Numerical simulations of wetting on biomembranes

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After the discovery of biomolecular condensates in biological cells, research in this field has increased dramatically. Cells use those condensate droplets as well as membranes to structure their interior. The interaction between membrane and droplet can lead to topological changes in cells like fission or fusion of membranes, which are little understood. In this application-oriented talk, we present a first numerical model, discretized using the finite element method, for simulating the wetting of biomembranes by condensates, including scenarios involving topological changes. The model uses a ternary phase-field approach and is thermodynamically consistent, coupling hydrodynamics, surface tensions as well as bending stiffness, inextensibility and line tension of the membrane. We demonstrate the capabilities of our model through simulation results, which we compare to analytical solutions, alternative numerical approaches, and relevant biological processes.

References:

[1] https://www.sciencedirect.com/science/article/pii/S0045782526002112

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