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Exact Solution for a class of Mass Transport Models, Condensation Transitions, and the Nature of the Condensate M.R. EVANS, School of Physics, Univ. Edinburgh, Edinburgh, UK, S.N. MAJUMDA, LPTMS., Univ. Paris-Sud, Orsay, FR, R.K.P. ZIA, Physics Dept., Virginia Tech, Blacksburg, VA, USA — We study the phenomenon of real space condensation in the steady state of one dimensional mass transport models. These models, including the Zero-Range Process and the Asymmetric Random Average Process, have been used to describe a variety of physical systems, e.g., bio-molecular motors, vehicular or pedestrian traffic, force propagation through granular media, etc. The dynamics consists of stochastically transferring a portion of the mass, from site to neighboring site, according to some prescribed distribution. For a class of these models, we find an easy test to check if the steady state (full multi-site) distribution is 'factorizable,' and if so, a simple method to construct the solution explicitly. Based on this approach, we not only verify the criterion for the existence of a condensation transition (where, a la Bose-Einstein, a finite fraction of the total mass condenses into a single site) but also elucidate the nature of the condensate. Specifically, we find two regimes: one where the mass of the condensate is Gaussian distributed with normal fluctuations, and a second regime with non-Gaussian distributions and anomalously large fluctuations.

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