CURRICULUM VITAE – Francisco Marques

Address: Department of Applied Physics,
Universitat Politècnica de Catalunya (UPC), 08034 Barcelona, Spain
E-mail: marques@fa.upc.edu
URL: http://www-fa.upc.es/websfa/fluids/marques/marques.html

Education:

Universitat de Barcelona, Spain	Physics	B.Sc. (Distinction)	1975
Universitat de Barcelona, Spain	Physics	M.Sc. (1st class Honors)	1977
Universidad de Barcelona, Spain	Theoretical Physics	Ph.D.	1980

Professional Experience:

2005–present	Chair of the Department of Applied Physics, Universitat Politècnica de Catalunya (UPC), Spain.
2003–present	Professor, Department of Applied Physics, UPC, Spain.
1985–2002	Associate Professor, Department of Applied Physics, UPC, Spain.
1982–1984	Post-Doctoral Fellow, Department of Applied Mathematics, UPC, Spain.
1980–1981	Post-Doctoral Fellow, Department of Theoretical Physics, Universitat de Barcelona (UB), Spain.
1976–1980	Teaching Assistant, Department of Theoretical Physics, UB, Spain.

Synergistic Activities:

Visiting Professor Positions:

Arizona State University, Tempe, USA, Department of Mathematics	November – December, 2002 to 2008 September – November 2001 October 1999 – November 2000 October – November 1998
Univ. de la República, Montevideo, Uruguay	August 2000
Univ. Federal Fluminense, Niteroi, Brasil	August 1999
Univ. de Buenos Aires, Argentina	August 1998
Pennsylvania State University, State College, USA, Department of Mathematics	November 1997 August – December 1996
Institut Henri Poincaré, CNRS, Paris, France	November–December 1981

Co-organizer: Meeting-Workshop on Mixing in Geophysical Flows, Polyt. Univ. of Catalonia, Barcelona, Spain, December 16–18, 1992.

Co-organizer: XII Taylor-Couette meeting, Northwestern Univ., Evanston IL, Sept. 6–8, 2001.

Guest Editor: Special issues of *Theoretical and Computational Fluid Dynamcis,*

Organizer: XIII Taylor-Couette meeting, UPC Barcelona, Spain, July 3–5, 2003.

Organizer: Nonlinear2008 meeting, UPC Barcelona, Spain, June 16–19, 2008.

Member: American Physical Society, American Mathematical Society, SIAM, European Research Community on Flow, Turbulence, and Combustion, Euromech - European Mechanics Society.

Referee for: Journal of Fluid Mechanics, Physics of Fluids, Physica D, Theoretical and Computational Fluid Dynamics, Int. Journal of Numerical Methods in Fluids, Acta Mechanica, Applied Scientific Research, DGICYT and DGU Proposals (Spanish Government)

