

Part A. PERSONAL INFORMATION

CV date 09/09/2024

First and Family name	Diego Córdoba Gazolaz		
Social Security, Passport, ID number	05282045A	Age	52
Researcher codes	Open Researcher and Contributor ID (ORCID**)	0000-0002-4056-2556	
	SCOPUS Author ID (*)	36008206200	
	WoS Researcher ID (*)	I-7455-2013	

A.1. Current position

Name of University/Institution	Consejo Superior de Investigaciones Científicas		
Department	Instituto de Ciencias Matemáticas		
Address and Country	Calle Nicolás Cabrera 13-15, Campus de Cantoblanco, UAM, 28049 Madrid, Spain		
Phone number	91 29 99798	E-mail	dcg@icmat.es
Current position	Profesor de Investigación	From	01/06/2009
Key words	Mathematical Analysis, PDE's, Incompressible fluids, singularities		

A.2. Previous positions

Period	Position/Institution/Country/Interruption cause
1998-1999	Member/ Institute for Advanced Study in Princeton / USA
1999-2001	L. E. Dickson Instructor/ University of Chicago / USA
2001-2002	Assistant Professor/ Princeton University / USA
2002-2003	Ramón y Cajal/ CSIC / Spain
2003-2009	Investigador Científico/ CSIC / Spain

A.3. Education

Degree	University	Year
<i>Bachelor (Mathematics)</i>	<i>Universidad Autónoma de Madrid</i>	1994
<i>Masters (Mathematics)</i>	<i>Princeton University</i>	1996
<i>PhD (Mathematics)</i>	<i>Princeton University</i>	1998

A.3. General indicators of quality of scientific production

Citations (Scopus): 3188. Citations (Wos): 2965.
 Average number of citations in the last five years: 235 /year.
 Papers in Q1: 63; ISI Papers: 71; h-index: 29 y 31 (WoS y Scopus)
 4 Sexenios (the last one in 2018). Former Ph.D. students: 8.
 Total publications in MathScinet: 84 with a total of 3074 citations.

Part B. CV SUMMARY

I am a Research Professor at the CSIC (www.icmat.es/dcordoba) and I am the Scientific Director of the Severo Ochoa program at the Institute of Mathematical Sciences (ICMat) since 2016. I defended my doctoral thesis in June 1998 in the mathematics department of Princeton University (USA). My postdoctoral work, before joining the CSIC in 2002 as Ramón y Cajal, was done first for a year at the Institute for Advanced Study (IAS, Princeton), then two years at the University of Chicago as L.E. Dickson Instructor and another year as Assistant Professor at Princeton University. In 2003 I was promoted to a position of Research Scientist at the age of 32 and in 2009 at the age of 37 to a position of Research Professor at the CSIC.

My scientific work is within the field of Mathematical Analysis, but is directly related to the study of fluid mechanics equations. This is an area that is particularly interesting for the interaction of experimental methods, numerical simulations, and rigorous mathematical proofs, an area in which my contributions stand out.

In the past 25 years I have contributed to the understanding of problems which involve the possible formation and propagation of singularities in fluid mechanics. I have studied different physical models for their mathematical interest as well as for their applications. Recently, in collaboration with my co-authors, we have successfully established new methods for addressing blow-up formation in non-linear



PDE, in particular for incompressible flows that are governed by Euler equations, Surface Quasi-geostrophic equations and Darcy's law.

My scientific achievements have earned me the following ERC projects:

• ERC Starting Grant (2008-2013) • ERC Advanced Grant (2018-2024),
and led me to be among the top 2% most cited scientists in his respective disciplines
(<https://www.webometrics.info/en/csic2020>).

Part C. RELEVANT MERITS

I have co-authored over 80 research papers in top-tier mathematical journals, including articles in *Annals of Math.* (5-publications), *J. Amer. Math. Soc.*, *Inventiones Mathematicae*, *Comm. Pure Appl. Math.* (3-publications), *Proc. Nat. Acad. Sci.*, (10-publications), *Duke Math.* (2-publications) *J.*, *Memoirs of the AMS*, *JEMS*, *Ann. Sci. Éc. Norm. Supér.*, *Comm. Math. Phys.* (5-publications), *Advances in Math.* (8-publications), *Amer. J. Math.*, *ARMA* (6-publications), *Annals of PDE* (3-publications), etc.

