Electronic Supplementary Material (ESI) for Soft Matter.

Supplementary Material for the manuscript: Geometric order parameters derived from the Voronoi tessellation show signatures of the jamming transition

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In the main manuscript, we examine the effect of dimension on the geometric order parameters associated with the Voronoi tesselation as we approach jamming. While the majority of the work is done with monodisperse spheres, in $d = 2$ monodisperse disks spontaneously crystalize. We thus use a 50:50 mixture of bidisperse disks with a 1:1.4 ratio of radii which are known to exhibit jamming. In doing so, we observe that the scaling of the standard deviation of the volume and the internal angle differs from the $d = 3-5$ case. It is not immediately clear whether this is a dimensional effect, an effect of the bidispersity, or both. In this supplement, we compare $d = 3$ systems of 16384 particles with a 50:50 mixture of 1:1.4 ratio of radii to the monodisperse $d = 3$ cases presented in the manuscript. We still observe power law scaling in all of the order parameters, with the possible exception of internal angle when approaching from below. However, the power laws for each parameter are not consistent with the power laws for monodisperse spheres. This seems to suggest that bidispersity and dimensional effects cannot be decoupled.

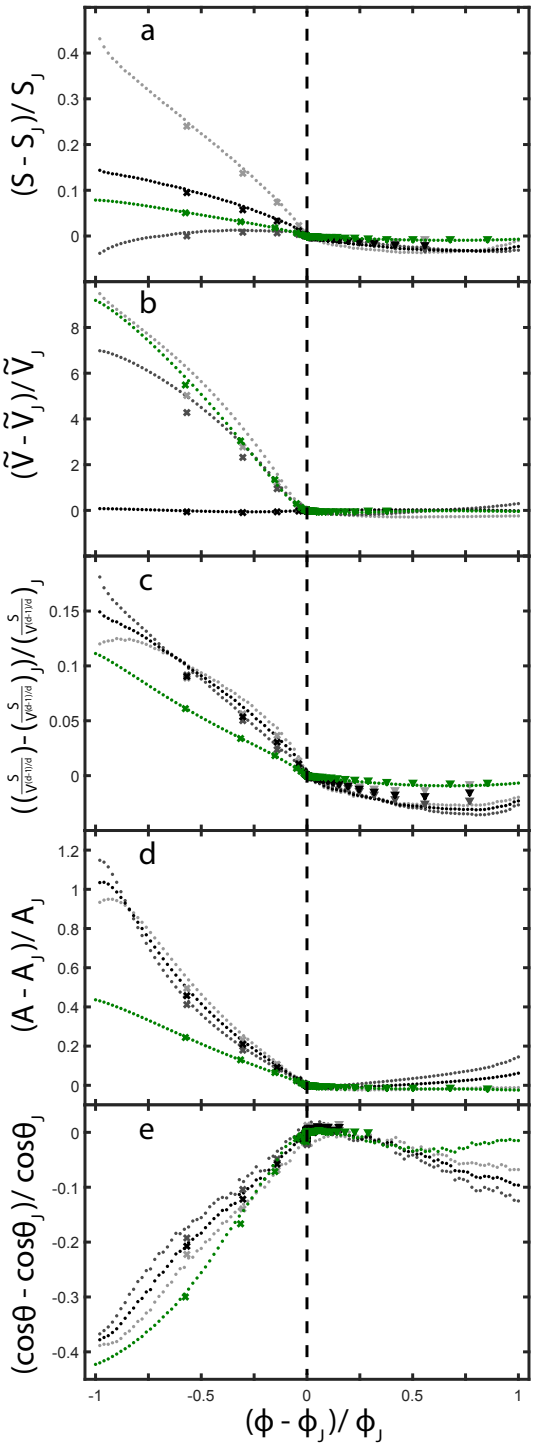

FIG. 1. Plots of scaled order parameters vs. the scaled packing fraction. Closed circles represent IQ data, x's represent GM data (from below), and triangles represent ES data (from above). Note that on this linear scale the GM and ES data is nearly all clustered right at ϕ_J. The parameters shown are (a) mean surface area, S, (b) standard deviation of volume divided by the mean of the volume, $\tilde{V}$, (c) mean surface to volume ratio $S/V^{(d-1)/d}$ (d) mean aspect ratio, A, and (e) mean aspect ratio angle $cos\theta$. We plot data for $d = 3$ bidisperse spheres (smaller particles light gray, larger particles dark gray, combined black) and $d = 3$ monodisperse spheres (green).

