Space fluctuations of an equilibrium surface under the Random Average Process

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The Random Average Process is a dynamical random surface based on $\mathbf{Z}^d$ whose heights start as a (deterministic) inclined plane and evolve in discrete time by taking averages of neighboring heights. The average weights are iid in time and relative positions of the heights. It has been proved that, under natural and mild conditions on the average weights, the surface viewed from the height at the origin converges in distribution in time. The covariance structure of the limit surface — remarkably, and not previously noted, the same of discrete Gaussian free fields — establish unbounded fluctuations in $d = 1$ and 2, and bounded ones for higher d. In the talk, we will explain how to obtain Central Limit Theorems for the (space) fluctuations of the suitably rescaled limit surface in $d = 1$ and 2 (in the finite dimensional sense).