Fecha del CVA	14/08/23

Parte A. DATOS PERSONALES

Nombre y apellidos	Daniel Peralta Salas		
DNI/NIE/pasaporte	50864765N	Edad	45
Núm. identificación del investigador	Scopus ID	57203716509	
	Código Orcid	0000-0001-5567-8538	

A.1. Situación profesional actual

Organismo	Agencia Estatal Consejo Superior de Investigaciones Científicas
Dpto./Centro	Instituto de Ciencias Matemáticas
Dirección	C/ Nicolás Cabrera 13-15, Campus UAM, 28049 Madrid, España

Teléfono	912999746	Correo electrónico	dperalta@icmat.es	
Categoría profesional	Investigador Científico		Fecha inicio	27/03/17
Espec. cód. UNESCO	1202 (Análisis), 1204 (Geometría)			
Palabras clave	Dynamical Systems, Partial Differential Equations, Differential Geometry, Mathematical Physics			

A.2. Formación académica *(título, institución, fecha)*

Licenciatura/Grado/Doctorado	Universidad	Año
Doctor: Física Teórica (**Premio Extraordinario** Doctorado)	Complutense de Madrid	2006
Licenciado: Física (**Premio Extraordinario** Licenciatura)	Complutense de Madrid	2001

A.3. Indicadores generales de calidad de la producción científica

3 sexenios de investigación (2003-2008, 2009-2014, 2015-2020).
Más de 100 artículos publicados en revistas JCR.
Más de 100 conferencias invitadas y plenarias en congresos nacionales e internacionales.
Google scholar: 1730 citas (índice h = 20; índice i10 = 51).

Parte B. RESUMEN LIBRE DEL CURRÍCULUM

Chair of the CSIC Group %Differential Geometry and Geometric Mechanics+. My research lines concern the connections between **dynamical systems, partial differential equations and differential geometry**. This includes topics in fluid mechanics, spectral theory, conservative dynamics and geometric analysis. Among my best results, I highlight:

- **New techniques to study geometrically complex structures in the equations that model physical phenomena (with A. Enciso)**. Main landmarks include the proof of a **1965 Arnold's conjecture**, the **centennial Lord Kelvin conjecture** on the existence of steady knotted vortex tubes, and the proof of **Michael Berry's conjecture** in quantum mechanics. I also mention the development of the global approximation theory for parabolic equations and applications to the movement of hot spots.
- First theoretical construction of a **Euclidean 3D steady fluid flow that can simulate a universal Turing machine (with R. Cardona and E. Miranda)**. This implies the

existence of undecidable fluid particle paths, a long standing open **problem posed by C. Moore** in 1991.

- Analytical construction of a new family of solutions to the equations of electromagnetism whose **electric and magnetic lines encode all torus knots and links**, which persist for all time (with H. Kedia and W. Irvine). The existence of these structures was an elusive open problem since 1990.

Main honors and distinctions:

- **European Research Council (ERC) Starting Grant** (2014-2019).
- **The Barcelona Dynamical Systems Prize** (2015).
- **Plenary Speaker, European Congress of Mathematics** (July 2016, Berlin, Germany). Second spanish mathematician that gives a plenary lecture at the ECM.
- **The Floer Lectures**, Floer Center of Geometry (June 2019, Bochum, Germany).
- **The MINT Distinguished Lectures**, Mathematical Institute (January 2020, Tel Aviv, Israel).
- **Plenary Speaker, Biannual Congress of the Spanish Applied Mathematical Society**, CEDYA-CMA (June 2021, Gijón, Spain).
- **Plenary Speaker, Biannual Congress of the Royal Spanish Mathematical Society**, RSME (January 2022, Ciudad Real, Spain).
- **Plenary Speaker, Biannual Congress Nolineal** (June 2023, Barcelona, Spain).
- **EMS distinguished speaker, Nordic Congress of Mathematicians with EMS** (July 2023, Aalborg, Denmark).

