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Flow field on the interface induced by swimming and driven colloids[1] MEHDI MOLAEI, JIAYI DENG, TIANYI YAO, NICHOLAS CHISHOLM, JOHN CROCKER, KATHLEEN STEBE, University of Pennsylvania — An active colloid trapped on or near a fluid interface generates a complex flow field that differs from the bulk flow. The flow field depends on the modes of motion, the mechanics of the interface, and hydrodynamic coupling with the bulk fluids. To characterize the flow field, we introduce a method based on the correlated motion of active colloids and passive tracer particles. The challenge is to extract weak biased motions of probes via interaction with the active colloids given the noisy environment and significant Brownian displacement. We examine a gallery of active motions and their flow fields; we simultaneously measure the rheology of the interface. We first investigate a 2d bacterial suspension on an oil-water interface as a model active colloidal system. We analyze the flow field induced by pusher and puller bacteria (models of force dipoles) and "pirouetting" bacteria (stationary rotlet dipoles) and driven magnetic microbeads (Stokeslets). The measurements are performed for the interfaces with different viscoelasticity. Tracer particle displacement fields at various lag times are compared to calculated displacement fields for hydrodynamic modes permitted in interfacial layers as a function of rheology and compressibility.

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Mehdi Molaei
University of Pennsylvania

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