

Mihaela Ifrim

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Research Interests

Nonlinear dispersive PDE; water waves; hyperbolic systems; microlocal analysis; harmonic analysis.

Academic Appointments

- *Professor*, Dept. of Math., Univ. of Wisconsin, Madison, August 2024 - present
- *Associate Professor*, Dept. of Math., Univ. of Wisconsin, Madison, August 2020 - July 2024
- *Clare Boothe Luce Assistant Professor*, Dept. of Math, U. Wisconsin, Aug. 2017 - Aug. 2020
- *Simons Postdoctoral Scholar* - UC Berkeley, Dept. of Math., January 2014 - August 2017
- *Postdoctoral Fellow* - Canada Research Chair Postdoctoral Fellowship, McMaster Univ., Dept. of Math. and Stat.; Sept. 2012 - Dec. 2013

Education

Ph.D. in Mathematics, Dept. of Mathematics, Univ. of California at Davis, CA, USA, 2012

M.S., Institute of Mathematics of the Romanian Academy, Bucharest, Romania, 2006 - 2007

B.S., Faculty of Mathematics and Computer Science, University of Bucharest,
Program: Advanced Studies Research Group, Bucharest, Romania, 2002 - 2006

Academic Visits

- *IHES research visit* - organized by Frank Merle and Daniel Tataru, France, May 1 - July 1, 2025
- *Miller Visiting Professor*, Dept. of Math., UC Berkeley, Aug. 2023 - Jan. 2024, (on sabbatical)
- *Simons Fellow*, Dept. of Math., UC Berkeley, January - July 2024, (on sabbatical)
- *Visiting Researcher*, Dept of Math., UC Berkeley, January - July 2024, (on sabbatical)
- *Schrödinger Institute*, Vienna, Program: “Nonlinear Waves and Relativity”, April - May, 2024
- *Research Visitor*, Univ. of Bergen, Norway, April 23 - 28, 2024
- *Research Visitor*, Université Sorbonne, Laboratoire Jacques-Louis Lions, Jussieu, Paris, France, September 23 - October 11th, 2023
- *Simons Visiting Professorship* - one month reunion for the Mathematical Sciences Research Institute program “Mathematical problems in fluid dynamics”, July - August 2023, Berkeley, California
- *Simons Visiting Professorship* for the duration of the Mathematical Sciences Research Institute program “Mathematical problems in fluid dynamics”, January - May 2021, Berkeley, California
- *Visiting Scholar*, Dept of Math., UC Berkeley, collaborative visit January - May 2020
- *University of Bonn collaborative visit*, Math. Dept., April 1 - 30, June 16 - 29, 2018 May 11 - 20, 2019, January 10 - 20, 2020, Bonn, Germany
- *ENS Cachan visiting Professor*, collaborative visit May 1 - June 11, 2018, France
- *University of Paris Sud visiting Professor*, Math. Dept., collaborative visit, University of Paris-Sud Orsay, March 15 - 30, 2018, France

- *Visiting Member* at IHES in “Nonlinear Waves” trimester, May - July 2016
- *Research Member* at Mathematical Sciences Research Institute (MSRI)
 - ~ New Challenges in PDE: Deterministic Dynamics and Randomness in High and Infinite Dimensional Systems from August 17, 2015 - December 18, 2015
 - ~ Mathematical General Relativity program, from October 1st to November 31st, 2013
- *Research Member* in Hausdorff Trimester Program: Harmonic Analysis and Partial Differential Equations, Bonn, Germany, May 20 - August 22, 2014.

Grants & Awards

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| • <i>Vilas Associate Fellowship</i> , UW Madison | 2025 - 2027 |
| • Presidential Early Career Award for Science and Engineering (PECASE) | 2025 |
| • <i>NSF Award</i> , DMS-2348908 | 2024 - 2027 |
| • <i>Visiting Miller Professorship Award</i> , Miller Institute in Science, UC Berkeley, | Fall 2023 |
| • <i>Simons Fellows in Mathematics</i> , Simons Foundation | Spring 2024 |
| • <i>Sloan Research Fellowship</i> , Alfred P. Sloan Foundation | 2019 - 2021 |
| • <i>NSF CAREER award</i> , DMS-1845037 | 2019 - 2024 |
| • <i>UW Madison 2018 Fall Research Competition Award</i> | Deferred |
| • <i>Honored Instructor Award</i> , University of Wisconsin-Madison | Fall 2018 |
| • <i>Clare Luce Boothe Professorship</i> | 2017 - 2022 |
| • <i>Hilldale Undergraduate/Faculty Research Fellowship</i> | 2020 - 2021 |
| • <i>Clay Mathematics Institute</i> travel award for <i>IHES Summer School on Non-linear Waves</i> , Bures-sur-Yvette, France, July 18 - 29, 2016 | |
| • <i>William Karl Schwarze Scholarship in Mathematics</i> , Department of Mathematics, University of California at Davis, Spring 2010- <i>for research and teaching achievements</i> | |
| • <i>Alice Leung Scholarship in Mathematics</i> , Department of Mathematics, University of California at Davis, Spring 2009 - <i>for research achievements</i> | |

