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Driven interfacial particles acting as capillary dipoles AARON DOERR, STEFFEN HARDT, Tech Univ Darmstadt — Solid particles attached to fluid-fluid interfaces exhibit a number of interesting phenomena such as the formation of regular crystal-like structures. The underlying particle-particle interactions as well as their various origins have been the subject of many studies mainly covering static situations. By contrast, the case of driven particles moving along a fluid-fluid interface is still widely unexplored. By means of perturbation methods we demonstrate that such particles cause a dipolar interfacial deformation which decays algebraically with distance from the particle center. In our study, we focus on particles at interfaces between two fluids of high viscosity ratio, equilibrium contact angles close to 90°, and a pinned three-phase contact line. It is shown that the moving particles change their orientation with respect to the interface normal at zero velocity, similar to the occurrence of a trim angle in ship hydrodynamics. The corresponding interfacial deformation gives rise to an direction-dependent particle-particle interaction which can be approximated via linear superposition in the case of large separations relative to the particle diameter.

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