Qeios

Peer Review

Review of: "Numerical Prediction of the Steady-State Distribution Under Stochastic Resetting from Measurements"

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This is a solid material describing two experimental realizations of SR (#1: colloids and #2: bugs), with a comparison to the theoretical results on SR and the NESS PDF for BM. This study will certainly have implications for the SR community. Here are some specific comments and suggestions: 1. Refs. [18] and [19] are the original studies on colloids and bugs, respectively. The current material is heavily/exclusively based on these and thus per se is not really original. Maybe this was the goal of the journal/author? 2. For a sole author, "I" instead of "WE" is often preferred. 3. The number of bars in a histogram is not a parameter for optimization. Statistically, for N data points with a given IQR, the bar-width is about 2*IQR*N^{-1/3}. 4. Why not use log-lin in Figs. 1b and 2? Exp(a*x) is then just a straight line. 5. Strictly speaking, system #1 has no perfect radial or cylindrical symmetry. 6. The 6-fold symmetry is fancy, but one can possibly do the same analysis with only one trap. Those 6 traps can affect the mutual diffusion of the beads. It is particularly true here, where the maximal displacements \sim \sqrt{MSD} are just about two tracer diameters, i.e., ca. 3 microns. So, no long-range or long-time diffusion was actually recorded. The MSDs, however, start to disagree, namely at longer times, as Fig. 4b shows. Will this data-vs-theory MSD divergence become more dramatic at times >20 sec? 7. The lag time is usually used for the TAMSD, while here it is employed for the MSD. 8. Why should the viscosity decrease for more separated particles? Was the value of eta in system #1 strongly perturbed by some artificial “confinement” of the tracers near those 6 green starting points? 9. JS or KL parameter seems to have physical units of the PDF, 1/meter (but none are included in the text). 10. For system #2, it is claimed that the motion of bugs takes place so that "with obstacle collisions increasing its rotational diffusion coefficient". This seems to be a very obstacle-density-

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dependent statement. If you e.g., pack those "sugar blocks" at nearly 100% space-filling fraction, no bug will rotate or move at all, despite perpetual collisions with the surrounding blocks. 11. The properties of those free paths of bugs are mass-, size-, shape-, etc.-dependent (both for bugs and for blocks). 12. The MSDs are not presented in log-log scale. Trends are extracted without showing the SDs of the points (both for PDF and MSD). 13. The Gaussianity of the PDF P(x) can easily be shown in log-log scale when plotting -log[P(x)] vs x, instead of plotting the raw P(x) vs x data, see e.g., Fig. 7 in Ref. [https://journals.aps.org/pre/abstract/10.1103/PhysRevE.105.L012106] or Fig. 3 in Ref. [https://journals.aps.org/prx/abstract/10.1103/PhysRevX.6.021006]. This would make the statements regarding the Gaussianity much more quantitative. 14. Minor: (i) Numbers and units are to be written separately, units never in italic. (ii) Numbers are complex, behaviors/systems are complicated or involved.

Declarations

Potential competing interests: No potential competing interests to declare.