Publications

1. Enhanced lifespan bounds for 1D quasilinear Klein-Gordon flows , H. Huang, M. Ifrim, D. Tataru, <https://arxiv.org/pdf/2602.08055>, submitted for publication, 2026
2. Global solutions for cubic quasilinear ultrahyperbolic Schrödinger flows, M. Ifrim, B. Pineau, D. Tataru, <https://arxiv.org/pdf/2504.06230>, accepted in **Duke Math J.**, 2025
3. A-priori estimates for generalized Korteweg-de Vries equations in $H^{-1}(\mathbf{R})$, M. Ifrim, T. Laurens, accepted in **Nonlinearity**, 2026
4. Sharp well-posedness for the free boundary MHD equations, M. Ifrim, B. Pineau, D. Tataru, Mitchell A. Taylor, <https://arxiv.org/abs/2412.15625>, submitted for publication, 2024
5. Global solutions for 1D cubic defocusing dispersive equations, Part IV: general dispersion relations, M. Ifrim, and D. Tataru, (63 pages), <https://arxiv.org/2410.10052> submitted, 2024
6. Modified scattering for the three dimensional Maxwell-Dirac system, S. Herr, M. Ifrim, and M. Spitz, <https://arxiv.org/abs/2406.02460>, (62 pages), submitted, 2024

7. Global solutions for cubic quasilinear Schroedinger flows in two and higher dimensions, M. Ifrim, and D. Tataru, <https://arxiv.org/abs/2404.09970>, (56 pages), submitted, 2024
8. **Book:** Free Boundary Problems in Fluid Dynamics, A. Ai, T. Alazard, M. Ifrim, and D. Tataru, *Oberwolfach Seminars* vol. 54, Publisher: **Birkhäuser Cham**, XIV, (362 pages) eBook ISBN 978-3-031-60452-2, published: 18 June 2024
9. The global well-posedness conjecture for 1D cubic dispersive equations, M. Ifrim and D. Tataru, **Proceedings of the 2023 Abel Symp. “Partial Differential Equations: Waves, Non-linearities and Nonlocalities**, Abel Symp., 18 Springer, Cham, 2025, 155–184.
10. Sharp Hadamard local well-posedness, enhanced uniqueness and pointwise continuation criterion for the incompressible free boundary Euler equations, M. Ifrim, B. Pineau, D. Tataru, and M. A. Taylor, **Annals of PDE** 11 (2025), no. 1, Paper No. 16, 154 pp
11. Global solutions for 1D cubic dispersive equations, Part III: the quasilinear Schrödinger flow, M. Ifrim, and D. Tataru , **Inventiones Mathematicae**, 242 (2025), no. 1, 221–304.
12. The lifespan of small data solutions for Intermediate Long Wave equation (ILW), M. Ifrim, and J.-C. Saut, **Comm. Partial Differential Equations**, 50 (2025), no. 3, 258–300.
13. Long time solutions for 1D cubic dispersive equations, Part II: the focusing case, M. Ifrim, D. Tataru, **Vietnam J. Math.**, Volume 52, pages 597–614, 2024
14. Global solutions for 1D cubic defocusing dispersive equations: Part I, M. Ifrim, D. Tataru, **Forum of Mathematics, Pi**, Vol. 11, (43 pages), 2023
15. Testing by wave packets and modified scattering in nonlinear dispersive pde’s, M. Ifrim, D. Tataru, **Trans. Amer. Math. Soc. Ser. B**, 11:164-214, 2024
16. The time-like minimal surface equation in Minkowski space: low regularity solutions, A. Ai, M. Ifrim, and D. Tataru, **Inventiones mathematicae**, 235, 745–891, 2024
17. The Benjamin-Ono approximation for 2D gravity water waves with constant vorticity, M. Ifrim, J. Rowan, D. Tataru, L. Wan, **Ars Inveniendi Analytica**, Paper No. 3, 2022
18. No pure capillary solitary waves exist in 2D finite depth, M. Ifrim, B. Pineau, D. Tataru, & M. Taylor, **SIAM J. Math. Anal.**, Vol. 54, No. 4, pp. 4452 - 4464, 2021
19. Two dimensional gravity waves at low regularity II: Global solutions, A. Ai, M. Ifrim, D. Tataru, **Ann. de l’Inst. H. Poincaré C Anal. Non Linéaire**, 39(4), 819–884, 2022
20. Local well-posedness for quasilinear problems: a primer, M. Ifrim and D. Tataru, **Bull. of the Amer. Math. Soc.**, Vol. 60, No 2, Pages 167–194, April 2023
21. The relativistic Euler equations with a physical vacuum boundary: Hadamard local well-posedness, rough solutions, and continuation criterion, M. Disconzi, M. Ifrim, and D. Tataru, **Arch. Ration. Mech. Anal.**, 245, 127–182, 2022
22. The compressible Euler equations in a physical vacuum: a comprehensive Eulerian approach, M. Ifrim, D. Tataru, **Ann. Inst. H. Poincaré C Anal. Non Linéaire**, 41(2):405-495, 2024
23. Almost global well-posedness for quasilinear strongly coupled wave-Klein-Gordon systems in two space dimensions, M. Ifrim, A. Stingo, **Forum Math. Sigma** 13 (2025), 56 pp.
24. Two dimensional gravity waves at low regularity I: Energy estimates, A. Ai, M. Ifrim, D. Tataru, **Ann. Inst. H. Poincaré C Anal. Non Linéaire**, 2025 (online)
25. A Morawetz inequality for gravity-capillary water waves at low Bond number, T. Alazard, M. Ifrim, D. Tataru, **Water Waves**, 3(3):429-472, 2021

