—Supplementary Information—
Velocity distribution of a homogeneously driven two-dimensional granular gas

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ISOTROPY AND GLOBAL ROTATION

Additionally to the homogeneous density of the system, for homogeneous driving also the velocity distribution has to be isotropic (i.e. symmetric and equal for both velocity components. Figure 1 shows both components of a single particle without interaction with other particles. As expected in this case, the distribution fulfills the above assumptions.

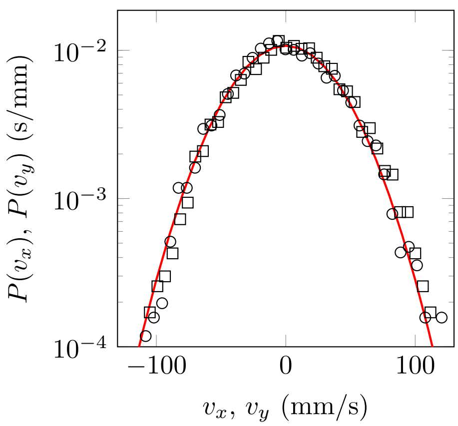

FIG. 1. Distribution of the velocity components $P(\vec{v} \cdot \vec{e}_x)$ of a single particle without interaction with other particles. The solid line shows a fit to a Gaussian.

Another important aspect is the exclusion of global rotation / vorticity. Apart from the particles at the boundary we find no visual indication of a large scale collective rotation. For a more quantitative argument, we estimated the global vorticity by the following procedure: From the experimental data (video recordings), we calculated the total angular momentum of the system with respect to the center of mass, $L = |m \sum_i \vec{r}_i \times \vec{v}_i| \approx 1.92 \times 10^{-6}\,\mathrm{kg\,m^2/s}$. If we approximate the entire system as a homogeneous rotating disc of radius $R = 0.235\,\mathrm{m}$ and $m = 0.464\,\mathrm{kg}$ (total mass of all particles) we obtain the moment of inertia, $J = 1/2mR^2 = 0.0128\,\mathrm{kgm^2}$. From $\vec{L} = J \times \vec{\omega}_s$ we obtain an effective angular velocity of the systen, $\omega_s \approx 1.5 \times 10^{-4}\,\mathrm{s^{-1}}$. If this small value would correspond to a systematic rotation, its rotational velocity would be four orders of magnitude below the rotational velocity of a single particle ($\approx 3\,\mathrm{s^{-1}}$). Therefore, we conclude that the systematic rotation (if any) can be safely neglected.

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