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Dynamical Heterogeneity and Aging in Turbulence with a Nambu-Goldstone Mode

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Abstract : We investigate the Nikolaevskiy equation numerically using exponential time differencing method and pseudo-spectral method. This equation develops a long-wavelength modulation that behaves as a Nambu–Goldstone mode, and short-wavelength instability and exhibit turbulence. Using the autocorrelation analysis, the statistical properties of the turbulence governed by the equation are investigated. The autocorrelation then has been fitted with The Kohlrausch– Williams–Watts (KWW) expression. By varying the control parameter, we show a transition from compressed to stretched exponential for the auto-correlation function of Nikolaevskiy turbulence. The compressed exponential is an indicator of the existence of dynamical heterogeneity while the stretched indicates aging process. Thereby, we revealed the existence of dynamical heterogeneity and aging in the turbulence governed by Nikolaevskiy equation.

Keywords : compressed exponential, dynamical heterogeneity, Nikolaevskiy equation, stretched exponential, turbulence
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