Research Grants

1. MEC-DGI (FIS2007-61585), *Centrifugal effects in thermal and shear instabilities*, 2007/09 (PI).
2. AGAUR, SGR-00024, *Fluid dynamics: pattern formation and geophysical applications*, 2006/08 (PI).
3. NSF (USA) DMS-05052705, *Stochastic parametric forcing in hydrodynamics*, 2005/08 (researcher).
4. Accion Integrada MEC/DAAD, HA2005-0087, *Spatio-temporal complexity and pattern formation in hydrodynamics*, 2006/07 (PI).
5. MEC-DGI, FIS2004-01336, *Hydrodynamics under Stochastic Boundary Forcing*, 2005/2007 (PI).
6. MCYT/FEDER, UNPC-E015, *Infraestructura de Clculo Intensivo para la Simulacin en Ciencias*, 2003/2004 (Co-PI).
7. Fellowships and exchange programs, Switzerland, *The Effects of Geometrically Forced Break of Bifurcation Patterns of a Swirling Flow/Vortex Breakdown System*, 2003-2004 (Co-PI).
8. MCYT, BFM2001-2350, *Direct numerical simulation and dynamical systems analysis of rotating incompressible flows*, 2002/2004 (PI).
9. AECI, international cooperation spain-israel, *Numerical modeling of three-dimensional nonlinear dynamics of confined swirling flows*, 2002/2003 (Co-PI).
10. NSF (USA), CTS-9908599, *Spatial and temporal resonances in hydrodynamics: a theoretical, experimental, and numerical exploration*, 2000/2003 (researcher).
11. DGICYT, PB97-0685, *Centrifugal and convective instabilities in hydrodynamic systems; parametric resonance and control in periodically forced systems*, 9/1998–8/2001 (PI).
12. NSF (USA), INT-9732637, *US–Spain Cooperative Research: Dynamic control and parametric resonance in hydrodynamic systems*, 1998/2001 (researcher).
13. AECI, Red 00043, *Formation and evolution of structures and transition to chaos in systems far from equilibrium*, 9/1997–8/2000 (Co-PI).
14. NSF (USA), DMS-9706951, *Dynamic control and parametric resonance in hydrodynamic systems*, 1997/2000 (researcher).
15. DGICYT, PB94-1209 *Evolution of structures and mixing in Taylor–Couette and Poiseuille flows*, 9/1995–8/1998 (PI).
16. DGICYT, PR95-425, *Time depending forcing in Taylor-Couette flow*, 8/1996–12/1996 (PI).
17. DGICYT, PB91-0595 *Large–scale circulation in confined flows*, 9/1992–8/1995.
18. DGICYT, PS87-0107 *Nonlinear dynamics of incompressible flows in closed containers*, 9/1988–8/1991.
19. DGICYT, PR84-1169/1169bis *Shear effects in Bénard convection and Taylor–Couette flow*, 9/1985–8/1988.

Selected Refereed Journal Papers

1. Lopez, J. M. and Marques, F., *Centrifugal effects in rotating convection: nonlinear dynamics*, Journal of Fluid Mechanics, **628**, 269–297, 2009.
2. Rubio, A., Lopez, J. M. and Marques, F., *Interacting oscillatory boundary layers and wall modes in modulated rotating convection*, Journal of Fluid Mechanics, **625**, 75–96, 2009.
3. Meseguer, A., Mellibovsky, F., Avila, M. and Marques, F., *Families of subcritical spirals in highly counter-rotating Taylor-Couette flow*, Physical Review E, **79(3)**, 036309–1/7, 2009.

