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Backward transformation of the colored-noise Fokker-Planck equation for shear-induced diffusion processes of non-Brownian particles¹ LAURA LUKASSEN, MARTIN OBERLACK, Chair of Fluid Dynamics / Graduate School of Excellence Computational Engineering, TU Darmstadt — As described in literature, non-Brownian particles in shear flow show a diffusive behavior due to hydrodynamic interactions. This shear-induced diffusion differs from the wellknown Brownian diffusion, as there is no separation of time scales. That means that the configuration of non-Brownian particles changes on the same time scale as the hydrodynamic velocity. This fact impedes the derivation of a Fokker-Planck equation describing non-Brownian particles in pure position space. In this context, we derived a new Fokker-Planck approach in coupled position-velocity space to assure the validity of the Markov process assumption which is violated in pure position space formulation (Lukassen, Oberlack, Phys. Rev. E 89, 2014). Here, we present a further validation of our new Fokker-Planck approach that allows us to establish a relation to a modified purely position space Fokker-Planck equation. This backward transformation exhibits additional correction terms when compared to other position space Fokker-Planck equations in that context known from literature. Our extended approach shall enable a better stochastic description of non-Brownian particle flows.

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