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A NON-LINEAR STABLE NON-GAUSSIAN PROCESS IN FRACTIONAL TIME

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Abstract. A subdiffusion problem in which the diffusion term is related to a stable stochastic process is introduced. Linear models of these systems have been studied in a general way, but non-linear models require a more specific analysis. The model presented in this work corresponds to a non-linear evolution equation with fractional time derivative and a pseudo-differential operator acting on the spatial variable. This type of equations has a couple of fundamental solutions, whose estimates for the L_p-norm are found to obtain three main results concerning mild and global solutions. The existence and uniqueness of a mild solution is based on the conditions required in some parameters, one of which is the order of stability of the stochastic process. The existence and uniqueness of a global solution is found for the case of small initial conditions and another for non-negative initial conditions. The relationship between the Fourier analysis and Markov processes, together with the theory of fixed points in Banach spaces, is particularly exploited. In addition, the present work includes the asymptotic behavior of global solutions as a linear combination of the fundamental solutions with L_p-decay.

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