Signature of bifractality in the one-dimensional Wolf-Villain model

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We introduce a multifractal optimal detrended fluctuation analysis to examine the scaling properties of the one-dimensional Wolf-Villain (WV) model for surface growth. This model generates coarsened surface morphologies over extended time scales (up to 10^9 monolayers), and its universality class is still unresolved. Our findings for the multifractal exponent $\tau(q)$ indicate an effective local roughness exponent that aligns with a transient in the molecular beam epitaxy (MBE) growth regime and the Edwards-Wilkinson (EW) universality class for negative and positive q-values, respectively. Consequently, while the results support the hypothesis that long-wavelength fluctuations fall within the EW class in the hydrodynamic limit, as suggested by recent studies, we observed a bifractal signature of the WV model with an MBE regime at short wavelengths [1].

References

[1] E. E. Mozo Luis, S. C. Ferreira, and T. A. de Assis, Phys. Rev. E **110**, L012801 (2024).

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