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.

- 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

- Xu, D., Heil,M., Seeboeck, T. & Avila, M. (2020)
  Resonances in Pulsatile Channel Flow with an Elastic Wall *Phys. Rev. Lett.* **125**, 254501. DOI: 10.1103/PhysRevLett.125.254501

- Vaquero-Stainer, C., Heil, M., Juel, A. & Pihler-Puzovic, D. (2019) Self-similar and disordered front propagation in a radial Hele-Shaw channel with time-varying cell depth. *Physical Review Fluids* **4**, 064002. DOI: 10.1103/PhysRevFluids.4.064002.

- Shepherd, D., Miles, J., Heil, M. & Mihajlovic, M. (2019) An adaptive step implicit midpoint rule for the time integration of Newton's linearisations of non-linear problems with applications in micromagnetics. *Journal of Scientific Computing* **80**, 1058-1082. DOI: 10.1007/s10915-019-00965-8

- Nielsen, A.R., Heil, M., Andersen, M. & Brons, M. (2019) Bifurcation theory for vortices with application to boundary layer eruption. *Journal of Fluid Mechanics* **865**, 831-849. DOI: https://doi.org/10.1017/jfm.2019.97

- Pihler-Puzovic, D., Peng, G., Lister, J. R., Heil, M. & Juel, A. (2018) Viscous fingering in a radial elastic-walled Hele-Shaw cell. *Journal of Fluid Mechanics* **849**, 163-191. DOI: https://doi.org/10.1017/jfm.2018.404

- Bergemann, N., Juel, A. & Heil, M. (2018) Viscous drop spreading on a layer of the same fluid: from sinking, wedging and spreading to their long-time evolution. *Journal of Fluid Mechanics* **843**, 1-28. DOI: https://doi.org/10.1017/jfm.2018.127.

- Walters, M.C., Heil, M., Whittaker, R.J. (2017) The Effect of Wall Inertia on High-Frequency Instabilities of Flow Through an Elastic-Walled Tube *The Quarterly Journal of Mechanics and Applied Mathematics*, hbx024. Direct electronic access to article. DOI: https://doi.org/10.1093/qjmam/hbx024

- Cisonni, J., Lucey, A.D., Elliott, S.J & Heil, M. (2017) The stability of a flexible cantilever in viscous channel flow *Journal of Sound and Vibration* **369** 186-202. DOI: 10.1016/j.jsv.2017.02.045
- Heil, M., Rosso, J., Hazel, A.L., Brons, M. (2017). Topological fluid mechanics of the formation of the Karman-vortex street. *Journal of Fluid Mechanics* **812** 199-221. DOI: https://doi.org/10.1017/jfm.2016.792 (Open Access).
- Bertram, C. & Heil, M. (2017). A Poroelastic Fluid/Structure-Interaction Model of Cerebrospinal Fluid Dynamics in the Cord with Syringomyelia and Adjacent Subarachnoid-Space Stenosis. *Journal of Biomechanical Engineering*, **139**(1), 1-10. DOI: 10.1115/1.4034657
- Heil, M. & Bertram, C. (2016). A poroelastic fluid-structure interaction model of syringomyelia. *Journal of Fluid Mechanics*, **809**, 360-389. DOI: https://doi.org/10.1017/jfm.2016.669
- Pestana, J., Muddle, R., Heil, M., Tisseur, F. & Mihajlovic M. (2016) Efficient block preconditioning for a C1 finite element discretisation of the Dirichlet biharmonic problem. *SIAM Journal on Scientific Computing* **38**(1), A325-A345. DOI: 10.1137/15M1014887 . (pdf)
- Heil, M. & Hazel, A.L. (2015) Flow in flexible/collapsible tubes. In: *Fluid-Structure Interactions in Low-Reynolds-Number Flows.* Eds: Duprat, C. & Stone, H.A. Royal Society of Chemistry, RSC Publishing.
- Pihler-Puzovic, D., Juel, A., Peng, G., Lister, J. & Heil, M. (2015) Displacement flows under elastic membranes. Part 1: Experiments and direct numerical simulations. *Journal of Fluid Mechanics* **784** 487- 511. DOI: doi:10.1017/jfm.2015.590 . (pdf)
- Peng, G., Pihler-Puzovic, D., Juel, A., Heil, M. & Lister, J. (2015) Displacement flows under elastic membranes. Part 2: Analysis of interfacial effects. *Journal of Fluid Mechanics* **784** 512- 547. DOI: doi:10.1017/jfm.2015.589 . (pdf)
- Cimpeanu, R., Martinsson, A. & Heil, M. (2015) A parameter-free perfectly matched layer formulation for the finite-element-based solution of the Helmholtz equation. *Journal of Computational Physics* **296** 329–347. DOI: doi:10.1016/j.jcp.2015.05.006.
- Pihler-Puzovic, D., Perillat, R., Russell, M., Juel, A. & Heil, M. (2013) Modelling the suppression of viscous fingering in elastic-walled Hele-Shaw cells. *Journal of Fluid Mechanics* **731**, 162-183 DOI: 10.1017/jfm.2013.375
- 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.
- Shepherd, D., Miles, J., Heil, M., Mihajlovic, M. (2014) Discretisation induced stiffness in micromagnetic simulations. *IEEE Trans. Magn.*, **50**(11) 7201304. DOI: 10.1109/TMAG.2014.2325494
- Muddle, R.L., Mihajlovic, M. & Heil, M. (2012) An efficient preconditioner for monolithically-coupled large-displacement fluid-structure interaction problems with pseudo-solid mesh updates. *Journal of Computational Physics* **231**, 7315-7334. DOI: 10.1016/j.jcp.2012.07.001
- Heil, M., Kharrat, T., Cotterill, P.A. & Abrahams, I.D. (2012) Quasi-resonances in sound-insulating coatings. *Journal of Sound and Vibration* **331** 4774-4784. DOI: 10.1016/j.sv.2012.05.029
- Hazel, A. L., Heil, M., Waters, S.L. & Oliver, J.M. (2012) On the liquid lining in fluid-conveying curved tubes. *Journal of Fluid Mechanics* **705**, 213-233. DOI: 10.1017/jfm.2011.346
- Willoughby, N., Parnell, W. J., Hazel, A. L. & Abrahams, I. D.(2012) Homogenization methods to approximate the effective response of random fibre-reinforced composites *International Journal of Solids and Structures* **49**, 1421–1433. DOI: 10.1016/j.ijsolstr.2012.02.010
- Hewitt, R. E., Hazel, A. L., Clarke, R. J. & Denier, J. P. (2011) Unsteady flow in a torus after a sudden change in rotation rate *Journal of Fluid Mechanics* , **68**, 88–119. DOI: 10.1017/jfm.2011.36
- Haines, P.E. Hewitt, R. E. & Hazel, A. L. (2011) The Jeffery–Hamel similarity solution and its relation to flow in a diverging channel *Journal of Fluid Mechanics* , **687**, 404–430. DOI: 10.1017/jfm.2011.362
- Bearon, R. N., Hazel, A. L. & Thorn, G. J. (2011) The spatial distribution of gyrotactic swimming micro-organisms in laminar flow fields. *Journal of Fluid Mechanics* , **680**, 602–635. DOI: 10.1017/jfm.2011.198

