Size-biased diffusion limits for the inclusion process

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We study the Inclusion Process with vanishing diffusion coefficient, which is known to exhibit condensation and metastable dynamics for cluster locations. Here we focus on the dynamics of mass distribution rather than locations, and consider the process on the complete graph in the thermodynamic limit with fixed particle density. We describe the mass distribution for a given configuration by a measure on a suitably scaled mass space and derive a limiting measure-valued process. When the diffusion coefficient scales like the inverse of the system size, the scaling limit is equivalent to the well known Poisson-Dirichlet diffusion, offering an alternative point of view for this well-established dynamics. Our approach can be generalized to other scaling regimes, providing a natural extension of the Poisson-Dirichlet diffusion to infinite mutation rate. Considering size-biased mass distributions, our approach yields an interesting characterization of the limiting dynamics via duality.

This is joint work with Simon Gabriel and Paul Chleboun (both Warwick).