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Fluctuation relations for anomalous dynamics generated by time fractional Fokker-Planck equations — Peter Dieterich[1], •Rainer Klages[2,3], and Aleksei V. Chechkin[2,4,5] — [1]Institut fuer Physiologie, Technische Universitaet Dresden — [2]Max Planck Institute for the Physics of Complex Systems, Dresden — [3]Queen Mary University of London, School of Mathematical Sciences — [4]Institute for Theoretical Physics NSC KIPT, Kharkov, Ukraine — [5]Institute of Physics and Astronomy, University of Potsdam

Anomalous dynamics characterized by non-Gaussian probability distributions (PDFs) and/or temporal long-range correlations can cause subtle modifications of conventional fluctuation relations (FRs). As prototypes we study three variants of a generic time-fractional Fokker-Planck equation with constant force. Type A generates superdiffusion, type B subdiffusion and type C both super- and subdiffusion depending on parameter variation. Furthermore type C obeys a fluctuation-dissipation relation whereas A and B do not.We calculate analytically the position PDFs for all three cases and explore numerically their strongly non-Gaussian shapes. While for type C we obtain the conventional transient work FR, type A and type B both yield deviations by featuring a coefficient that depends on time and by a nonlinear dependence on the work.We discuss possible applications of these types of dynamics and FRs to experiments.

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