Parte C. MÉRITOS MÁS RELEVANTES

C.1. Publicaciones destacadas (últimos 5 años)

1.- B. Khesin, D. Peralta-Salas, C. Yang, The helicity uniqueness conjecture in 3D hydrodynamics. **Transactions of the American Mathematical Society** 375 (2022) 909-924.

2.- R. Cardona, E. Miranda, D. Peralta-Salas, F. Presas, Constructing Turing complete Euler flows in dimension 3. **Proceedings of the National Academy of Sciences** 118 (2021) 1-9.

3.- A. Enciso, D. Peralta-Salas, Approximations theorems for the Schrodinger equation and quantum vortex reconnection. **Communications in Mathematical Physics** 387 (2021) 1111-1149.

4.- D. Peralta-Salas, A. Rechtman, F. Torres de Lizaur, A characterization of 3D steady Euler flows using commuting zero-flux homologies. **Ergodic Theory & Dynamical Systems** 41 (2021) 2166-2181.

5.- D. Peralta-Salas, R. Slobodeanu, Energy minimizing Beltrami fields on Sasakian 3-manifolds. **International Mathematics Research Notices** 2021 (2021) 6656-6690.

6.- A. Enciso, A. Luque, D. Peralta-Salas, Beltrami fields with hyperbolic periodic orbits enclosed by knotted invariant tori. **Advances in Mathematics** 373 (2020) 107328 (1-46)

7.- B. Khesin, S. Kuksin, D. Peralta-Salas, Global, local and dense non-mixing of the 3D Euler equation. **Archive for Rational Mechanics and Analysis** 238 (2020) 1087-1112.

8.- A. Enciso, M.A. Garcia-Ferrero, D. Peralta-Salas, Approximation theorems for parabolic equations and movement of local hot spots. **Duke Mathematical Journal** 168 (2019) 897-939.

9.- M. Domínguez-Vázquez, A. Enciso, D. Peralta-Salas, Solutions to the overdetermined boundary problem for semilinear equations with position-dependent nonlinearities. **Advances in Mathematics** 351 (2019) 718-760.

10.- A. Enciso, D. Hartley, D. Peralta-Salas, A problem of Berry and knotted zeros in the eigenfunctions of the harmonic oscillator. **Journal of the European Mathematical Society** 20 (2018) 301-314.

11.- A. Enciso, D. Peralta-Salas, F. Torres de Lizaur, Knotted structures in high-energy Beltrami fields on the torus and the sphere. **Annales Scientifiques de l'École Normale Supérieure** 50 (2017) 995-1016.

12.- A. Enciso, R. Lucà, D. Peralta-Salas, Vortex reconnection in the three-dimensional Navier-Stokes equations. **Advances in Mathematics** 309 (2017) 452-486.

C.2. Proyectos (últimos 5 años)

- Invariant manifolds in dynamical systems and PDE. Starting Grant from the European Research Council 335079 INVARIANT. PI: Daniel Peralta. Budget: 1.260.000" . Period: 2014-2019.

- Topological structures in PDE. Europa Excelencia EUR2019-103821. PI: Daniel Peralta. Budget: 75.000" . Period: 2020-2021.

- Geometric structures in dynamical systems, mechanics and hydrodynamics. MTM PID2019-106715GB-C21. PI: David Martín and Daniel Peralta. Budget: 78.287" . Period: 2020-2023.

- Knots in dynamical systems with applications to electromagnetism and quantum systems. H2020-MSCA-IF-2020, 101023017-KNOTDYNAPP. Main Coordinator: Daniel Peralta. Budget: 160.932 " . Period: 2022-2023.

- Computational, dynamical and geometrical complexity in fluid dynamics. Proyectos de Investigación Científica BBVA 2021. PI: Eva Miranda and Daniel Peralta. Budget: 150.000" . Period: 2022-2025.