- Stewart, P.S., Heil, M., Waters, S.L. & Jensen, O.E. (2010) Sloshing and slamming oscillations in collapsible channel flow. *Journal of Fluid Mechanics* **662**, 288-319. (abstract) (pdf) (Supplementary material (movie))
- Whittaker, R.J., Heil, M., Jensen, O.E., & Waters, S.L. (2010) The onset of high-frequency self-excited oscillations in elastic-walled tubes. *Proceedings of the Royal Society A* **466**, 3635-3657. (abstract) (pdf)
- Whittaker, R.J., Heil, M., Jensen, O.E., & Waters, S.L. (2010) A rational derivation of a tube law from shell theory. *Quarterly Journal of Mechanics and Applied Mathematics* (pdf) (abstract)
- Heil, M., Boyle, J. (2010) Self-excited oscillations in three-dimensional collapsible tubes: Simulating their onset and large-amplitude oscillations. *Journal of Fluid Mechanics* **652**, 405-426 (abstract) (pdf)
- Whittaker, R.J., Waters, S.L., Jensen, O.E., Boyle, J. & Heil, M. (2010) The energetics of flow through a rapidly oscillating tube. Part I: General theory. *Journal of Fluid Mechanics* **648**, 83-121 (abstract) (pdf)
- Whittaker, R.J., Heil, M., Boyle, J., Jensen, O.E., & Waters, S.L. (2010) The energetics of flow through a rapidly oscillating tube. Part II: Application to an elliptical tube. *Journal of Fluid Mechanics* **648**, 123-153 (abstract) (pdf)
- de Lózar, A., Juel, A. & Hazel, A. L. (2008) The steady propagation of an air finger into a rectangular tube. Journal of Fluid Mechanics **614**, pp 173–195. Link to electronic journal
- Hazel, A.L. & Heil, M. (2008) The influence of gravity on the steady propagation of a semi-infinite bubble into a flexible channel. Physics of Fluids **20**, 092109. (abstract) (pdf preprint)
- Heil, M., Hazel, A.L. & Boyle, J. (2008): Solvers for large-displacement fluid-structure interaction problems: Segregated vs. monolithic approaches. Computational Mechanics. (journal link)
- Heil, M. & Waters, S.L. (2008) How rapidly oscillating collapsible tubes extract energy from a mean flow. Journal of Fluid Mechanics **601**, 199-227. (journal link).
- Hewitt, R. E. & Hazel, A. L. (2006) Midplane-symmetry breaking in the flow between two counter-rotating disks. *Journal of Engineering Mathematics*
  DOI: 10.1007/s10665-006-9098-2. (journal link)
- Heil, M. & Hazel, A. L. (2006) oomph-lib – An *O*bject-*O*riented *M*ulti-*Ph*ysics Finite-Element *Lib*rary. In: *Fluid-Structure Interaction*, Editors: M. Schafer und H.-J. Bungartz. Springer (Lecture Notes on Computational Science and Engineering), pp 19–49. (abstract) (pdf preprint)
- Heil, M. & Waters, S.L. (2006) Transverse flows in rapidly oscillating, elastic cylindrical shells. *Journal of Fluid Mechanics* **547**, 185-214. (abstract) (pdf preprint)

- Jensen, O.E. & Heil, M. (2003) High-frequency self-excited oscillations in a collapsible-channel flow. *Journal of Fluid Mechanics* **481** 235-268. (pdf preprint) (abstract)

  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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