

Chapter 1

oomph-lib related Publications

Here is a list of publications resulting from (or produced with) `oomph-lib`. If you have produced any work with `oomph-lib` and would like it to be listed here, send us a URL (or an electronic version of the publication) and we will install a link to it.

- Diekmann, Jan, and Uwe Thiele. “Mesoscopic hydrodynamic model for spreading, sliding, and coarsening compound drops”. *Physical Review Fluids* 10 (2025): 024002. <https://doi.org/10.1103/physrevfluids.10.024002>.
- Hartmann, Simon, and Uwe Thiele. “Gradient dynamics model for drops of volatile liquid on a porous substrate”. *Physical Review Fluids* 10 (2025): 014003. <https://doi.org/10.1103/physrevfluids.10.014003>.
- Pietz, Anthony, Karin John, and Uwe Thiele. “The role of substrate mechanics in osmotic biofilm spreading”. *Soft Matter* 21 (2025): 2935–2945. <https://doi.org/10.1039/d4sm01463d>.
- Voss, Florian, and Uwe Thiele. “Chemo-mechanical motility modes of partially wetting liquid droplets” (2025). <https://doi.org/10.48550/ARXIV.2504.03297>.
- Zeugin, T., Keuchel, P., Morón, D., Coulter, F. B., Halic, M. M. N., Heil, M., Avila, M., & Holzner, M. (2025). Fluid structure interaction in pulsatile flow through an elastic pipe segment. *Physical Review Fluids*, 10(7), Article 073101. <https://doi.org/10.1103/ymqr-dbsw>
- Fontana, J. V., Cuttle, C., Pihler-Puzovic, D., Hazel, A. L. & Juel, A. (2024) Peeling fingers in an elastic Hele-Shaw channel. *Journal of Fluid Mechanics* **985** DOI: [10.1017/jfm.2024.210](https://doi.org/10.1017/jfm.2024.210)
- Lawless, J., Keeler, J., Hazel, A. L. & Juel, A. (2024) Stable bubble formations in a depth-perturbed Hele-Shaw channel *Physical Review Fluids* **9**, 093605. DOI: [10.1103/physrevfluids.9.093605](https://doi.org/10.1103/physrevfluids.9.093605)
- Miara, T., Vaquero-Stainer, C., Pihler-Puzovic, D., Heil, M., & Juel, A. (2024). Dynamics of inertialess sedimentation of a rigid U-shaped disk. *Communications physics*, 7(47). <https://doi.org/10.1038/s42005-024-01537-5>
- Vaquero-Stainer, C., Miara, T., Juel, A., Pihler-Puzovic, D., & Heil, M. (2024). U-shaped disks in Stokes flow: Chiral sedimentation of a non-chiral particle. *Journal of Fluid Mechanics*, 999. <https://doi.org/10.1017/jfm.2024.923>
- Diekmann, Jan, and Uwe Thiele. “Drops of volatile binary mixtures on brush-covered substrates”. *The European Physical Journal Special Topics* 233 (2024): 1615–1624. <https://doi.org/10.1140/epjs/s11734-024-01169-4>.
- Hartmann, Simon, et al. “Drops on Polymer Brushes: Advances in Thin-Film Modeling of Adaptive Substrates”. *Langmuir* 40 (2024): 4001–4021. <https://doi.org/10.1021/acs.langmuir.3c03313>.

- Voss, Florian, and Uwe Thiele. "Gradient dynamics approach to reactive thin-film hydrodynamics". *Journal of Engineering Mathematics* 149 (2024). <https://doi.org/10.1007/s10665-024-10402-x>.
- Deblais, A., Xie, K., Lewin-Jones, P., Aarts, D., Herrada, M. A., Eggers, J., Sprittles, J. E., & Bonn, D. (2025). Early stages of drop coalescence. *Physical Review Fluids*, 10(4), L042001. <https://doi.org/10.1103/PhysRevFluids.10.L042001>
- Lewin-Jones, P., Lockerby, D. A., & Sprittles, J. E. (2024). Collision of liquid drops: Bounce or merge? *Journal of Fluid Mechanics*, 995, A1. <https://doi.org/10.1017/jfm.2024.722>
- Sprittles, J. E. (2024). Gas Microfilms in Droplet Dynamics: When Do Drops Bounce? *Annual Review of Fluid Mechanics*, 56(1), 91–118. <https://doi.org/10.1146/annurev-fluid-121021-021121>
- Diddens, C. & Rocha, D. (2024). Bifurcation tracking on moving meshes and with consideration of azimuthal symmetry breaking instabilities. *Journal of Computational Physics* 518, 113306. <https://doi.org/10.1016/j.jcp.2024.113306>

This paper provides a detailed description of `pyoomph`, "...an object-oriented multi-physics finite element framework for Python. It is mainly a custom high level frontend for the prime functionalities of the powerful C++ library oomph-lib..." (quote from their webpage). They maintain their own, impressively long [list of publications](#) (35 at the time of writing this (August 2025)) that involved the use of `pyoomph` or its predecessor codes.