4. Cui, Y. D., Lopez, J. M., Lim, T. T. and Marques, F., *Harmonically forced enclosed swirling flow*, Physics of Fluids, **21(3)**, 034106–1/10, 2009.
5. Avila, M. Grimes, M., Lopez, J. M. and Marques, F., *Global endwall effects on centrifugally stable flows*, Physics of Fluids, **20(10)**, 104104–1/7, 2008.
6. Abshagen, J., Lopez, J. M., Marques, F. & Pfister G., *Bursting dynamics due to a homoclinic cascade in Taylor-Couette flow*, Journal of Fluid Mechanics, **613**, 357–384, 2008.
7. Rubio, A., Lopez, J. M. and Marques, F., *Modulated rotating convection: Radially traveling concentric rolls*, Journal of Fluid Mechanics, **608**, 357–378, 2008.
8. Avila, M., Belisle, M. J., Lopez, J. M., Marques, F. & Saric, W. S., *Mode competition in modulated Taylor-Couette flow*, Journal of Fluid Mechanics, **608**, 357–378, 2008.
9. Marques, F. & Lopez, J. M., *Influence of wall modes on the onset of bulk convection in a rotating cylinder*, Physics of Fluids, **20**, 024109, 2008.
10. Lopez, J. M., Cui, Y. D., Marques, F. & Lim, T. T., *Quenching of unsteady vortex breakdown via harmonic modulation*, Journal of Fluid Mechanics, **599**, 441–464, 2008.
11. Avila, M., Marques, F., Lopez, J. M. & Meseguer, A., *Stability control and catastrophic transition in a forced Taylor-Couette system.*, Journal of Fluid Mechanics, **590**, 471–496, 2007.
12. Lopez, J. M., Marques, F., Mercader, I. & Batiste, O., *Onset of convection in a moderate aspect-ratio rotating cylinder: Eckhaus-Benjamin-Feir instability.*, Journal of Fluid Mechanics, **590**, 187–208, 2007.
13. A. Meseguer, A., Avila, M., Mellibovsky, F., & Marques, F., *Solenoidal spectral formulations for the computation of secondary flows in cylindrical and annular geometries.*, European Physical Journal Special Topics, **146**, 249–259, 2007.
14. Marques, F., Mercader, I., Batiste, O. & Lopez, J. M., *Centrifugal effects in rotating convection: Axisymmetric states and three-dimensional instabilities.*, Journal of Fluid Mechanics, **580**, 303–318, 2007.
15. Lopez, J. M., Rubio, A. & Marques, F., *Traveling circular waves in axisymmetric rotating convection.*, Journal of Fluid Mechanics, **569**, 331–348, 2006.
16. Marques, F. & Lopez, J.M., *Onset of three-dimensional unsteady states in small aspect-ratio Taylor-Couette flow.*, Journal of Fluid Mechanics, **561**, 255-277, 2006.
17. Avila, M., Meseguer, A. & Marques, F., *Double Hopf bifurcation in co-rotating spiral Poiseuille flow.*, Physics of Fluids, **18(6)**, 064101-1/13, 2006.
18. Meseguer, A. & Marques, F., *Bicritical instabilities in pressure driven helicoidal flows.*, Journal of Physics: Conference Series, **14**, 228–235, 2005.
19. Lopez, J. M. & Marques, F., *Finite aspect ratio Taylor-Couette flow: Shil'nikov dynamics of 2-tori.*, Physica D, **211**, 168-191, 2005.
20. Meseguer, A. & Marques, F., *On the stability of medium gap co-rotating spiral Poiseuille flow.*, Physics of Fluids, **17(9)**, 094104, 2005.
21. Abshagen, J., Lopez, J. M., Marques, F. & Pfister, G., *Mode competition of rotating waves in reflection-symmetric Taylor-Couette flow.*, Journal of Fluid Mechanics, **540**, 269-299, 2005.
22. Abshagen, J., Lopez, J. M., Marques, F. & Pfister, G., *Symmetry breaking via global bifurcations of two-tori in hydrodynamics.*, Physical Review Letters, **94(7)**, 074501, 2005.
23. Leung, J. J. F., Hirsa, A. H., Blackburn, H. M., Marques, F. & Lopez, J. M., *Three-dimensional modes in a periodically driven elongated cavity.*, Physical Review E, **71**, 026305, 2005.

24. Blackburn, H. M., Marques, F. & Lopez, J. M., *Symmetry breaking of two-dimensional time-periodic wakes.*, Journal of Fluid Mechanics **522**, 395-411, 2005.

25. Iranzo, V., Marques, F. & Lopez, J. M., *From global to local bifurcations in a forced Taylor-Couette flow.*, Theoretical and Computational Fluid Dynamics **18(2-4)**, 115-128, 2004.

26. Lopez, J. M. & Marques, F., *Mode competition between rotating waves in a swirling flow with reflection symmetry.*, Journal of Fluid Mechanics **507**, 265-288, 2004.

27. Lopez, J. M., Marques, F., Hirsa, A. H., Miraghaie, R., *Symmetry breaking in free-surface cylinder flows.*, Journal of Fluid Mechanics, **502**, 99-126, 2004.

28. Marques F., Lopez, J.M., Blackburn, H.M., *Bifurcations in systems with Z2 spatio-temporal and O(2) spatial symmetry.*, Physica D, **189**, 247-276, 2004.

29. Lopez, J.M., Marques, F., Shen, J., *Complex dynamics in a short Taylor-Couette annulus with the top endwall stationary and the bottom rotating.*, Journal of Fluid Mechanics, **501**, 327-354, 2004.