- Geometry, Dynamics and Field Theory. RED2022-134301-T. PI: Daniel Peralta. Budget: 24.000" . Period: 2023-2024.

- Excellence Programme Severo Ochoa. SEV-2015-0554. PI: Diego Córdoba. Budget: 4.000.000" . Period: 2016-2019. I am one of the garants.

C.3. Conferencias y cursos invitados destacados (últimos 5 años)

1.- Lagrangian complexity in 3D steady Euler flows. Workshop Small Scale Dynamics in Fluid Motion. June 2022, **Stony Brook, USA**.

2.- MHD equilibria in toroidal geometries. Workshop Rigorous Analysis of Incompressible Fluid Models. February 2022, **Cambridge, UK**.

3.- The many facets of complexity of Beltrami fields in Euclidean space. Workshop on the h-principle and Beyond. November 2021, **IAS, Princeton, USA**.

4.- Existence of stationary Euler flows with compact support. **One World PDE Seminar**. March 2021 (online seminar), UK.

5.- Beltrami fields exhibit knots and chaos almost surely. Workshop on Vortex Filaments. November 2020, **Fields Institute, Toronto (online event), Canada**.

6.- New results on the dynamics of the steady Euler flows. Workshop Conservative Dynamics and its Interactions. August 2019, **Lausanne, Switzerland**.

7.- Approximation theorems for the Schrodinger equation and vortex reconnection in quantum fluids. BIRS Workshop on Hamiltonian PDEs. June 2019, **Oaxaca, Mexico**.

8.- An introduction to Beltrami fields (minicourse). Euler and Vortices School. May 2019, **Warwick, UK**.

9.- Periodic orbits and invariant tori in ideal fluid flows (minicourse). 16th School on Interactions Between Dynamical Systems and Partial Differential Equations, June 2018, **Barcelona, Spain**.

10.- Topology of nodal sets of solutions to elliptic PDEs (minicourse). Nonlinear PDE for Future Applications: Geometry and Inverse Problems, October 2017, **Sendai, Japan**.

11.- Vortex reconnection in the three-dimensional Navier-Stokes equations. Oberwolfach meeting Dynamische Systeme, July 2017, **Oberwolfach, Germany**.

12.- Topological aspects of critical points and level sets in elliptic PDEs (minicourse). CIME School on Geometry of PDEs and Related Topics, June 2017, **Cetraro, Italy**.

C.4. Supervisión de estudiantes (últimos 5 años):

- JAE-INTRO: Joan Solá (2017), Robert Cardona (2017), Javier Peñafiel (2019), Laia Weisz (2020), Ariadna Hernández (2021), Josep Fontana (2022), Mario Rodríguez (2023), Isaac Ramos (2023).
- TRABAJO FIN DE GRADO: Nicolás de Lucas (2023).
- TRABAJO FIN DE MASTER: Francisco Torres de Lizaur (2014), Jorge Hidalgo (2020), Andrea Belloni (2022), Javier Peñafiel (2022).
- TESIS DOCTORAL: Francisco Torres de Lizaur (2018), Alvaro Romaniega (2022). Actualmente 2 estudiantes de doctorado: Alba García Ruiz y Javier Peñafiel.
- POSTDOCS: David Hartley, Alejandro Luque, Miguel Vaquero, Eric Latorre, Juan Margalef, Ernesto Nungesser, Stefano Maró, Diego Berti, Wadim Gerner, Benjamin Bode.

C.5. Gestión científica (selecto):

– Member of the editorial boards of Revista Matematica Iberoamericana (EMS) and Qualitative Theory of Dynamical Systems (Birkhäuser).
– Jury member of several prizes and positions (Vicent Caselles, Barcelona Dynamical Systems Prize, Juan de la Cierva, Ramón y Cajal, õ) and usual evaluator of grants (AEI, ERC, Israel Science Foundation, õ).
– Member of the scientific advisory board of IMTECH (UPC, Barcelona).
– Member of the governing board of ICMAT since 2016.