Abstract

In this paper diffusion processes with changing modes are studied involving the variable order partial differential equations. We prove the existence and uniqueness theorem of a solution of the Cauchy problem for fractional variable order (with respect to the time derivative) pseudo-differential equations. Depending on the parameters of variable order derivatives short or long range memories may appear when diffusion modes change. These memory effects are classified and studied in detail. Processes that have distinctive regimes of different types of diffusion depending on time are ubiquitous in the nature. Examples include diffusion in a heterogeneous media and protein movement in cell biology.