

Logic. ICE Projects 61/2004, Universidad de Zaragoza. Coordinated by Francisco Gaspar.

32.2 Courses on teaching innovation

Web materials for semi–presential teaching. 2004 (three times).

32.3 Attendance to courses

Basic course on using WebCT for mathematical teaching in engineering. September–October 2003.

Interview and communication techniques for tutors. November 2003.

33 Recognition of teaching activity

2 positive five–year evaluations (1/10/92 to 30/06/99, 1/07/99 to 30/06/04)

Maximum grade (2/2) by the Agency for Evaluation of Teaching Activity, Gobierno de Aragón (2005 and 2006).

OTHER ACTIVITIES

34 Studies and activities in music and popularization

Título de Profesor de Grado Medio de Música (especialidad Piano) (Teacher of piano), Ministerio de Educación y Ciencia. 1988.

Título de Profesor de Grado Medio de Música (especialidad Solfeo, Teoría de la Música y Transposición musical) (Teacher of solfeggio, music theory and transposition), Ministerio de Educación y Ciencia. 1994.

Freelance writing and stable collaborations:

Classical music critic for *Diario 16 Aragón*, from November 1990 to October 1996.

Program notes for Auditorio de Zaragoza: more than 30 published notes from 1996 to 2006.

Recording critic for *CD Compact*, from January 1999.

Classical music critic for *El Periódico de Aragón*. From October 1999 to June 2007 (around 400 published columns).

Musical consulting for *Al Ayre Español Orquesta*, from 2005 to 2006.

Collaboration with the Orquesta Clásica Universitaria de Zaragoza (8 concerts in 2003).