I have been awarded an Alfred P. Sloan Doctoral Dissertation Fellowship (1997-1998), American Institute of Mathematics Postdoctoral Fellowship in 1999, Ramón y Cajal Researcher position in 2002, the SEMA Prize (Sociedad Española de Matemática Aplicada) for young researchers in 2005, and the Miguel Catalán Young Award 2011 from the Comunidad Autónoma de Madrid. In 2008 I obtained a Starting Independent Research Grant from the European Research Council (2008-2013). And from September 2015 until February 2016 I was appointed Minerva Distinguished visitor at Math. Department of Princeton University. During the first semester of 2022 I have been a Member of IAS (Princeton) (www.ias.edu).

I was an Invited speaker (PDE session) of the International Congress of Mathematicians (ICM) in Rio de Janeiro 2018.

Since 2016 I am the Scientific Director of the Severo Ochoa Programs 2016-2019, 2020-2023 and 2024-2028 at ICMat. I have also directed a total of 7 projects of the National Program of the Ministry, 2 ERC grants (Starting and Advanced grant) and a Marie Curie project (FP7-PEOPLE-2013-IEF).

Recently, I have been awarded the Margarita Salas Medal prize 2022 for research supervision from CSIC. All my Ph.D. students have obtained a post-doc at internationally renowned centers and the impact of these doctoral theses is reflected in the number of awards and distinctions received by my students.

Very recently I have been awarded the "Premio Nacional de Investigación" 'Julio Rey Pastor' of the year 2023.

C.1. Publications (Most relevant 10 publications in the last 10 years)

1. "Instantaneous gap loss of Sobolev regularity for the 2D incompressible Euler equations" (with Luis Martínez-Zoroa & Wojciech Ozanski). **Duke Math Journal**. 2024, 173(10), 1931–1971.
2. "Nonexistence and strong ill-posedness in S^k and Sobolev spaces for SQG" (with Luis Martínez-Zoroa). **Adv. Math.** 407 (2022), Paper No. 108570.
3. "Mixing solutions for the Muskat problem" (with A. Castro & D. Faraco). **Inventiones Mathematicae**, 2021, 226(1), pp. 251–348.
4. "Global well-posedness for the 2D stable Muskat problem in $H^{3/2}$ " (with O. Lazar). **Ann. Sci. Éc. Norm. Supér.** (4) 54 (2021), no.5, 1315–1351.
5. "Global smooth solutions for the inviscid SQG equation" (with A. Castro & J. Gómez-Serrano). **Mem. Amer. Math. Soc.** 266 (2020), no. 1292, v+89 pp.
6. "Global solutions for the generalized SQG patch equation" (with J. Gómez-Serrano & A. D. Ionescu). **Arch. Ration. Mech. Anal.** 233 (2019) no3. 1211-1251.
7. "Existence and regularity of rotating global solutions for the generalized surface quasi-geostrophic equations" (with A. Castro & J. Gómez-Serrano). **Duke Math Journal**. Vol 165, no.5, (2016), 935-984.
8. "Finite time singularities for the free boundary incompressible Euler equations" (with A. Castro, C. Fefferman, F. Gancedo & J. Gomez-Serrano), **Annals of Math**, 178, 3, 1061-1134 (2013).
9. "On the global existence for the Muskat problem" (with P. Constantin, F. Gancedo and R. Strain), **J. Eur. Math. Soc. (JEMS)** 15, 201-227 (2013).



10. "Rayleigh-Taylor breakdown for the Muskat problem with applications to water waves". (with A. Castro, Ch. Fefferman, F. Gancedo and M. López-Fernández) **Annals of Math.** 175 (2): 909-948 (2012).

