Universality in reaction-diffusion fronts

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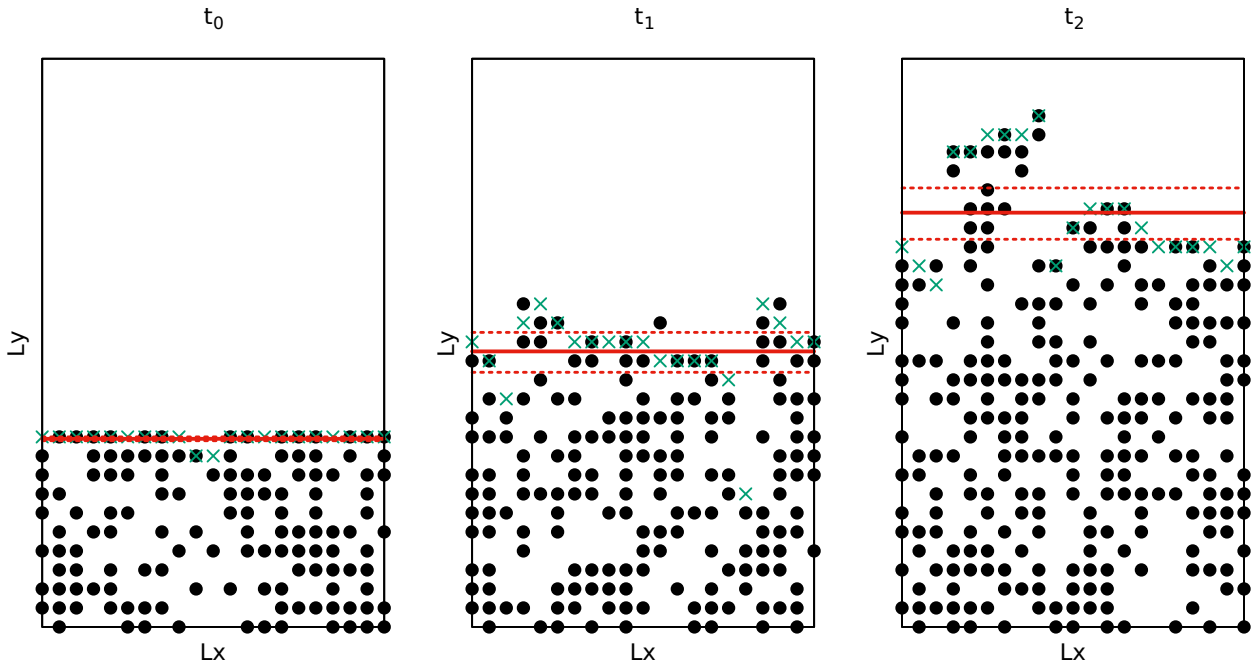
We have studied the dynamical critical behavior of the reversible process $A + A \longleftrightarrow A$ by performing extensive numerical simulations of the time evolution of an interface separating stable and unstable phases.

The simulation of the dynamic of a reaction-diffusion front:



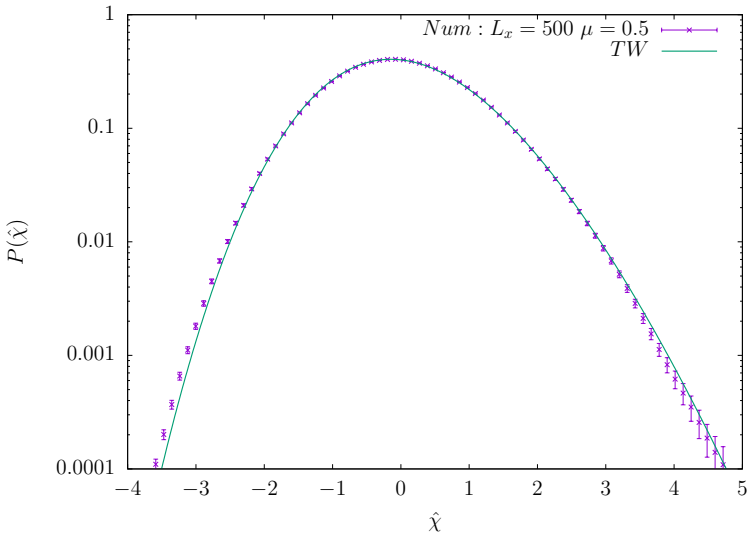
We calculate the stable front $h(x,t)$, the position of the interface $\bar{h}(t)$ and its roughness $w^2(L_x,t) = \overline{\langle [h(x,t) - \bar{h}(t)]^2 \rangle}$.

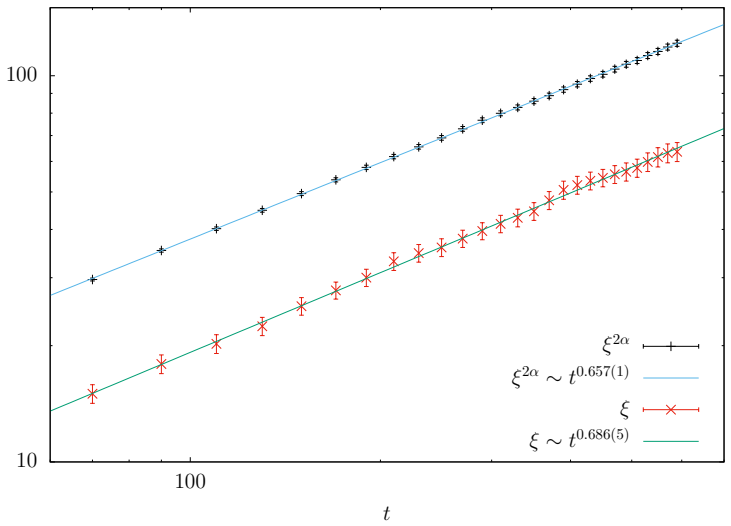
We have measured the critical exponents which characterize the spatio-temporal fluctuations of such a front for different lattice sizes.

Exponents	Simulations	KPZ universality
α	0.463(4)	1/2
β	0.319(2)	1/3
z	0.686(5)	2/3

We successfully reach the KPZ limit.

The histogram of the front fluctuations is in line with the Tracy-Widom distribution. We have also determined the correlation length.





Thank you so much for your attention!