ESCAPE OF MASS IN ZERO-RANGE PROCESSES WITH RANDOM RATES

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ABSTRACT. We consider zero-range processes in $\mathbb{Z}^d$ with site dependent jump rates. The rate for a particle jump from site x to y in $\mathbb{Z}^d$ is given by $\lambda_x g(k) p(y-x)$, where $p(\cdot)$ is a probability in $\mathbb{Z}^d$, $g(k)$ is a bounded nondecreasing function of the number k of particles in x and $\lambda = \{\lambda_x\}$ is a collection of i.i.d. random variables with values in $(c, 1]$, for some $c > 0$. For almost every realization of the environment λ the zero-range process has product invariant measures $\{\nu_{\lambda,v} : 0 \leq v \leq c\}$ parametrized by v, the average total jump rate from any given site. The density of a measure, defined by the asymptotic average number of particles per site, is an increasing function of v. There exists a product invariant measure $\nu_{\lambda,c}$, with maximal density. Let μ be a probability measure concentrating mass on configurations whose number of particles at site x grows less than exponentially with $\|x\|$. Denoting by $S_\lambda(t)$ the semigroup of the process, we prove that all weak limits of $\{\mu S_\lambda(t), t \geq 0\}$ as $t \to \infty$ are dominated, in the natural partial order, by $\nu_{\lambda,c}$. In particular, if μ dominates $\nu_{\lambda,c}$, then $\mu S_\lambda(t)$ converges to $\nu_{\lambda,c}$. The result is particularly striking when the maximal density is finite and the initial measure has a density above the maximal. This is joint work with Pablo A. Ferrari.

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