C.2. Research projects (Most relevant in the last 10 years)

Project title: Non-local dynamics in incompressible fluids.

Funding Source: European Research Council (Advanced Grant) ERC-2017-AdG

Period: 01/09/2018- 31/08/2024

Amount: 1.800.000 Euros

PI: Diego Córdoba

Number of researchers: 5

Project title: Formación de singularidades en fluidos incompresibles.

Funding Source: Ministerio de Ciencia e Innovación. MTM2017-89976-P & 114703GB-100

Period: 1/1/2018 – 1/10/2021 & 1/09/2021-31/08/2024 Amount: 51.441 Euros & 72.600 Euros

PI: Diego Córdoba

Number of researchers: 10

Project title: ICMAT Severo Ochoa project

Funding Source: MINECO. SEV-2015-556, CEX2019-000904-S and CEX2023- 001347-S

Period: 2016-2019, 2020-2023 and 2024-2028. Amount: 4.000.000 & 4.000.000 & 5.660.000 Euros

PI: Diego Córdoba

Number of researchers: 100

Project title: Global existence vs Blow-up in some nonlinear PDEs arising in fluid mechanics

Funding Source: European Commission FP7-PEOPLE-2013-IEF

Period: 01/10/2014 – 30/09/2016

Amount: 166.336,20 Euros

PI: Diego Córdoba

Number of researchers: 2

Project title: Contour dynamics and singularities in incompressible flows.

Funding Source: European Research Council (Starting Grant) ERC-2007-StG

Period: 01/09/2008- 31/08/2013

Amount: 650.000 Euros

PI: Diego Córdoba

Number of researchers: 5

C.3. Awards and Honors

- Starting Grant of the European Research Council ERC (2008-2013).
- Miguel Catalán young Award 2011 from Comunidad Autónoma de Madrid.
- Minerva Distinguished Visitor at the Math. Department of Princeton University 2014-2015.
- Two of my former Ph.D. students have obtained independently an ERC Starting Grant (F. Gancedo 2015 and J. Gómez-Serrano 2018).
- Scientific director of the Severo Ochoa Excellence Program at the ICMAT 2016-2028.
- Invited speaker, International Congress of Mathematicians ICM, Rio de Janeiro 2018.
- Advanced Grant of the European Research Council ERC (2018-2024).
- Margarita Salas Medal award 2022 for research supervision from CSIC.
- “Premio Nacional de Investigación” ‘Julio Rey Pastor’ of the year 2023.

C.4. Former Ph. D. Students

- Francisco Gancedo. Ph.D. Thesis title: Problems in fluid interfaces in incompressible flows. Ph.D. June 2007 (FPU Fellowship 2003-2007). First job after leaving ICMat: L.E. Dickson Instructor at University of Chicago and later Ramon y Cajal at Universidad de Sevilla. Currently: Profesor Titular at Universidad de Sevilla. Awards: Jose Luis Rubio Prize of the RSME 2008, Young SEMA "Antonio Valle" Prize in 2014, Ramon y Cajal contract 2011 and ERC Starting Grant 2015.
- Angel Castro. Ph.D. Thesis title: Non-linear and Non local model in Fluid Mechanics. Ph.D. June 2010 (FPI Fellowship 2006-2010). First job after leaving ICMat: Postdoc at Ecole Normale Sup. In Paris and later Ramon y Cajal at Universidad Autonoma de Madrid. Currently: Científico Titular at ICMat-CSIC. Awards: Jose Luis Rubio Prize of the RSME 2014 and Ramon y Cajal Contracts in 2013.
- Rafael Granero. Ph.D. Thesis title: On the non-homogenous Muskat problem. Ph.D. June 2013 (FPI Fellowship 2009-2013) Advised jointly with Rafael Orive. First job after leaving ICMat: Arthur J.



Krener Assistant Prof. at Univ. of California, Davis and later Postdoctoral researcher at Institut Camille Jordan in Lyon. Currently: Profesor asociado at Universidad de Cantabria. Awards: Vicent Caselles Prize of the RSME 2015 and Leonardo BBVA 2021 Scholarship.

