Central Limit Theorem for a Gaussian Incompressible Flow with Additional Brownian Noise

Tomasz Miernowski

Abstract: We generalize the result of Komorowski and Papanicolaou published in [7]. We consider the solution of stochastic differential equation
\[ dX(t) = V(t, X(t))dt + \sqrt{2\kappa}dB(t), \]
where \( B(t) \) is a standard \( d \)-dimensional Brownian motion and \( V(t, x), (t, x) \in \mathbb{R} \times \mathbb{R}^d \), is a \( d \)-dimensional, incompressible, stationary, random Gaussian field decorrelating in finite time. We prove that the weak limit as \( \epsilon \downarrow 0 \) of the family of rescaled processes \( X_\epsilon(t) = \epsilon X(t/\epsilon^2) \) exists and may be identified as a certain Brownian motion.

2000 AMS Mathematics Subject Classification: 60F05 (60G15).

Key words and phrases: Weak convergence, random process, Gaussian field, incompressible flow, diffusion.

The full text is available here