Phase transitions for the slowed exclusion process

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In this talk I will consider the symmetric simple exclusion process with a slow bond. This is a Markov process with state space $\{0,1\}^{\mathbb{T}_n}$, where $\mathbb{T}_n$ represents the one dimensional discrete torus. In this process, particles wait a mean one exponential time after which they jump to one of their nearest neighbors. We fix the jump rate from x to $x+1$ equal to the jump rate from $x+1$ to x and equal to 1 for all sites, except for x = -1 where it equals $\alpha n^{-\beta}$, with $\alpha > 0$ and $\beta \in [0, \infty]$. By increasing the value of β we are creating a microscopic barrier which blocks the passage of particles across the bond $\{-1, 0\}$. I will present some scaling limits for this model at the level of hydrodynamics and fluctuations. In the hydrodynamics, for $\beta \in [0, 1)$, the density of particles evolves according to the heat equation with periodic boundary conditions; if $\beta = 1$, it evolves according to the heat equation with some Robin's boundary conditions and if $\beta \in (1, \infty]$, it evolves according to the heat equation with Neumann's boundary conditions. A similar phase transition is also present on the fluctuations of the density, the current, the tagged particle and the occupation time.

This is a joint work with Tertuliano Franco (UB - Brazil) and Adriana Neumann (UFRGS - Brazil).