- Javier Gómez-Serrano. Ph.D. Thesis title: Analytic and Computer assisted proofs in problems related to Fluid Mechanics. Ph.D. June 2013 (ERC contract 2009-2013). First job after leaving ICMat: Junior faculty (Instructor and Assistant Prof.) at Princeton University. Currently: Professor at Brown University and Universidad de Barcelona. Awards: Young SEMA "Antonio Valle" Prize in 2018, Vicent Caselles Prize of the RSME 2017 and ERC Starting grant 2018.

- Tania Pernas-Castaño. Ph.D. Thesis Title: ``On the Splat singularity for the Muskat problem`` Ph.D 2017 (FPI Fellowship 2013-2017). First jobs after leaving ICMat: Profesora Ayudante at UAM and Post-doc at University of Bonn.

- Daniel Lear. Ph.D. Thesis Title: ``Stability Near Hydrostatic Equilibrium in Fluid Mechanics`` Ph.D 2019 (Caixa Fellowship and SO Contract 2014-2019). Advised jointly with Angel Castro. First jobs after leaving ICMat: Lecturer at University of Illinois at Chicago and postdoctoral researcher at the Mathematical Institute of Charles University in Prague. Currently: Ramon y Cajal at Universidad de Cantabria. Awards: Ramon y Cajal contract in 2022.

- During the first semester of 2023 Victor Cañulef and Luis Martínez-Zoroa defended their Ph.D. under my supervision. First jobs after leaving ICMat: Universidad de Santiago de Chile and University of Basel respectively.

C.5. Member of Committees

- Member of the Scientific committee of the Spanish Royal Mathematical Society (RSME) since 2008-2015.
- Member of the Scientific committee of the National Research Council (CSIC) in the area of Physics and Mathematics 2012-2016.
- Editor in Chief of the Journal Revista Matemática Iberoamericana. And Editorial board member of the Journals Discrete and Continuous Dynamical Systems - Series S, Nonlinear Analysis: Real World Applications, Interfaces and free boundaries and SEMA Journal.
- Chair of the Department of Fundamental Mathematics at the ICMAT 2010-2015.

C.6. Example of Contributions to Congress (Plenary Speaker)

- Conferencia Sección de Matemáticas. Real Academia de Ciencias Exactas, Física y Naturales de España. Madrid, February 2024.
- Small scale dynamics in incompressible fluid flows. American Institute of Mathematics, Pasadena, California, USA, November 2023.
- Recent Advances in Fluid Dynamics. Duke University, May 2023.
- Nonlinear PDEs in Fluid Dynamics. CIRM (Marseille Luminy, France), May 2022.
- Rigorous analysis of incompressible fluid models and turbulence. Isaac Newton Institute for Mathematical Sciences, Cambridge University, February 2022.
- Plenary Speaker, Biannual Congress of the Royal Spanish Mathematical Society, RSME (January 2022, Ciudad Real, Spain).
- Convex Integration and Nonlinear Partial Differential Equations. ICMS, Uni. of Edinburgh, Nov 2021.
- Fluid turbulence and Singularities of the Euler/ Navier Stokes eq., Harvard University, March 2019.
- Invited speaker, International Congress of Mathematicians (ICM), Rio de Janeiro, Aug. 2018.
- Regularity and Blow-up of Navier-Stokes Type PDEs using Harmonic and Stochastic Analysis, Banff International Research station, Agosto 2018.
- Making a Splash - Droplets, Jets, and Other Singularities, ICERM-Brown University, March 2017.
- Fourth Chicago Summer School in Analysis, University of Chicago, June 2017.
- "Frontiers in Mathematics", Mathematics Department at Texas A&M., September 2017.
- Congress: Nonlinear waves 2016. IHES (Paris). June 20-24, 2016.
- Workshop: Water waves and related fluid models. Oxford University. Sept. 28-Oct. 2, 2015.
- Minerva Distinguished Visitor Lectures at Mathematics Department of Princeton University, December 2015.