Two-phase flows on evolving surfaces: modeling and analysis

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In this talk I would like to present some models of two-phase flows on evolving surfaces. Namely, I would like to focus on a diffuse interface model for incompressible viscous two-phase fluids with different densities, nowadays known as Abels-Garcke-Grün model, on an evolving surface. After briefly showing the derivation of the model, I will introduce a suitable framework of evolving families of Banach and Hilbert spaces, and explain some recent results concerning the well-posedness of strong solutions to the problem. Namely I will first focus on the existence of a local strong solution, which is separated from pure phases, and then on how to extend this solution to a global-in-time unique separated strong solution. I will also take the occasion to show some recent techniques for obtaining the validity of the strict separation property on two-dimensional surfaces (as well as on 2D bounded domains) under very weak assumptions on the behavior of the singular potential close the pure phases. These works are in collaboration with Helmut Abels, Ciprian G. Gal, and Harald Garcke.