Abstract Submitted
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Angular statistics of fluid particle trajectories in confined two-dimensional turbulence BENJAMIN KADOCH, IUSTI, Aix-Marseille University, Marseille, France, WOUTER BOS, LMFA-CNRS, Ecole Centrale de Lyon, Ecully, France, KAI SCHNEIDER, M2P2-CNRS & CMI, Aix-Marseille University, Marseille, France — The directional change of fluid particles can be characterized by the angle between subsequent particle displacement increments evaluated as a function of the time lag [1]. At small values of the time-increment the so-defined angle is proportional to the curvature of the trajectory. At large values this coarse-grained curvature should be affected by the presence of solid no-slip walls around the flow domain. In [2] we applied these statistics to three-dimensional isotropic turbulence, here we compare homogeneous and confined two-dimensional turbulent flows. We show that at long times the probability density function of the angles carries the signature of the confining domain if finite size effects are present. At short times, the PDF of the cosine of the angle is given by a power law with a well defined exponent, reminiscent of the close to Gaussian character of the velocity field.

[1] S. Burov, S.A. Tabei, T. Huynh, M.P. Murrell, L.H. Philipson, S.A. Rice and A.R. Dinner. Distribution of directional change as a signature of complex dynamics. Proc. Natl. Acad. Sci., 110(49), 19689, 2013.
[2] W.J.T. Bos, B. Kadoch and K. Schneider. Angular Statistics of Lagrangian Trajectories in Turbulence. Physical Review Letters 114 (21), 214502, 2015.

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