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Mathematical inference in one point microrheology[1] CHRISTEL HOHENEGGER, University of Utah, SCOTT MCKINLEY, Tulane University — Pioneered by the work of Mason and Weitz, one point passive microrheology has been successfully applied to obtaining estimates of the loss and storage modulus of viscoelastic fluids when the mean-square displacement obeys a local power law. Using numerical simulations of a fluctuating viscoelastic fluid model, we study the problem of recovering the mechanical parameters of the fluid's memory kernel using statistical inference like mean-square displacements and increment auto-correlation functions. Seeking a better understanding of the influence of the assumptions made in the inversion process, we mathematically quantify the uncertainty in traditional one point microrheology for simulated data and demonstrate that a large family of memory kernels yields the same statistical signature. We consider both simulated data obtained from a full viscoelastic fluid simulation of the unsteady Stokes equations with fluctuations and from a Generalized Langevin Equation of the particle's motion described by the same memory kernel. From the theory of inverse problems, we propose an alternative method that can be used to recover information about the loss and storage modulus and discuss its limitations and uncertainties.

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