Martingale solutions of the stochastic Navier-Stokes equations driven by Lévy noise in 3D domains

Elżbieta Motyl emotyl@math.uni.lodz.pl
Lodz University, Lodz

Abstract

We consider the Navier-Stokes equations

$$du(t) = \big[\Delta u - (u \cdot \nabla)u + \nabla p + f(t)\big]\, dt + \int_Y F(t,u)\, \tilde{\eta}(dt,dy) + G(t,u(t))\, dW(t), \qquad t \in [0,T],$$

in 3D possibly unbounded domain $\mathcal{O}$, with the incompressibility condition div $u = 0$, the unitial condition $u(0) = u_0$, and with the homogeneous boundary condition $u_{|\partial \mathcal{O}} = 0$. Using the classical Faedo-Galerkin approximation and the compactness method we can prove existence of a martingale solution understood as a system $(\Omega, \mathcal{F}, \mathbb{P}, \mathbb{F}, \eta, W, u)$, where $(\Omega, \mathcal{F}, \mathbb{P}, \mathbb{F})$ is a filtered probability space, η is a time homogeneous Poisson random measure, W is a cylindrical Wiener process and $u = (u_t)_{t \in [0,T]}$ is a stochastic process, satisfying appropriate integral equality. We consider also the compactness and tighness criteria in a certain space contained in some spaces of *càdlàg* functions, *weakly càdlàg* functions and some Fréchet spaces. Moreover, we use a version of the Skorokhod Embedding Theorem for nonmetric spaces.

AMS Classification: 35Q30, 60H15.