30. Lopez, J. M., Marques, F., *Small aspect ratio Taylor-Couette flow: Birth of a very-low-frequency three-torus state.*, Physical Review E, **68**, 036302-1/9, 2003.

31. Marques, F., Gelfgat, A.Y., Lopez, J.M., *A tangent double Hopf bifurcation in a differentially rotating cylinder flow.*, Physical Review E, **68**, 016310-1/13, 2003.

32. Lpez, J.M., Marques, F., *Modulated Taylor-Couette flow: Onset of spiral modes.*, Theoretical and Computational Fluid Dynamics, **16(1)**, 59-69, 2002.

33. Sanchez, J., Marques, F., Lopez, J.M., *A continuation and bifurcation technique for Navier-Stokes flows.*, Journal of Computational Physics, **180**, 78-98, 2002.

34. Lpez, J.M., Hart, J. E., Marques, F., Kittelman, S., Shen, J., *Instability and mode interactions in a differentially-driven rotating cylinder.*, Journal of Fluid Mechanics, **462**, 383-409, 2002.

35. Marques, F., Lopez, J.M., Iranzo, V., *Imperfect Gluing Bifurcation in a Temporal Glide-Reflection Symmetric Taylor-Couette flow.*, Physics of Fluids Letters, **14**, L33-L36, 2002.

36. Lpez, J.M., Marques, F., Shen, J., *An efficient spectral-projection method for the Navier-Stokes equations in cylindrical geometries II. Three dimensional cases.*, Journal of Computational Physics, **176**, 384-401, 2002.

37. Meseguer A., Marques F., *On the competition between centrifugal and shear instability in spiral Poiseuille flow.*, Journal of Fluid Mechanics, **455**, 129-148, 2002.

38. Marques, F., Lpez, J.M., Shen, J., *Mode interactions in an enclosed swirling flow: A double Hopf between azimuthal wavenumbers 0 and 2.*, Journal of Fluid Mechanics, **455**, 263-281, 2002.

39. Marques, F., Lpez, J.M., Shen, J., *A periodically forced flow displaying symmetry breaking via a T3 gluing bifurcation and T2 resonances.*, Physica D, **156**, 81–97, 2001.

40. Marques, F., Lpez, J.M., *Precessing vortex breakdown mode in an enclosed cylinder flow*, Physics of Fluids, **13**, 1679–1682, 2001.

41. Lpez J.M., Marques F., Sanchez J., *Oscillatory modes in an enclosed swirling flow.*, Journal of Fluid Mechanics, **439**, 109–129, 2001.

42. Lpez J.M., Marques F., *Dynamics of 3-tori in a periodically forced Navier-Stokes flow.*, Physical Review Letters, **85**, 972–975, 2000.

43. Lpez J.M., Marques F., Shen, J., *Endwall effects in a periodically forced centrifugally unstable flow.*, Fluid Dynamics Research, **27**, 91–108, 2000.

44. Lpez J.M., Marques F., *Determining the self-rotation number following a Naimark–Sacker bifurcation in the periodically forced Taylor–Couette flow.*, ZAMP, **51** 61–74, 2000.

45. Marques F., Lpez, J.M., *Spatial and temporal resonances in a periodically forced extended system.*, Physica D, **136** 340–352, Febrero 2000.

46. Meseguer A., Marques F., *On the competition between centrifugal and shear instability in spiral Couette flow.*, Journal of Fluid Mechanics, **402**, 33–56, 2000.

47. Antonijoan J., Marques F., Sanchez, J., *Nonlinear spirals in the Taylor–Couette problem.*, Physics of Fluids, **10**, 829-838, 1998.

48. Marques F., Sanchez J., Weidman P.D., *Generalized Couette-Poiseuille flow with boundary mass transfer.*, Journal of Fluid Mechanics, **374**, 221–249, 1998.

