

Ming-Chih Lai

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Education:

Ph.D. Mathematics, Courant Institute of Mathematical Sciences, New York University, 1998/09.

Research Interests:

- Immersed boundary and immersed interface methods
- Modeling and simulations for interfacial flow problems
- Fast direct solvers for elliptic equations in non-Cartesian coordinates

Appointments:

- 2014/12 - present, *Chair Professor*, Department of Applied Mathematics, National Chiao Tung University
- 2013/01– 2013/05 *Visiting Professor*, Hong Kong Baptist University
- 2012/09– 2012/12 *Visiting Professor*, Research Institute for Mathematical Sciences (RIMS), Kyoto University
- 2009/08 - 2012/07, *Founding Director*, Center of Mathematical Modeling and Scientific Computing, NCTU
- 2007/08 - 2009/07, *Chair*, Department of Applied Mathematics, NCTU
- 2005/08 - present, *Professor*, Department of Applied Mathematics, NCTU
- 2002/08 - 2005/07, *Associate Professor*, Department of Applied Mathematics, NCTU
- 1999/08 - 2002/07, *Assistant Professor*, Department of Mathematics, National Chung Cheng University
- 1998/08 - 1999/07, *Research Associate*, Duke University

International and Domestic Committees:

- Mathematical Society of ROC (Taiwan), President, 2016/01–
- National Center for Theoretical Sciences (NCTS), Math Division, Deputy Director, 2016/01–
- SIAM Membership committee, 2014/01-2016/12
- SIAM East Asia Section (EASIAM), President 2013/01-2014/12, Vice-President 2011/01-2012/12
- Ministry of Science and Technology (previous National Science Council) Mathematics Division, Panel Chair, 2012/01-2014/12

Prizes and Awards:

- Ministry of Education, National Chair Professorship, 2017
- Ministry of Education, Academic Award, 2014
- National Science Council, Outstanding Research Award, 2011
- Mathematical Society of ROC, Academic Award, 2011
- National Science Council, Outstanding Scholar Research Grant, 2009/08-2012/07
- National Chiao Tung University, Academic Research Award, 2005
- National Science Council, Outstanding Research Award, 2003
- Dean's Special Recognition Award, 2003
- *Kurt O. Friedrichs Prize* for an outstanding dissertation in Mathematics at Courant Institute, New York University, 1999/04

Editorial Boards:

- Taiwanese Journal of Mathematics, 2014/08 - 2017/07
- Communications in Computational Physics, 2012-
- East Asian Journal on Applied Mathematics, 2010-
- Advances in Applied Mathematics and Mechanics, 2009-

Selected Invited Talks

- SIAM Conference on the Life Sciences (SIAM LS16, being held jointly with SIAM annual meeting), Mini-symposium speaker, Boston, USA, July 11–14, 2016
- The 7th PRCM, Section organizer and speaker on "Computational Aspects of Interface Problems with Applications", NSU, Seoul, Korea, June 27–July 1, 2016
- International Workshop on Fluid-Structure Problems (invited speaker) NUS, Singapore, May 30–June 3, 2016
- ICIAM 2015, Mini-symposium co-organizer and speaker, Beijing, China, August 10–14, 2015
- JSIAM 2014 Annual Meeting (invited speaker), Tokyo, Japan, September 3-5, 2014
- KSIAM 2014 Spring Conference (plenary speaker), National Seoul University, Korea, May 23-24, 2014
- Annual meeting of Mathematical Society of ROC (plenary speaker), NCTU, December 7-9, 2012

- Biological Complex Fluids, 2012 Cargese summer school (invited lecturer), Corsica Island, France, June 25th-July 7th, 2012
- Workshop on Fluid Motion Driven by Immersed Structures (tutorial speaker on the immersed boundary method), Fields Institute, Canada, August 9-13, 2010
- Fluid dynamics, Analysis and Numerics (invited speaker, 40 mins talk), Duke University, USA, June 28-30, 2010

Selected Publication List

1. M.-C. Lai and C. S. Peskin, An immersed boundary method with formal second-order accuracy and reduced numerical viscosity, *Journal of Computational Physics*, 160, 705-719 (2000).
2. J. T. Beale and M.-C. Lai, A method for computing nearly singular integrals, *SIAM J. on Numerical Analysis*, vol 38, No 6, 1902-1925, (2001).
3. Z. Li and M.-C. Lai, The immersed interface method for the Navier-Stokes equations with singular forces, *Journal of Computational Physics*, vol 171, No 2, 822-842, (2001).
4. M.-C. Lai, W.-W. Lin and W. Wang, A fast spectral/difference method without pole conditions for Poisson-type equations in cylindrical and spherical geometries, *IMA Journal of Numerical Analysis*, vol 22, No 4, 537-548, (2002).
5. M.-C. Lai, A simple compact fourth-order Poisson solver on polar geometry, *Journal of Computational Physics*, vol 182, 337-345, (2002).
6. Z. Li, W.-C. Wang, I.-L. Chern and M.-C. Lai, New formulations for interface problems in polar coordinates, *SIAM J. on Scientific Computing*, vol 25, No 1, 224-245, (2003).
7. M.-C. Lai and Y.-H. Tseng, A fast iterative solver for the variable coefficient diffusion equation on a disk, *Journal of Computational Physics*, vol 208, 196-205, (2005).
8. J. Huang, M.-C. Lai and Y. Xiang, An integral equation method for epitaxial step flow growth simulations, *Journal of Computational Physics*, vol 216, 724-743, (2006).

