Summit to: (Atomistic Methods, Molecular Dynamics, Kinetic Monte Carlo)

Transient superdiffusion via solitons in Fermi-Pasta-Ulam-Tsingou-β chians

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EXTENDED ABSTRACT: Correctly predicting the sound speed is the traditional way to determine energy carriers in Fermi-Pasta-Ulam-Tsingou (FPUT)-β chains. As yet, it is under long-standing debate whether the carriers are solitons [1, 2] or effective phonons, because both of them predict the sound speed well. Here, based on molecular dynamics method, we provide numerical evidences in the far-off-equilibrium transient regime to distinguish that solitons are the carriers of anomalous diffusion. Results show that the scalings of energy correlation C_E reflect the Lévy-5/3 transient superdiffusion, while the side peaks of momentum correlation C_P, as hallmarks of superdiffusion, satisfy the Kardar-Parisi-Zhang scaling, whose moving velocity gradually increases to the sound speed. Furthermore, results confirm that the collisions of solitons lead to the velocity fluctuations of solitons, which causes the observation that the velocities of solitons, no matter greater or less than, will converge to the sound speed. Thus, the soliton with the sound speed gradually becomes the most probable soliton which determines the side peaks. Our results resolve the controversy via directly mapping the side peaks to the anomalous diffusion of solitons, and attributing the transient superdiffusion in FPUT-β chains to the solitions.

Keywords： transient superdiffusion; solitons; FPUT-β chains; Kardar-Parisi-Zhang scaling

REFERENCES

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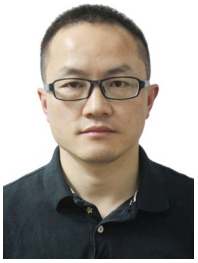
BIOGRAPHY



Yi Ming has completed his PhD at the age of 26 years from University of Science and Technology of China. He has published more than 10 papers in reputed journals.

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