26. Dispersive decay of small data solutions for the KdV equation, M. Ifrim, H. Koch, D. Tataru, **Ann. Sci. de l'École Norm. Supérieure**,(4), 56(6):1709-1746, 2023
27. The NLS approximation for two dimensional deep gravity waves, M. Ifrim, D. Tataru, **Sci. China Math**, 62, no 6, 1101 - 1120, 2019
28. No solitary waves in 2-d gravity and capillary waves in deep water, M. Ifrim, D. Tataru, **Nonlinearity**, 33, no. 10, 5457 – 5476, 2020
29. A Morawetz inequality for water waves, T. Alazard, M. Ifrim, D. Tataru, **American Journal of Mathematics**, 144(3):607-699, 2022
30. Well-posedness and dispersive decay of small data solutions for the Benjamin-Ono equation, M. Ifrim, D. Tataru, **Annales scientifiques de l'ENS**, 4 (52), no 2, 297 - 335, 2019
31. Finite depth gravity water waves in holomorphic coordinates, B. Harrop-Griffiths, M. Ifrim, D. Tataru, **Ann. PDE**, 3, (102 pages), no 1, 2017
32. Two dimensional gravity water waves with constant vorticity: I. Cubic lifespan, M. Ifrim, D. Tataru, **Analysis & PDE**, 12, no 4, 903 - 967, 2019
33. The lifespan of small data solutions to the KP-I, B. Harrop-Griffiths, M. Ifrim, D. Tataru, **Int. Math. Res. Not.**, no 1, 1 - 28, 2017
34. The lifespan of small data solutions in two dimensional capillary water waves, M. Ifrim, D. Tataru, **Arch. Ration. Mech. Anal.**, 225(3), 1279 - 1346, 2017
35. Two dimensional water waves in holomorphic coordinates II: global solutions, M. Ifrim, D. Tataru, **Bull. Soc. Math. France**, 144, no 2, 369 - 394, 2016
36. Global bounds for the cubic nonlinear Schrödinger equation (NLS) in one space dimension, M. Ifrim, D. Tataru, **Nonlinearity** 28, no. 8, 2661 - 2675, 2015
37. Two dimensional water waves in holomorphic coordinates, J. K. Hunter, M. Ifrim, D. Tataru, **Comm. Math. Phys.**, 346, no. 2, 483 - 552, 2016
38. A modified energy method proving enhanced lifespan of smooth solutions of a Burgers-Hilbert equation, J. K. Hunter, M. Ifrim, D. Tataru, D. T. Wang, **Proc. AMS**, Vol. 143(8)2015
39. Enhanced lifespan of smooth solutions of a Burgers-Hilbert equation, J. K. Hunter, M. Ifrim, **SIAM J. on Math. Anal.**, Vol 44(3), pp. 1279 - 2235, 2012
40. A quasilinear Schrödinger equation, large amplitude inertial oscillations in a rotating shallow fluid, J. K. Hunter, M. Ifrim, **IMA J. of Applied Math.**, Vol. 78(4), pp. 762 - 776, 2013