9. M.-C. Lai, Y.-H. Tseng and H. Huang, An immersed boundary method for interfacial flows with insoluble surfactant, *Journal of Computational Physics*, vol 227, 7279–7293, (2008).
10. K. Ito, M.-C. Lai and Z. Li, A well-conditioned augmented system for solving Navier-Stokes equations in irregular domains, *Journal of Computational Physics*, 228, 2616-2628 (2009).
11. Y. Kim, M.-C. Lai and C. S. Peskin, Numerical simulations of two-dimensional foam by the immersed boundary method, *Journal of Computational Physics*, vol 229, 5194-5207 (2010).
12. Y. Kim and M.-C. Lai, Simulating the dynamics of inextensible vesicles by the penalty immersed boundary method, *Journal of Computational Physics*, vol 229, 4840-4853 (2010).
13. K.-Y. Chen, K.-A. Feng, Y. Kim and M.-C. Lai, A note on pressure accuracy in immersed boundary method for Stokes flow, *Journal of Computational Physics*, vol 230, 4377-4383 (2011).
14. P. Constantin, M.-C. Lai, R. Sharma, Y.-H. Tseng and J. Wu, New numerical results for the surface quasi-geostrophic equation, *Journal of Scientific Computing*, Vol 50, Issue 1, 1-28 (2012).
15. Y. Kim, Y. Seol, M.-C. Lai and C. S. Peskin, The immersed boundary method for two-dimensional foam with topological changes, *Communications in Computational Physics*, Vol 12, No 2, 479-493 (2012).
16. M.-C. Lai, W.-F. Hu, and W.-W. Lin, A fractional step immersed boundary method for Stokes flow with an inextensible interface enclosing a solid particle, *SIAM Journal on Scientific Computing*, Vol 34, No 5, pp.B692-B710 (2012).
17. Y. Kim and M.-C. Lai, Numerical study for viscosity and inertial effects on tank-treading to tumbling motions of vesicle under shear flow, *Physical Review E*, 86, 066321 (2012).
18. K.-Y. Chen and M.-C. Lai, A conservative scheme for solving coupled surface-bulk convection-diffusion equations with an application to interfacial flows with soluble surfactant, *Journal of Computational Physics*, Vol 257, pp. 1-18 (2014).

19. W.-F. Hu, Y. Kim, and M.-C. Lai, An immersed boundary method for simulating the dynamics of three-dimensional axisymmetric vesicles in Navier-Stokes flows, *Journal of Computational Physics*, Vol 257, pp. 670-686 (2014).
20. Y. Kim, M.-C. Lai, C. S. Peskin and Y. Seol, Numerical simulations of three-dimensional foam by the immersed boundary method, *Journal of Computational Physics*, Vol 269, pp. 1-21 (2014).
21. W.-F. Hu, M.-C. Lai, and Y.-N. Young, A hybrid immersed boundary and immersed interface method for electrohydrodynamic simulations, *Journal of Computational Physics*, Vol 282, pp. 47-61 (2015).
22. H. Nganguia, Y.-N. Young, A. T. Layton, W.-F. Hu, and M.-C. Lai, An immersed interface method for axisymmetric electrohydrodynamic simulations in Stokes flow, *Communications in Computational Physics*, Vol 18, pp. 429-449 (2015).
23. H. Wu, M. Thiebaud, W.-F. Hu, A. Farutin, S. Rafai, M.-C. Lai, P. Peyla, and C. Misbah, Amoeboid motion in confined geometry, *Rapid Communications, Physical Review E* 92, 050701(R) (2015).
24. W.-F. Hu, M.-C. Lai, Y. Seol and Y.-N. Young, Vesicle electrohydrodynamic simulations by coupling immersed boundary and immersed interface method, *Journal of Computational Physics*, Vol 317, pp. 66-81 (2016).
25. K.-L. Pan, Y.-H. Tseng, J.-C. Chen, K.-L. Huang, C.-H. Wang, and M.-C. Lai, Controlling droplet bouncing and coalescence with surfactant, *Journal of Fluid Mechanics*, Vol 799, pp. 603-636 (2016).
26. Y. Seol, W.-F. Hu, Y. Kim and M.-C. Lai, An immersed boundary method for simulating vesicle dynamics in three dimensions, *Journal of Computational Physics*, Vol 322, pp. 125-141 (2016).
27. Y. Kim, M.-C. Lai, and Y. Seol, Numerical simulations of vesicle and bubble dynamics in two-dimensional four-roll mill flows, *Physical Review E* 95, 053105 (2017).
28. Y. Seol, S.-H. Hsu, and M.-C. Lai, An immersed boundary method for simulating interfacial flows with insoluble surfactant in three dimensions, *Communications in Computational Physics*, accepted (2017).