- Maretvadakethope, S., Hazel, A. L., Vasiev, B. & Bearon, R. N. (2023) The interplay between bulk flow and boundary conditions on the distribution of micro-swimmers in channel flow. *Journal of Fluid Mechanics* 976, A13. DOI: [10.1017/jfm.2023.897](https://doi.org/10.1017/jfm.2023.897)
- Smith, K., Retallick, A., Melendrez Armada, D., Vijayaraghavan, A., & Heil, M. (2023). Modelling graphene-polymer heterostructure MEMS membranes with the Föppl-von Kármán equations. *ACS Applied Materials and Interfaces*. <https://doi.org/10.1021/acsami.2c21096>
- Li, H., Retallick, A., Juel, A., Heil, M., & Pihler-Puzovic, D. (2023). Swelling-induced Patterning in Soft Microchannels. *Soft Matter*. <https://doi.org/10.1039/D3SM01008B>
- Cheng, H., Luding, S. & Weinhart, T. (2023), CG-enriched concurrent multi-scale modeling of dynamic surface interactions between discrete particles and solid continua. *Acta Mechanica Sinica*, 39(1). Article 722218. <https://doi.org/10.1007/s10409-022-22218-x>
- Cheng, H., Thornton, A. R., Luding, S., Hazel, A. L. & Weinhart, T. (2023), Concurrent multi-scale modeling of granular materials: Role of coarse-graining in FEM-DEM coupling. *Computer methods in applied mechanics and engineering*, 403 (Part A). Article 115651. <https://doi.org/10.1016/j.cma.2022.115651>
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- Hartmann, Simon, et al. "Sessile drop evaporation in a gap – crossover between diffusion-limited and phase transition-limited regime". *Journal of Fluid Mechanics* 960 (2023). <https://doi.org/10.1017/jfm.2023.176>.
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- Kasischke, Maren, et al. "Pattern formation in slot-die coating". *Physics of Fluids* 35 (2023). <https://doi.org/10.1063/5.0150340>.
- Keeler, J. S., Gaillard, A., Lawless, J., Thompson, A., Juel, A. & Hazel, A. (2022) The interaction of multiple bubbles in a Hele-Shaw channel *Journal of Fluid Mechanics* 946 A40 DOI: [10.1017/jfm.2022.618](https://doi.org/10.1017/jfm.2022.618)
- Lawless, J., Keeler, J., Gaillard, A., Hazel, A. & Juel, A. (2022) The Unpredictable Nature of Bubble Evolution. *Scientific Reports*, 12. DOI: [10.1038/s41598-022-23231-8](https://doi.org/10.1038/s41598-022-23231-8)
- Henkel, C., et al. "Soft wetting with (a)symmetric Shuttleworth effect". *Proceedings of the Royal Society A: Mathematical, Physical and Engineering Sciences* 478 (2022). <https://doi.org/10.1098/rspa.2022.0132>.

- Stegemerten, Fenna, Karin John, and Uwe Thiele. "Symmetry-breaking, motion and bistability of active drops through polarization-surface coupling". *Soft Matter* 18 (2022): 5823–5832. <https://doi.org/10.1039/d2sm00648k>.
- Matharu, P., Hazel, A., & Heil, M. (2021). Spatio-temporal symmetry breaking in the flow past an oscillating cylinder. *Journal of Fluid Mechanics*, **918**, A42. doi:10.1017/jfm.2021.358.

See also the accompanying "Focus on Fluids" article: Hourigan, K. (2021). Exotic wakes of an oscillating circular cylinder: How singles pair up. *Journal of Fluid Mechanics*, **922**, F1. doi:10.1017/jfm.2021.492

- Nogueira Fontana, J.V., Juel, A., Bergemann, N., Heil, M. & Hazel, A. (2021) Modelling finger propagation in elasto-rigid channels. *Journal of Fluid Mechanics* **916** A27. doi:10.1017/jfm.2021.219
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- Keeler, J., Thompson, A., Lemoult, G., Juel, A. & Hazel, A. (2020) The influence of invariant solutions on the transient behaviour of an air bubble in a Hele-Shaw channel. *Proceedings of the Royal Society A: Mathematical, Physical and Engineering Science*, **475**, p. 1-21 21 p., 20190434. DOI: 10.1098/rspa.2019.0434
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- Pihler-Puzovic, D., Juel, A. & Heil, M. (2014) The interaction between viscous fingering and wrinkling in elastic-walled Hele-Shaw cells. *Physics of Fluids* **26**, 022102. DOI: [doi:10.1063/1.4864188](https://doi.org/10.1063/1.4864188).
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- Thompson, A., Tipton, C., Juel, A., Hazel, A. & Dowling, M. (2014) Sequential deposition of overlapping droplets to form a liquid line. *Journal of Fluid Mechanics*, **761**, p. 261-281 DOI: [10.1017/jfm.2014.621](https://doi.org/10.1017/jfm.2014.621)
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The computations shown in this paper were performed in the days before oomph-lib, but the problem considered in this study now features in oomph-lib demo problems:

- Flow in a 2D channel with an oscillating wall.
- Flow in a 2D collapsible channel.

1.1 PDF file

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