49. Marques F., Lpez J.M., *Taylor-Couette flow with axial oscillations of the inner cylinder: Floquet analysis of the basic flow.*, Journal of Fluid Mechanics. **348**, 153–175, 1997.

50. Meseguer A., Marques F., Sanchez J., *Feigenbaum's Universality in a Low-Dimensional Fluid Model.*, International Journal of Bifurcations and Chaos. **6**, 1587-1594, 1996.

51. Marques F., Mercader I., Net M., Massaguer J.M., *Thermal Convection in Vertical Cylinders. A Method Based on Potentials of Velocity.*, Computer Methods in Applied Mechanics and Engineering, **110**, 157-169, 1993.

52. Sanchez J., Crespo D., Marques F., *Spiral vortices between concentric cylinders.*, Applied Scientific Research, **51**, 55-59, 1993.

53. Marques F., *On Boundary Conditions for Velocity Potencials in confined Flows. Application to Couette Flow.*, The Physics of Fluids A, **2**, 729-737, 1990.

54. Jaen X., Llosa J., Marques F., Montoto A., *Realization of Poincare Group induced by second order ordinary differential systems. Noninteraction Theorems.*, Journal of Mathematical Physics, **27**, 519-523, 1986

55. Marques F., Iranzo V., Molina A, Montoto A, Llosa J., *Wordl line condition and the noninteraction theorem.*, Physical Review D, **31**, 314-318, 1985

56. Iranzo V., Llosa J., Molina A., Marques F., *Comparison of several approaches to the relativistic dynamics of direct interacting particles.*, Annals of Physics, **150**, 114-149, 1983

57. Iranzo V., Llosa J., Marques F., Molina A., *The Problem of Physical coordinates in predictive Hamiltonian systems.*, Journal of Mathematical Physics, **24**, 1665-1671, 1983

58. Lapiedra R., Marques F., Molina A., *Classical Predictive Electrodynamics of two charges with radiation: Energy and 3-momentum balance and scattering cross-sections.*, Journal of Mathematical Physics, **20**, 1316-1320, 1979

Invited talks and seminars

1. Workshop on Dynamical Systems and Continuum Physics. Centre de recherches mathématiques, Montreal, Canada. *Bursting dynamics due to a heteroclinic cascade in Taylor-Couette flow*, November 2007.

2. Joint seminar Madrid-Bayreuth. Avila, Spain. *Hydrodynamic instabilities in rotating fluids*, September 2002.

3. Dept. of Mathematics, Arizona State University *On the competition between centrifugal and shear instabilities in Taylor–Couette flow*, October 1998.

4. Universidad de Buenos Aires, Departamento de Física *Control de Inestabilidades y Resonancia Paramétrica en Mecánica de Fluidos*, August 1998.

5. ETSI Aeronáuticos, Universidad Politécnica de Madrid *Control of centrifugal instabilities using parametric forcing*, July '97.

6. Pennsylvania State University, Department of Mathematics *Taylor–Couette flow with axial oscillations of the inner cylinder*, November 1996.

PhD Thesis supervision

1. Vicente Iranzo Fernndez, *Hamiltonian systems and quantization in Predictive Relativistic Mechanics*, May 1983, Physics, Barcelona University.
2. Juan Snchez Umbra, *Numerical simulation in confined flows: preturbulent structures*, September 1994, Mathematics, Barcelona University.
3. Daniel Crespo Arteaga, *Characterization of the flow between concentric cylinders using Digital Image Processing*, Decembre 1994, Applied Physics, Polythecnical University of Catalonia.
4. Alvaro Meseguer Serrano, *Bifurcations in Fluid Systems: Petrov-Galerkin Schemes*, June 1998, Applied Physics, Polythecnical University of Catalonia.
5. Marc Avila Canyellas, *Nonlinear dynamics of mode competition in annular flows*, June 2008, Applied Physics, Polythecnical University of Catalonia.
6. Fernando Mellibovsky Epstein, *Subcritical transition in shear flows*, June 2008, Applied Physics, Polythecnical University of Catalonia.