Invited Talks (selected)

- **Nonlinear Waves and Dispersive Equations Workshop**, Oberwolfach, Germany, upcoming: March 1 - 6, 2026
- **Séminaire Laurent Schwartz**, Inst. des Hautes Études Scientifiques (IHES), May 27, 2025
- **Plenary Speaker** at *2025 SIAM Great Lakes* annual meeting, Illinois Inst. of Technology, Chicago, September 27 - 28th, 2025
- **Plenary Speaker** at **Conference on Mathematics of Wave Phenomena**, Karlsruhe, Germany, February 24 - 28, 2025
- **Banff BIRS**, “Nonlinear Water Waves: Rigorous Analysis and Scientific Computing (24w5207)”, Canada, October 27 - November 1, 2024
- **Speaker** in the **Nonlinear Waves and Relativity, Workshop 1**, Erwin Schrödinger International Inst. for Math. and Physics (ESI) of the Univ. of Vienna, Austria, May 13, 2024

- **Research Visitor**, Univ. of Bergen, Norway, April 23 - 28, 2024
- **Invited Address** at the Spring 2024 AMS Central Section Meeting of the Society, Univ. of Wisconsin - Milwaukee, April 20 - 21, 2024
- **2024 DiPerna Lecture Speaker**, UC Berkeley, USA, April 12, 2024
- **Plenary Speaker** at **Thirteenth Ohio River Analysis Meeting (ORAM 13)**, Univ. of Kentucky in Lexington, KY, March 16 - 17, 2024
- **Analysis and PDE Seminar**, Stanford Univ., Palo Alto, USA, March 12, 2024
- **Harmonic Analysis and PDE Seminar**, UC Berkeley, USA, February 27, 2024

Academic Service

- Co-organizer with D.Tataru, J. Marzuola, A. Ai of the **BIRS workshop Dynamics in Geometric Dispersive Equations and the effects of Trapping, Scattering and weak Turbulence**, III 26w5556, November 29 to December 4, 2026.
- Member of the **AWM Research Symposium Organizing Committee**, 2024-2025
- Member of the **2024 NSF COMMITTEE OF VISITORS (CoV)**
- Co-organizer with Jacek Jendrej (CNRS), Andrew Lawrie (MIT), Anne-Sophie de Suzzoni (Ecole Polytechnique) of the *Nonlinear Dispersive Equations: Advances and Perspectives*, Luminy, **The Centre International de Rencontres Mathématiques (CIRM)**, France, May 12 - 16 2025
- Co-organizer with Daniel Tataru of the *Special Session on Nonlinear waves* at the **AMS Sectional Meeting in Milwaukee**, Univ. of Wisconsin - Milwaukee, April 20 - 21, 2024
- Co-organizer with Daniel Tataru of the Minisymposia *Recent methods in nonlinear dispersive waves*, **Conference on Mathematics of Wave Phenomena**, Karlsruhe, Feb 18 - 24, 2025
- Co-organizer of the one month research gathering: **MSRI** program ‘Mathematical problems in fluid dynamics’ during Summer 2023, July 17 - August 11 2023
- **OVCERGE Research Committee** member (served as a member of the award committee for the *Fall competition*, and *Villas research awards*), UW, Madison, 2020 - 2023
- Chair of **Hilldale/Hoslstrom Physical Sciences Award Committee**, University of Wisconsin - Madison, 2022 - 2023, 2023-2024, 2024-2025, 2025-2026
- Co-organizer of the **Oberwolfach Seminar: Free Boundary Problems in Fluid Dynamics**, October 23 - October 30, 2022
- Co-organizer of the **MSRI** program ‘Mathematical problems in fluid dynamics’ during Spring 2021: <http://www.msri.org/programs/327>
- Co-organizer of the graduate summer school at **MSRI**: [Introduction to water waves](#), 2020
- Co-organizer of the **AMS Sectional**: ‘Nonlinear Dispersive Equations and Water Waves’, Univ. of Wisconsin, Madison, September 14 - 15, 2019

Recent Advising & Mentoring

- **Allison Byars**, current Ph.D. student, Univ. of Wisconsin, Madison.
- **Honging Huang**, current Ph.D. student, Univ. of Wisconsin, Madison.
- **Lizhe Wan**, former Ph.D student, now postdoctoral fellow in Beijing.
- **Thierry Laurens**, Van Vlek Postdoc, Univ. of Wisconsin, Madison, August 2023 - ongoing