Anomalous relaxation in diffusive processes with non-linear clocks

D. O'Malley[1], and J.H. Cushman[1]

[1]*Purdue University, West Lafayette, Indiana, USA*

ABSTRACT: A diffusive process, X(t), with stationary increments can be transformed into a process with nonstationary increments by introducing a non-linear clock, *i.e.*, define Y(t)=X(F(t)) where F(t) is a non-linear function. Such a transformation can significantly alter the relaxation pattern of the process. We study the effect of these transformations on the relaxation patterns for Brownian and Lévy motions. A wide array of relaxation patterns are possible including exponential, stretched exponential and power-law relaxations. This family of processes provides a flexible tool for modeling relaxation pattern measurements from diffusion in porous media. These measurements have medical imaging applications such as diffusion tensor imaging.