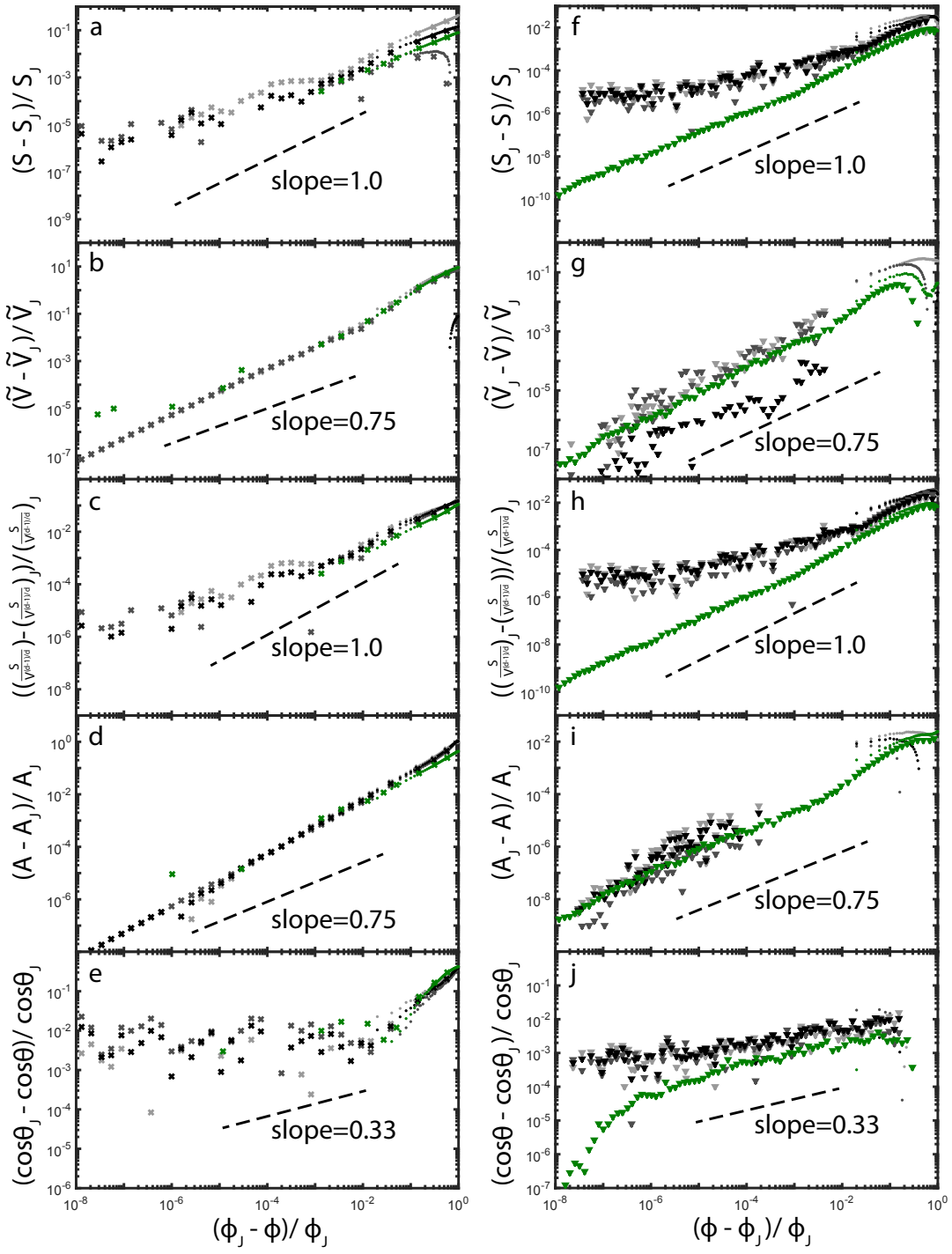

FIG. 2. Log-log plots of each scaled order parameter vs. the scaled packing fraction approaching jamming from below (left) and above (right). Closed circles represent IQ data, x's represent GM data (from below), and triangles represent ES data (from above). The parameters shown are (a,f) mean surface area, S, (b,g) standard deviation of volume divided by the mean of the volume, $\tilde{V}$, (c,h) mean surface to volume ratio $S/V^{(d-1)/d}$ (d,i) mean aspect ratio, A, and (e,j) mean aspect ratio angle $cos\theta$. We plot data for $d = 3$ bidisperse spheres (smaller particles light gray, larger particles dark gray, combined black) and $d = 3$ monodisperse spheres (green). The slopes shown give the power laws for monodisperse spheres for comparison.